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ABSTRACT BOOK

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Since 2010, the P.P. Shirshov Institute of Oceanology RAS (SIO RAS) in Gelendzhik maintains the research (observational) site for year round multi-disciplinary studies and monitoring of the marine environment in the coastal zone. Analysis of the data obtained at the observational site revealed the existence of well pronounced short-term variability of coastal zone hydrodynamics at time scales from 1-3 days to 1-2 weeks. The paper examines the role of external forcing (including the impact of adjoined open sea dynamics and wind stress) in the short-term variability of hydrodynamics and upper mixed layer evolution.

PT3 TOOLS AND SPECIFIC RECOMMENDATIONS FOR POLICY MAKERS BASED ON THE RESULTS OF THE PERSEUS EU PROJECT

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PERSEUS (Policy-oriented marine Environmental Research in Southern EUropean Seas) was a large-scale, four-year EU project (2012-2015) involving 53 partners from 21 countries and 300+ scientists that assessed the combined effects and impacts of human and natural pressures on the Mediterranean and Black Seas and used the objectives and principles of the Marine Strategy Framework Directive (MSFD) to achieve its goal. PERSEUS was a first-of–its-kind, marine environmental research project that targeted a large part of its activities at creating science-based governance tools for policy makers and supported them in developing adaptive policies for the achievement of Good Environmental Status (GES) across the Mediterranean and Black Sea. Scientific findings from PERSEUS showed that pressures on both the Mediterranean and the Black Sea are still increasing. In addition, and related to knowledge-based policy it seems that there is a lack of data accessibility and long time series, while in many cases poorly constrained processes cannot really support policy making (e.g. ecosystem functioning, climate change, fisheries management, etc.). Resource exploitation, industrial pollution, tourism and transportation affect their ecosystems, but can also have negative effects on socio-economic activities. Working closely with the Regional Conventions of Mediterranean and the Black Sea, and providing a set of tools for the policy makers, PERSEUS enhanced the understanding of the true added value of the policy-science interface.

PT5 WATER DIVERSION AND SEA-LEVEL RISE: POTENTIAL THREATS TO FRESHWATER SUPPLIES IN THE CHANGJIANG RIVER ESTUARY

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The densely-populated mega-city of Shanghai relies increasingly on freshwater from the Changjiang estuary (70% now). However, this strategy is facing potential threats due to extensive water diversion in the lower basin and future sea-level rise. The present study evaluates the ability of Shanghai to source its water from the estuary, especially in the dry season. Flow <15,000 m3 s-1 ca. 50% for dry seasons, represents the threshold for salinity 0.45 psu (chloride 250 mg/L) above which the estuary is unusable for freshwater. Correlating discharge and salinity, maximum salinity and related time duration, and taking the future water diversions and sea-level rise into consideration, we extrapolated salinity events into the future at intervals of 10 years until 2040. We estimate that water diversions of 56.2x109m3 (1800 m3s-1), 59.2x109m3 (1900 m3s-1) and 61.3x109 m3 (2000 m3s-1) will occur in 2020, 2030 and 2040, and a rise of sea level of 0.12 m by 2040 (from 2010), equivalent 506 m3s-1, ca. 19.4% of the total reducing discharge of 2040 into the estuary (ca. 28% projected to the worst case of February of 2040). Based on scenario building, the pattern of salinity distribution would remain >0.45 for 20-65, 75-90 and 120-128 days (in 2020, 2030, and 2040, respectively), for extreme low-flow conditions. These periods exceed the present 68-day maximum freshwater storage in Qingcaosha reservoir, which is meant to secure freshwater for Shanghai in the future.

PT6 HISTORY OF TOTAL POLLUTION LOAD CONTROL AND POSSIBLE FUTURE COASTAL MANAGEMENT IN JAPAN

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Environmental management system of coastal seas in Japan differs between enclosed coastal seas and other coastal seas. Among 88 officially designated enclosed coastal seas, Total Pollution Load Control (TPLC) system in terms of COD, Total Nitrogen (TN) and Total Phosphorus (TP) has been applied to special 3 areas which were Tokyo Bay, Ise Bay and the Seto Inland Sea including their watershed. TPLC has given significant effects on the reduction of pollutants load and on the improvement of water quality in these three designated areas. Present status of Tokyo Bay and Ise Bay requires further reduction of pollutants load. On the other hand, the Seto Inland Sea except Osaka Bay does not require further reduction of TN and TP load because TN and TP concentration in sea water of the area has been already satisfied with environmental standards of TN and TP. Accordingly, the Seto Inland Sea except Osaka Bay are now entering into new phase of TPLC system which can be said to be post-TPLC age. In that sense, the Seto Inland Sea is a kind of top runner of environmental management in Japan. However, holistic environmental condition of the Seto Inland Sea is not so good as desirable level because biological habitat such as sea grass bed and tidal flat, biological diversity and living resources are so deteriorated. Possible future coastal management in this area is requested to include active conservation such as restoration of biodiversity, biological productivity, habitat and well balanced nutrient cycle between land and sea. Holistic approaches such as ecosystem-based management (EBM), integrated coastal management (ICM) should also be incorporated. Governmental basic plan for the environmental conservation of the Seto Inland Sea and the Seto Inland Sea Law were recently revised in 2015 towards new direction. Although the revised new system has not fully worked yet partly because action plan of each prefecture level has not yet consolidated. However, new management policy of the Seto Inland Sea will contribute to the future coastal management of all coastal seas around Japan.

ORAL PRESENTATIONS

O1. DEVELOPMENT OF COASTAL MANAGEMENT METHOD TO REALIZE THE SUSTAINABLE COASTAL SEA

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The Ministry of Environment, Japan has begun the new research project "Development of Coastal Management Method to Realize the Sustainable Coastal Sea" (2014-2018, PI: T.Yanagi) in 2014. This project aims to propose the suitable ICM (Integrated Coastal Management) for realizing the sustainable coastal community. Three research fields (Seto Inland Sea as semi-enclosed coastal sea, Sanriku coastal seas for open character coastal sea and Japan Sea's coastal sea where the international management is necessary) are selected to clarify their natural characteristics from the viewpoint of physical, chemical and biological oceanography. Social and human scientists are also included to this trans-disciplinary project in order to clarify the economic and cultural aspects of the sustainable coastal community. We will develop the integrated numerical model which is useful for the policy decision in the coastal areas.

O2. FATE OF SILTS AND CLAY FROM RIVER AND ITS CONTRIBUTION TO TRANSPARENCY

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Phytoplankton plays a key role as primary producer, forming the base of marine food webs. Knowledge in relation to permeability of light in water is important for the understanding of phytoplankton growth in the euphotic zone. In this study, we conducted laboratory experiments in relation to light attenuation using inorganic particle (silica particle) and field investigations in Osaka Bay. There was a positive correlation between the concentrations of the silica particle and integral values of the absorbance at photosynthetic active radiation (PAR: wavelength 400-700 nm) in the laboratory experiments. The highest integral value of the absorbance at PAR was observed for the particle size of 1.0 мм. In Osaka Bay, high contribution of the inorganic particle to light attenuation was observed compared to the organic particles. Multiple linear regression analysis using the particle size and the amount of total suspended solids (TSS: consisting of three component fractions; organic/inorganic tripton and phytoplanktons) showed that the particle size was an essential factor controlling the light attenuation in the coastal sea.

O3. SATOUMI APPROACH FOR REALIZING SUSTAINABLE COASTAL USE IN A RIAS-TYPE BAY: A CASE OF SHIZUGAWA BAY IN SANRIKU COAST HIT BY THE HUGE TSUNAMI ON 11 MARCH 2011

Teruhisa Komatsu[1], Shuji Sasa[1], Shigeru Montani[2], Osamu Nishimur[3], Takashi Sakamaki[3], Chihiro Yoshimura[4], Manabu Fujii[4], Tetsuo Yanagi[5]

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Rias-type bays are one of the most common coasts in Japan where aquacultures have been active due to sheltered geological shape with a deep bottom. The huge tsunami hit Sanriku Coast consisting of open rias-type bays near the epicenter facing Pacific Ocean on 11 March 2011. For recovering Sanriku Coast, it is important to include sustainability in its program. Satoumi is defined as the human use and management of coastal seas for high productivity while maintaining high biodiversity. Therefore, we proposed Satoumi approach to an open rias-type bay, Shizugawa Bay, in southern Sanriku Coast. We conducted scientific researches on mapping of coastal habitats and aquaculture facilities, hydrography, and material flows of nutrients, a minor element (Fe) and organic matters in the bay including those from the rivers and from the offshore waters. At the same time, Committee for Shizugawa Bay Management of Fishermen's Cooperative of Miyagi Prefecture decided to decrease in aquaculture facilities for sustainable development of aquaculture. Based on these data, a physical-biological coupling model was used for calculating the number of aquaculture facilities that are suitable not only for yields but also for environments. These researches were established on strong collaborations among a fishermen's' cooperative, local governments and scientists. Results of this practice may help to realize sustainable coastal use of a rias-type bay.

O4. MANAGEMENT FOR SUSTAINABLE USE OF INTERNATIONAL SEMI ENCLOSED SEA, JAPAN SEA

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New project "Development of Coastal Management Method to Realize the Sustainable Coastal Sea" started in 2014. The objectives are to study the appropriate status of the coastal area and to provide scientific information to policy makers for better coastal management. One of the target areas in this project is Japan Sea. Japan Sea is a semi-closed sea which is surrounded by the Eurasian continent and Japanese islands. This area is one of the most populated regions in the world and experiences a rapid economic growth. In addition, it is reported that the sea surface temperature has increased rapidly compared to other areas. In our study, nutrient inputs and climate change are key drivers which influence the ecosystem of Japan Sea. Numerical models of the marine ecosystem were used for understanding and forecasting the impact and response mechanism of the ecosystem. Based on the study results, options for appropriate management will be proposed.

However, because of the long coastal zone along Japan, it is not appropriate to apply the same management options to all areas. Therefore, in this study, the coastal zone was divided into five sub-regions according to the characteristics of water mass. Surface water of Japan Sea is basically formed by Kuroshio water, Taiwan Current water, freshwater discharged in the East China Sea, freshwater discharged in Japan Sea and deep water of Japan Sea. Using physical numerical models, the mixing ratio of these five waters was calculated and options for regional management in each sub-region will be prepared.

O5. THE INTEGRATED COASTAL ZONE MANAGEMENT BASED ON THE ECOSYSTEM SERVICE

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To advance the sustainable development of “Satoumi” means to build the “Coastal zone governance based on sustainability”. The conceptual and institutional examine of the governance should be based on the current situation. The resolution is to rebuild a good and innovative relationship between individual policies including national land policy, regional policy and environmental policy based on “Satoumi”. The economic and social evaluation of the environmental value in Seto Inland Sea used CVM on 1998 (Tsuge, T. and T. Washida, 2003) was compared to questionnaire research on 2015. We identify the potential variables including basic demographic and economic attributes based on the previous studies about changes in the human values of coastal areas. Ecosystem services and their monetary value should be included in the SA due to its powerful role in representing human and coastal area relationships. Monetary valuation of ecosystem services can strongly support both diversity and sustainability attributes of Satoumi system. Regional sustainability assessment framework for integrated coastal zone management which consist of Inclusive Wealth, Satoumi, and Ecological Service Approach was proposed. This research framework is based on the concept of “Integrated coastal zone management (ICZM)”. In ICZM, multiple disciplines bring its own professional scholarship and aim to manage a coastal area in complementary way. ICZM has a potential to realize a coastal area supporting sustainability.

O6. MEASURES FOR ENVIRONMENT CONSERVATIONIN ENCLOSED COASTAL SEAS

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Japan experienced severe water pollution problems throughout the period of the high economic growth in 1960s. With the concentration of population and industries, large quantities of pollutants flowed into the sea, and these caused health hazard and harmful algae blooms which damage fishery and living environment especially in the enclosed sea.
We have implemented various measures including drainage control and sewerage system expansion based on the Water Pollution Control Law. Total Pollutant Load Control System (TPLCS) has been implemented in Tokyo Bay, Ise Bay, and the Seto Inland Sea from 1979. TPLCS is designed to reduce the total amount of pollutant loads (target items; chemical oxygen demand, total nitrogen, total phosphorus) flowing into enclosed sea. As a result of efforts including TPLCS, the amount of pollutant loads have been reduced steadily, water quality has a tendency to improvement as a whole. On the other hand, algae bloom and oxygen deficient water mass were still observed. Besides, these situations were different by respective sea area. Moreover, in a concept of «Bountiful Sea», we also recognize the importance of bio-diversity and bio-productivity. To resolve these problems, it is necessary to effort of pollutants reduction flowing from the land, and to cooperate among entities in local communities. Moreover, we need to promote comprehensive measures such as preservation of tidal flat and seaweed bed as well as installation of bio-friendly revetments.

O7. ENSURING SUCCESSFUL AND SUSTAINABLE RESTORATION AND PROTECTION OF COASTAL WATERS: THE CHESAPEAKE BAY TOTAL MAXIMUM DAILY LOAD PLAN

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The Chesapeake Bay is the largest coastal bay in North America with a watershed spanning 6 states and Washington, D.C. (the "watershed jurisdictions"). Restoration of the Bay has been the focus of nearly 40 years of restoration effort. Significant progress has been made, but the Bay still does not meet water quality standards. In 2010, as required by the federal Clean Water Act, the U.S. Environmental Protection Agency (EPA), in cooperation with the watershed jurisdictions, established a legally enforceable limit on the levels of pollution called a Total Maximum Daily Load (TMDL). The TMDL sets limits on pollutant loading and divides the responsibility for meeting those limits among the watershed jurisdictions and 6 “source sectors” – agriculture, urban stormwater, wastewater, onsite sewage systems, forest land and atmospheric deposition. Each of the watershed jurisdictions developed a detailed plan to meet the TMDL limits, describing the pollution control actions each sector will take and the deadline for action. The TMDL limits must be achieved by 2025. In addition, to ensure that the restoration stays on track to achieve the 2025 goal, the TMDL includes 2-year Milestone goals that must also be achieved. The TMDL and Milestone goals are being enforced and progress is reported to the public by the EPA. Enforcement is essential to the success of the restoration so that all jurisdictions and sectors meet their commitments and be assured that others are meeting theirs as well.

O8. DEVELOPING AN ENVIRONMENTAL HEALTH REPORT CARD FOR LAGUNA DE BAY, PHILIPPINES

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Laguna de Bay is the largest inland waterbody in the Philippines and the third largest in South East Asia. Laguna de Bay is connected to Manila Bay via the Pasig River, which flows through metro-Manila and is a tidal estuary. It has a has a surface area of 900 km2, with an average depth of 2.5 meters and an elevation of about 1 meter above sea level. The watershed population is over 8 million people. Laguna de Bay features distinct regions. The West Bay watershed is the most populated and heavily developed, mainly because it includes part of Metro Manila, while the East Bay is the least. The West and Central Bays are separated by Talim Island, the biggest and most populated island. This first ecosystem health report card is designed to provide a better understanding of the current ecosystem health, particularly as water quality improvement strategies are developed. Two workshops were conducted to develop a framework for the report card, identified the target audience, developed indicators and thresholds, and determined the key messages. Overall Laguna de Bay scored a low passing mark, 76%, a C-, in water quality and an F in fisheries weigh regional scores also developed. Laguna de Bay consistently is within national water quality guidelines in DO, BOD, nitrate, and total coliform but consistently scored poorly for chlorophyll a and phosphate. Water quality and fisheries are negatively impacted by high population and industrialization. Laguna de Bay scored an F for fisheries due to catch per unit effort, invasive species, and zooplankton ratios.

O9. IMPLEMENTATION OF SUSTAINABLE AQUACULTURE AS A MODEL OF SATO UMI TO IMPROVE PRODUCTIVITY WITHIN COASTAL AREA OF INDONESIA

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The development of sustainable model of aquaculture by applying Sato Umi concept within coastal area of Indonesia has expanded from the center of first experiment in the northern coastal area of west Java to central Java (western Indonesia) and Bantaeng in the South Sulawesi of central Indonesia. The similar program has also been proposed for Maluku Province in the eastern part of Indonesia. In the next 5 years, Indonesia is developing the Techno Parks Program in some areas, in which aquaculture and fisheries activities development on the base of Sato Umi concept in the coastal area are involves in this program. The development of Techno Parks are directed as a center application of technology to stimulate the economy in the regency, and a place of training, apprenticeship, technology dissemination center, and center business advocacy for the public. Hopely, Sato Umi concept that has a similar spirit with Techno Park can be applied to support the implementation of Techno Park program in Indonesia.

O10. DEVELOPMENT OF THE BASIC CRITERIA FOR RUSSIAN COASTS TYPIFICATION

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There are many types of coasts classifications that indicate main coastal features. As a rule, the "static" state of the coasts is considered regardless of their evolutionary features and ways to further transformation. Since the most part of the coastal zone studies aimed at ensuring of economic activity, it is clear that the classification of coast types should indicate total information required by the users. Accordingly, the coast classification should include the criterion, characterizing as dynamic features of the coast and the conditions and opportunities of economic activity. The coast classification, of course, should be based on geomorphological coast typification. Similar typification has been developed by leading scientists from Russia and can be used with minimal modifications. The authors propose to add to basic information (geomorphological type of coast) the evaluative part for each coast sector. It will include the estimation of the coast changes probability and the complexity of the coast stabilization for economic activity. This method will allow to assess the dynamics of specific coastal sections and the processes intensity and, as a result – the stability of the coastal area.

O11. INVESTIGATIONS OF THE BALTIC SEA COASTAL ZONE ABOVE-WATER PART TOPOGRAPHY DYNAMICS BY MEANS OF TERRESTRIAL LASER SCANNER (SVETLOGORSK CITY, KALININGRAD REGION)

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The paper describes application of the terrestrial laser scanner for investigation of coastal dynamics of the Svetlogorskaya Bay, Baltic Sea. Methods of investigation and results of surveys repeated over the two consecutive years for quantification of coastal erosion and slope processes within the coastal zone are presented.

O12. CONDITIONS FAVOURABLE FOR PROTECTION THE MARINE SHORE OF THE VISTULA SPIT AND SAMBIAN PENINSULA (THE BALTIC SEA, KALININGRAD OBLAST) BY OFFSHORE DISPOSAL OF DREDGED MATERIAL

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Three dumping sites located at the south-eastern part of the Baltic Sea (Kaliningrad Oblast) at shallow depths are considered. The first one is located to the south of the Vistula Lagoon inlet in front of a permanently eroded open marine shore segment. The second one is located to the north of the Vistula Lagoon inlet, and is used now for disposing of dredged material extracted from the Kaliningrad Seaway Canal. The third dumping site is located near the northern shore of the Sambian Peninsula to the east of the Cape Gvardeijski and assigned for disposing the dredged material extracted from the fairway to the Pionerskij Port located nearby. The last site is planned to be used for disposing of dredged material from the future port that should be constructed there before the beginning of the FIFA World Cup 2018. All three dumping sites are located not far from the eroded segments of the shore. The question behind the study is: would it possible that disposed material will naturally transported from the damping site to the shore and accumulate there to protect it from erosion? A numerical hydrodynamic-transport 3D model (MIKE) was used to model sediment transport under different wind actions. The winds with the speed stronger than 15 m/s complete wash out disposed material from the dumping site and spreading it over the wide area with a negligible layer thickness. Winds of about 7-10 m/s transport material along the shore at a distance of few kilometers that may be useful for shore protection.

O13. MODERN ABRASION PROCESSES OF THE AZOV SEA COAST

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The Azov Sea Coast is subjected to a complex of hazardous exogenous geological processes, landslides and abrasion being the most important ones. Both natural and anthropogenic factors contribute to the development and intensification of these processes. These processes are currently growing due to an increased frequency of storm surges.

O14. DYNAMICS OF THE ANAPA BAY-BAR SUBMERGE SLOPE

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The planning of exploration and socio-economic development of coastal regions is impossible without the knowledge of coastal processes and scientifically based forecast of the evolution not only the shoreline, but the submerge slope also. Laboratory of lithodynamic and geology of the Southern Branch of the P.P. Shirshov Institute of Oceanology RAS since 2010 surveys bottom topography within Anapa Bay-Bar. Along Anapa Bay-Bar the presence of two longshore underwater bars is clearly observed. The first underwater bar is narrower than another one. His width is up to 40 m and it is located at the depth of 1.5-2.0 m. The second underwater bar is wider (up to 150 m) and it is located at the depth of 3.5-4.0 m. The both bars have the height, approximately, of 2.0-2.5 m. Both bars are well expressed in the central part of Anapa spit. Modern dynamics of the submerge slope changes will be considered in the paper.

O15. MORPHODYNAMICS OF THE BAKALSKAYA SPIT OF THE BLACK SEA

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Studies of shape dynamics of the Bakalskaya Spit based on observation and numerical simulation are carries out. The Bakalskaya Spit is a dynamically active sand formation on the north-west coast of the Crimea Peninsula. Field observations and satellite image analyses showed that the erosion of spit west coast, eastward displacement of spit distal part and separation of distal part from the spit main part are the most significant processes. After the autumn storms in 2010 the isthmus between the distal part of spit and its main part was eroded and had not recovered till now. So the distal part of the Bakalskaya Spit turned into island. Dynamic of sediments depends on wind wave parameters and sea level oscillations. Effect of changing of wind wave direction and storm surge height on erosion and deposition processes in the Bakalskaya Spit region of the Black Sea is studied by using of XBeach numerical model. Dependencies of location and space dimension of erosion and deposition areas of sediments on characteristics of waves and surges are obtained. It is found that the most intensive erosion of spit isthmus occurs in case of wave running from the west in comparison of cases of wave running from the south-west and north-west if there are no surges. Presence of surges may results in increasing or decreasing of erosion process intensiveness depending on wave direction.

O16. MODERN STATE AND DYNAMIC OF THE BEACHES OF KALAMITSKIY GULF IN THE WESTERN CRIMEA

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In 1980-th the average width of beaches of Kalamitskiy Gulf on the Western coast of Crimea was 40 m on accumulative part and 10 m on abrasion. Now they are reduced more than 2 times. Depletion of beaches, abrasion of coasts and erosion of underwater slope accompany these processes. Activation of mentioned processes is caused by deficit of beaches material due to intense anthropogenic impact on the coast. The main factors of human activity in that area are quarrying of sand and pebbles on the beaches; regulation of solid runoff of rivers; unwarranted hydrotechnical construction; dredging; pollution of sea waters and bottom sediment. Between natural factors the Black Sea level rise, sinking down of described coast, wind-wave conditions, beaches lithology and activation of extreme storms facilitate beaches reduction.

O17. MONITORING THE DYNAMICS OF THERMOABRASION COASTS AT KHARASAVEY AREA, WESTERN YAMAL (KARA SEA)

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The dynamics of thermoabrasion coasts on loose sediments under permafrost conditions are highly variable due to several factors: length of the dynamic period of the year, mechanic composition of the frozen ground and its ice content, hydrometeorological conditions, and human impact. Multiannual monitoring of the coastal zone was carried out by Lab. Geoecology of the North (Moscow State University) at the 22 km long Kharasavey deposit site, Western Coast of Yamal Peninsula (Kara Sea). The methods include direct measurements and observations (repeated topographic survey of shore transects from 1981 to 2012) along with remote sensing data analysis (images from 1964 to 2011). This allowed producing detailed characteristics of coastal dynamics. At the site, thermoabrasion coasts occupy the most part, and accumulative coasts are present in the north. Data on natural relief forming factors and ground composition are included in the detailed geomorphologic map of the site. Shore retreat rate shows correlation to amounts of wind-wave energy and to specific wind directions. Human impact on the coast includes dredging at the port channel, mining of sand, driving motor vehicles, and deposition of construction debris. Relations between shore retreat rate and aforementioned factors were studied, including dependencies on ice content, and shore segmentation was carried out. This allows for coastal dynamics forecasts in the region.

O18. EVOLUTION OF COASTAL LAGOONS OF THE SAKHALIN ISLAND

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Lagoons of Sakhalin island is the fifth part of the coast. Two lagoon types predominate in the Sakhalin Island. The first type includes large and medium lagoons located along the edge of seacoast flatlands. This is a “classical” lagoon type. The second type (estuaries) is connected with coast segments in mouths of the rivers. Their development is dominated by alluvial processes. Evolution of lagoons and estuaries the islands of Sakhalin is influenced by increase of global sea level.

O19. EVOLUTION OF SANDY BEACH IN THE CITY OF VARNA

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The article represents a retrospective review of long time research of genesis and development of the Central beach in the City of Varna which makes possible a forecast of its further development. Both natural and anthropogenic impact on the beach evolution is taken into consideration. It is ascertained that construction of coastal protection structures at the northern part of the beach in 80's resulted in cessation of natural beach area growth. The strengthen of a breakwater in the main port and illegal building also contributed to considerable coast recession and beach volume reducing. Because of this a recreational potential of the Central beach is gradually decreasing. New method named "cross-shore sediment bypassing" is suggested to reduce the negative trend.

O20. UNDERWATER BARRED BEACH PROFILE TRANSFORMATION UNDER DIFFERENT WAVES CONDITIONS

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Based on numerical modelling evolution of beach under waves with height 1,0-1,5 m and period 7,5 and 10,6 sec as well as spectral wave parameters varying cross-shore analysed. The beach reformation of coastal zone relief is spatially uneven. It is established that upper part of underwater beach profile become terraced and width of the terrace is in direct proportion to wave height and period on the seaward boundary but inversely to angle of wave energy spreading. In addition it was ascertain that the greatest transfiguration of profile was accompanied by existence of bound infragravity waves, smaller part of its energy and shorter mean wave period as well as more significant roller energy.

O21. LANDSLIDE RISKMANAGEMENT IN THE COASTALZONE OF THE KUIBYSHEV RESERVOIR DUE THE DESIGN OF HIGH-SPEED LINE"MOSCOW-KAZAN"

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High-speed railway "Moscow-Kazan" by the draft crosses the Volga (Kuibyshev reservoir) in Chuvashia region 500 m below the village of New Kushnikovo. The crossing plot is a right-bank landslide slope with a stepped surface. Its height is 80 m; the slope steepness - 15-16°. The authors should assess the risk of landslides and recommend anti-landslide measures to ensure the safety of the future bridge. For this landslide factors have been analyzed, slope stability assessment has been performed and recommendations have been suggested. The role of the following factors have been analyzed: 1) hydrologic- erosion and abrasion reservoir and runoff role; 2) lithologyc (the presence of Urzhum and Northern Dvina horizons of plastically deformable rocks, displacement areas); 3) hydrogeological (the role of perched, ground and interstratal water); 4) geomorphological (presence of the elemental composition of sliding systems and their structure in the relief); 5) exogeodynamic (cycles and stages of landslide systems development, mechanisms and relationship between and slide tiers of different generations and blocks contained in tiers). As a result 6-7 computational models at each of the three engineering-geological sections were made. The stability was evaluated by the method “of the leaning slope”. It is proved that the slope is in a very stable state and requires the following measures: 1) unloading (truncation) of active heads blocks of landslide tiers) and the edge of the plateau, 2) regulation of the surface and groundwater flow, 3) concrete dam, if necessary.

O22. SEDIMENT TRANSPORT NEAR THE VISTULA SPIT (BALTIC SEA)

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The Vistula Spit is a sandy elongated barrier form which borders the Vistula Lagoon from the Baltic Sea. The evolution of the spit as well as nowadays sediment transport along the marine shore of it are still under discussion, especially due to existing of entrance jetties bordered the Strait of Baltiysk, the single inlet to the Vistula Lagoon, and advanced up to 10 m depth seaward. Different hypothesizes about ether uniform transport from north to south or contrary directed fluxes with convergence at various points at the spit shore are discussed. Most of them are based on fact of accumulation of sandy material just to north from the northern entrance jetty as in incoming corner. Basing on statistics of near-surface wind, direct measurements of currents and analysis of direction of the scour hole located between jetties the paper confirms the existence of two opposite fluxes - one brings alluvium from the Vistula River mouth to north as main winds blow from south-west and west, and, in contrast, another one brings material obtained by erosion of the western shore of the Sambian Peninsula to south. Dynamic equilibrium between these fluxes through hundreds of years resulted in formation of present shape of the coastline, and it is expected that the area of the equilibrium in alongshore migrations is in the top of the Yantarny-Baltiysk concave. Appearance of entrance jetties of the Vistula Lagoon inlet, in the area where opposite alongshore migration of material are nearly equalised, leaded to the accretion-erosion pattern, which is pseudo equal to sediment transport from north to south.

O23. LONG-TERM DYNAMICS IN LOCATIONS OF COASTLINE OF THE VISTULA SPIT BY RESULTS OF THE SATELLITES IMAGES ANALYSIS

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Images of satellites OrbView-3 for 2004 and 2005 years (spatial resolution 1 m/pixel) and Pleiades for 2014 year (spatial resolution 0.5 m/pixel) for the Vistula Lagoon (the Baltic Sea) were used. In contrast to shoreline location often used as an indicator of a shore retreat the paper recommends to use the changes in location of dune edge as an indicator of shore dynamics. Nine well identified mark points were selected for the northern Russian part of the Vistula Spit as control ones. The average difference in locations of these points obtained by geodetic survey and satellite images was 0.4 m.

The lines of the foredune edge for 25 km northern part of the Vistula Spit (from the Polish-Russian border to the Strait of Baltiysk) for 2004-2005 and 2015 were digitized with the step of 10 m and compared. Introducing the level of confidence ± 1.5 m per 10 years, we considered that eroded, stable and accreted parts of the shore have the total length 15.4, 4.9, 5.2 km (60.4%, 19.1%, 20.5%). The average (10 years) erosion rate for the marine shore on the Russian side of the Vistula Spit is 0.6 m/year, and accretion rate is 0.3 m/year.

Maximum erosion rate (2.2 m/year) was revealed on the shore segment to south from the Strait of Baltiysk, which is under permanent erosion during last one century and a half after construction of the entrance jetties.

O24.1. SHORT-TERM DYNAMICS OF THE ANAPA BAY-BAR SHORELINE

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The Anapa bay-bar is located in the northwestern part of the Black Sea. With the goal in mind to determine the short-term dynamics of the Anapa bay-bar we analyzed satellite images from 2003 to the present. Depending on the hydro-lithodynamical situation the shoreline configuration during storm can vary from a rectilinear to sinusoidal forms. There are regions of local erosion or accumulation whose formation is related to the alongshore motion of sediments and dynamics of underwater bars. Comparison of the data on 1965 and 1966 showed that in this period the amplitude of the shoreline position was more than 20 m but average displacement of the shoreline for 13 months was only 0.8 m. This study showed that for the analysis of changes in the shoreline position is necessary to consider the configuration of the coastline at the time of each observation and the local dynamics.

O24.2. ANALYSIS OF LONG-TERM DYNAMICS OF THE ANAPA BAY-BAR WATER EDGE

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To determine the long-term dynamics of the Anapa bay-bar we analyzed aerial photographs 1941-1944, satellite images of 1960-80s and from 2003 to the present. In the analysis of the long-term variations in the water edge one has to take into account the configuration of the shoreline at the moment of survey and local short-term dynamics. The average value of the water edge displacement over 47 years was 23 m in the direction to the coast. There are areas of severe erosion on the northern and southern parts. The central part of the bay-bar can be called relatively stable. Regions of comparable erosion and accumulation alternate here. The obtained data clarified and gave a more detailed estimate of the evolution of the coastline dynamics of the Anapa bay-bar.

O25. NEW APPROACH TO COASTAL ZONE VULNERABILITY CLASSIFICATION

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New approach of assessment of coastal zone vulnerability to wave action, based on nonlinear properties of wave transformation, is presented on example of Anapa bay-bar coasts.

O26. GEOECOLOGICAL ASSESSMENT OF DANGEROUS NATURAL PROCESSES DEVELOPMENT FOR THE BLACK AND AZOV SEAS COASTS WITHIN THE TAMAN REGION

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Intensive economic development of the Black and Azov seas coastal zone requires the solution of the important geoecological tasks. Typically, geoecological risk assessment includes the quantification of damage from the impact of the waves and landslide processes, floods and surges of flood waters, man-caused operations. This assessment is undertaken for the purpose of developing of preventive measures to reduce the impact of named processes to the transformation of the coastalzone.

Long-term monitoring of the Taman Peninsula coastal zone showed that these estimates of the geoecological risk are not sufficient to solve the problems of interaction between the region ecosystems and population. The geological structure of Peninsula is too complex.

The state of geological structures of Taman region has been characterized as stress-strain. The activity of mud volcanoes are an indicator of activity of tectonic deformation. Long-term monitoring of underwater mud volcanoes, that are located at a distance of several hundred meters from the seashore, showed that the centers of volcanic eruptions are moved toward the shore.

Assessment degree of the geoecological risk from natural processes is of paramount importance. Moreover, a factor of the tectonic instability for region must be included to geoenvironmental risk assessment.

Detailed results of several years investigations will be presents at the conference.

O27. A THREE-DIMENSIONAL MODEL OF DISCHARGED COLD WATER JET IN COASTAL AREA

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In this study, a three-dimensional numerical model for cold water jets in the coastal region is developed for the calculation of not only the initial mixing but also horizontal dispersion above the seabed. The computed velocities and temperatures were compared with the measurements obtained in the scaled hydraulic experiment. The good agreement with measurements confirms the model provides appropriate results for cold water dispersion. Our numerical results indicate that coastal topography is the most important factor in determining areas influenced by discharged cold water.

O28. MOORED PROFILER OBSERVATIONS OF SUBMESOSCALE COLD- CORE EDDIES IN PETER THE GREAT BAY OF THE EAST/JAPAN SEA IN LATE WINTER

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Submesoscale cold-core (T< 0°C) eddies were observed near the shelf break in Peter the Great Bay of the East/Japan Sea in March 2010. The observations were carried out at the moored automatic mobile profiler Aqualog station. The profiling was as frequent as every hour allowing us to obtain data with high temporal resolution. Aqualog delivered vertical profiles of ocean current velocity, acoustic backscatter at 2 MHz, temperature, and salinity between the depths of 20 m and 105 m. Below the profiling range, the InterOcean S4 current meter with temperature and salinity sensors was mounted on the mooring line. Above the profiling range, the RBR XR420 CTD logger with dissolved oxygen, chlorophyll-a fluorescence, and turbidity sensors was also mounted on the mooring line. Additionally we used the data of ship-born CTD casts, the satellite-born imagery and scatterometery, and the coastal weather station records. The data analysis suggests that the cold-core submesoscale eddies play an important role in supplying the densest water (y_u> 27.24 kg/m^3) from the northern part of Peter the Great Bay to the shelf break zone where it cascades downward into the deep northern basin of the Sea. The volume of the densest water in an eddy, according to our rough estimate, is 0.5-1 km^3. At the sea shelf, the densest water is richer in oxygen by 0.4 ml/l than surrounding water. It also contains much more suspended particles brought by the rivers.

O29. NUMERICAL SIMULATION OF MESO- AND SUBMESOSCALE FEATURES OF THE NORTH-WESTERNBLACK SEA SHELF CIRCULATION USING HIGH SPATIAL RESOLUTION

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A numerical experiment on reconstruction of currents was conducted with real atmospheric forcing data in autumn period of 2007 on the basis of Marine hydrophysical institute (MHI) hydrodynamic model, which was adapted to the coastal area of the Black Sea with an open boundary (north-western shelf). A high resolution (horizontal grid 500×500 m and 44 vertical layers from 1 m to 49 m) and detailed bathymetry with resolution ~1.6 km were used in the calculation. A higher spatial resolution allowed to get a detailed mesoscale and submesoscale structure of currents in the upper and deep layers of the north-western shelf and to obtain quantitative and qualitative characteristics of the eddies and jets more accurately in comparison with previous calculations.

O30. IN SITU OBSERVATIONS OF THE SHELF-SLOPE WATER EXCHANGE UNDER THE MONSOON CONDITIONS IN THE PRIMORYE CURRENT ZONE (THE JAPAN SEA)

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This paper presents a joint effort by the SIO RAS and POI FEB RAS team devoted to processes of water mass exchanges between the shelf zone and deep sea in the northwestern Japan Sea. For the field study we employed both the new instruments e.g., moored automatic mobile Aqualog profiler and conventional survey. The Aqualog profiler collected data during summer monsoon 2015 and winter monsoon 2015/2016. All available in situ data from the ship-borne oceanographic surveys and the Aqualog profiler are supplemented by remotely sensed data, namely infrared imagery and altimetry measurements, the latter providing a base for the Lagrangian analysis of surface currents. Current and water mass variability at the shelf break, as well as cross-shelf fluxes are analyzed using multiple data sets. Relationship with conditions of summer and winter monsoon is also considered.

O31. COMPLEX MONITORING OF GEOCRYOLOGICAL STRUCTURE AND GROUND TEMPERATURE REGIME OF THE ARCTIC COASTAL ZONE IN THE AREAS OF INFRASTRUCTURE CONSTRUCTION

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The research of geocryological structure of the coasts is important in the planning and construction of infrastructure in permafrost zone. Long-term monitoring of temperature regime of the Arctic coastal zone soils needs to predict the steady state of the object during its operation and prevent possible negative consequences resulting from interruption of the steady state. It is especially important in conditions of today's climate change, as well as the possibility of warming effect of engineering facilities (for example pipelines). The results of a study of the coastal seasonally frozen cap, formed in the contact zone of freezing fast ice to the bottom are presented by the examples of the Mys Kamenniy settlement at the Gulf of Ob coast (Kara Sea) and Varandey settlement at the Pechora Sea areas. The technology of the monitoring station establishment for the geocryological statement and temperature regime of the Arctic coastal zone observations is proposed based on the conducted field works experience.

O32. ICE AGE AND COASTAL ADAPTATIONS

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Eustatic changes, due to ice-age climatic alteration in the volume of water, have interrelations with other long-term processes. These processes are connected with the glacial activity and related isostatic adjustment. Here we focus on gradual topographic changes mostly in glacial and periglacial areas, changing the redistribution of amount of water globally before and after glaciations. In coastal areas they are linked with sediment- and hydro-isostasy. Glacial erosion is a significant, but variable factor. It creates overdeepenings of different scale in favorable conditions. Many huge enclosed basins - including the Baltic - were created or strongly modified by this process. In relation to the ice age onset they can hold additional amount of water, even if related isostasy often reduces its volume. Negative topographic elements, previously occupied by central parts of ice sheets (Bothnian, Hudson Bay) would likely remain stable water storage with gradual shallowing up to future system of giant lakes. Vice versa, accumulation replaces water by low-compacted sediments, with additional subsidence. Large part of deposition was concentrated on positive topographic features. Hydro-isostasy impacted non-uniform relocation of coastal zone in local and regional scale. The local one is connected with water load changes of the enclosed basins. The regional influence could be subsidence of the ocean floor and subsequent uplift of continents caused by global eustatic changes.

O33. MAPPING OF VARIATIONS IN THE ANAPA BAY BAR LANDSCAPE-MORPHOLOGIC STRUCTURE WITH HIGH-RESOLUTION SATELLITE IMAGES

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The Anapa bay bar is at present one of only a few sand beaches in the Black Sea coastal zone of Russia. The bay bar includes three main belts – beach, dune belt and hillocky sands. A strong anthropogenic impact is observed: the landscape-morphological structure of the dune belt is disturbed, so monitoring of the bay bar is essential . For this purpose we had compiled a series of maps of landscape-morphological structure for the Blagoveschensk and Vityazevo-Anapa parts of the bay bar using high-resolution images from WorldView-2 satellite. Interpretation of stereo-pairs of multitemporal images was carried out at the scale of 1:2000, while a series of maps was compiled at the scale of 1:5000. Twelve sites with different landscape-morphologic structure are covered by these maps and characterized. The structure depends on geomorphologic neighborhood (adjacency to the cliff or to the lagoon) and aspect to wind direction, but mainly on the degree of anthropogenic influence. So the dune belt has been formed at the beach in some areas, but in other areas the dune belt is located behind the beach, or sometimes has disappeared. The compiled maps clearly reflect these variations and show their mainly anthropogenic origin. These maps will help to investigate adaptive solutions for Anapa bay bar conservation and protection.

O34. MODELING AND MONITORING OF THE PROCESSES IN THE COASTAL ZONE OF IMERETINKA LOWLAND, BLACK SEA, SOCHI

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The interest to study the processes in the Imeretinka lowland increases in the last years due the few reasons. The main structures of so-called "coastal cluster" of Olympic Games 2014 built in this area. Some of planned structures effected significantly the coastal processes; they are the seaport near the river Mzimta mouth and coastal protection. The natural coastal processes in the area complicated by the effects of the underwater canyons. The natural-technogenic system requires the study with using the methods of modeling and monitoring. Wave climate of Imeretinka lowland coast estimated based on long-term data of meteorological fields above Black Sea with modeling of wave transformation in nearshore zone by the gentle slope equations. Such approach provides possibilities to assess the effect of the designed coastal protection structures on the changes of the wave parameters in nearshore zone. Numerical modeling of currents in the Black Sea using 3D circulation model with refinement in the region of canyons of the Imeretinka coast obtained. To estimate the sediment transport, 3D Lagrangian multifraction sediment transport model LagrSed is used. 2D flow fields, free-surface level and wave characteristics calculated, using 2D hydrodynamic model of the coastal zone. It has presented the few years story of modeling and monitoring of the coastal processes with the important lessons.

O35. DISTRIBUTION SEDIMENTS OF THE TSUNAMI 1983 AND 1993 YEARS IN THE COASTAL AREA OF EASTERN PRIMORYE

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In recent years, it was first identified tsunami deposits within Eastern Primorye and Western Sakhalin. Primorsky kray is located on the continental margin of the Asian continent and is characterized by monsoon conditions for the circulation of air masses. This area is to a lesser extent tsunami than or Sakhalin or Kuril Islands, but the tsunami waves approach the littoral of deep and have a stretch throughout from Golden cape to the mouth of the Tumen River. Traces of the tsunami are an important part of research on the identification paleotsunami and distinguish it from storms, which occur much more frequently. This article discusses the implications of the two catastrophic events in the Primorsky kray. Are defined as follows tsunamigenic deposits in soil samples on the marshy coastal lowlands. Compares the main morphological parameters of the tsunami in these areas.

O36. THE DESCRIPTION OF THE RHEOLOGICAL BEHAVIOR OF FLUID MUD

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In order to handle the immense fluid mud problems in German coastal watersthe applicability of numerical models needs to be enhanced. Here not onlya qualitative but also quantitative description for the rheologicalbehavior of fluid mud is crucial. Therefore a literature review ispresented and the outcoming approaches are combined with new theoreticalapproaches to form an analytical model describing the rheology of fluidmud. This approach is validated taking sediment samples from differentcoastal sites and using them to mix fluid mud of different water contents. The rheological behavior is measured and the results are fitted with thenew fluid mud rheological law.

O37. LARGE BARRIER-LAGOON SYSTEMS ON THE EASTERN AND SOUTH-EASTERN BALTIC SEA COASTS: CONDITIONS OF DEVELOPMENT

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The paper considers the geological structure and evolution of large barrier-lagoon systems in the eastern and southeastern coasts of the Baltic Sea. The data available on some coastal deltaic plains in the Leningrad Region, Latvia and Lithuania are discussed in some details. The considered materials lead the authors to the conclusion about a unified mechanism of the systems' development. A considerable rise of the sea level at the Littorina Sea transgression fostered large transgressive bars developing at the margins of deltaic plains and lagoons formation on the surface of these plains.

O38. NEWEST TECTONICS OF THE VISTULA SPIT AREA

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The interests of forecasting of the area's development simulate to take more attention to the study of its newest tectonics. The most informative tectonic pattern for the studies of coastal zones is neotectonic one, based on the structural principle, which shows the newly formed and inherited dislocations, reflected in the modern landscape and exodynamics of the earth's surface. The question of the manifestations of newest tectonics by way on the example of the Vistula Spit (Baltic Sea) is discussed.

O39. MAIN TRENDS OF THE SAMBIANN COASTAL SYSTEM (SOUTH-EASTERN BALTIC) DEVELOPMENT: HOLOCENE LITHODYNAMICS AND RECENT COASTAL PROCESSES

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Synthesis of long-term geological research of the Russian part of the southeastern Baltic and its coastal zone allowed to establish boundaries, time of forming and structure of Sambian morpho-lythodynamic marine and coastal system. Studied system includes coastal zone (by the water depth about 30 m according to longshore storm wave currents impact) and adjacent silty-clay sedimentation basins. Development of Curonian Spit area in Late Pleistocene – Holocene was reconstructed based on marine geological and geophysical study and modeling. Comparative analyses of geological settings of the Curonian and Vistula Spits and lagoons has shown that the mechanisms of their development is significantly different. By late Holocene, the study area of southeastern Baltic Sea consisted of several lithodynamic coastal systems. By 5 ka BP both lagoon systems were formed. Evolution of spits and lagoons during last 5000 years caused development of similar morphological features. Vistula and Curonian lagoons transformed into sediment traps for alluvial deposits of Neman and Pregola rivers. Smoothening of the shoreline as a result of longshore sediment drift is a dominant coastal process.

O40. HOLOCENE SAND ACCRETION COASTAL FORMS OF THE EASTERN GULF OF FINLAND (THE BALTIC SEA) AND RECENT COASTAL DYNAMICS TRENDS

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Coastal systems of the eastern Gulf of Finland were formed during Holocene as a result of several sea level changes caused by interaction of transgressions/regressions of postglacial Baltic Sea basins and tectonic movements. Genesis and succession of accretion forms development was determined by geomorphic analyses and geological study carried out offshore using acoustic profiling and sediment sampling and onshore using ground-penetrating radar and shallow drilling. In some cases the age of accretion forms was clarified using archeological data. One of reasons of active accretion form development within study area was existence of big amount of sediment material, deposited earlier, in Late Pleistocene during deglaciation. During Littorina Sea transgression (about 7.6-7.3 ka BP) the coastal line formed several deeply incised bays (e.g. Narva-Luga Klint, Sestroretsky, Lakhta bays and Vysokinskoye Lake). The hugest sand spits (bars): Ligovskaya, Sestroretskaya, Kudrukula and lagoon systems were formed 6.5-6.0 ka BP. Recently sand relict bars, spits and dunes are located onshore due to glacioisostatic uplift while most part of the nearshore bottom is formed by boulder-pebble benches, as a result erosion dominates. Nowadays longshore sand migration and growing of sand spit occurred locally; their maximal length not exceeds 900 m that is 3-4 times less than the early Holocene spits. Such reducing of the spits size is explained by significant deficiency of material in sediment flux.

O41. VERTICAL MOVEMENTS OF THE COAST AND SHELF OF THE BLACK AND MEDITERRANEAN SEAS DURING THE HOLOCENE

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Vertical movement of Earth crust can modify the shape of the eustatic sea level curves. A method allows calculation of the eustatic sea level course using the known local curves. We were able to divide a number of local curves of the Mediterranean Sea to the eustatic and tectonic components. The data about dynamics of the vertical crustal movements in 27 points of the Mediterranean coast and shelf during the Holocene were obtained. It was found that the velocities of raising and dipping are unstable over time and can reach value of 10 mm/year. Satellite measurements have recorded the velocities of vertical movements in the range of -10 to +20 mm/year for some parts of Black Sea coast. Such movements of the Earth's crust undoubtedly have a large impact on coastal processes and should be considered in designing coastal structures.

O42. CASPIAN - BLACK SEA - MEDITERRANEAN CORRIDOR FORMATION, PARATETHYS SEA DEGRADATION

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We propose a possible mechanism leading to the transformation of the Paratethys seas (i.e., the Sarmatian Sea-Lake, Meotian Sea, Pontian Sea-Lake, etc.). The time period from the formation of the closed Sarmatian Sea-Lake to the present is considered. The main reason for the collapse of the Sarmatian Sea-Lake into the Black and Caspian seas was development of a canyon that cut through the mountains separating the Black and Mediterranean seas. Later, this canyon was transformed into the Bosporus and the Dardanelles straits. The canyon was formed mainly by erosive activity of a river that had periodically emerged from the Paratethys. Abrasion of the canyon bottom and the related erosional lowering of its level led to gradual drainage of the Paratethys basins. The consequences of the Messinian Salinity Crisis in the Mediterranean Sea contributed to the penetration of salt water into the Paratethys and then to its temporary isolation and transformation into a closed sea-lake. Later, its level rose, and the river was formed again. That river again flowed into the Mediterranean Sea, in the process eroding its own bed. During low levels of the World Ocean, the riverbed eventually dropped below high ocean level. When the ocean level uplifted the canyon was flooded by Mediterranean water. This process led to the formation of a corridor linking the seas together; this corridor developed over the course of many glacioeustatic fluctuations in the World Ocean.

O43. ESTIMATE OF DEPENDENCE OF TURBULENT KINETIC ENERGY DISSIPATION RATE ON THE BUOYANCY FREQUENCY FOR THE COASTAL ZONE OF THE BLACK SEA

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Estimates of dependence of turbulent energy dissipation rate from stratification in pairing zone between the shelf and continental slope of the Black Sea are made, based on the analysis of the measurements of the three components of velocity vector pulsation carried out in 2004–2014 using the probe-turbulence meter "Sigma-1". The measurement results are compared with the previously calculated dependences of energy dissipation rate and vertical turbulent diffusion coefficient in the study area from stratification based on a model that uses an array of temperature fluctuations data.

O44. FEATURES OF WIND FIELD OVER THE SEA SURFACE IN THE COASTAL AREA BASED ON SAR OBSERVATIONS

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"Wind-shadowing" effects in the Gulf of Finland coastal zone are analyzed using high resolution Envisat Synthetic Aperture Radar (SAR) measurements and model simulations. These effects are related to the internal boundary layer (IBL) development due to abrupt change the surface roughness at the sea-land boundary. Inside the "shadow" areas the airflow accelerates and the surface wind stress increases with the fetch. Such features can be revealed in SAR images as dark areas adjacent to the coastal line. Quantitative description of these effects is important for offshore wind energy resource assessment. It is found that the surface wind stress scaled by its equilibrium value (far from the coast) is universal functions of the dimensionless fetch Xf/G. Wind stress reaches an equilibrium value at the distance Xf/G of about 0.4.

O45. SIMULATION AND EARLY WARNING OF NATURAL AND TECHNOGENIC INFLUENCES IN COASTAL AREAS IN THE SEA OF AZOV

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In this work, the waves and currents generated by prognostic wind in the Sea of Azov are investigated using a three-dimensional nonlinear sigma-coordinate model. The mathematical model was also used for studying the transformation of passive admixture in the Sea of Azov, caused by the spatiotemporal variations in the fields of wind and atmospheric pressure, obtained from the prediction SKIRON model. Comparison of the results of numerical calculations and the data of field observations, obtained during the action of the wind on a number of hydrological stations was carried out. The evolutions of storm surges, velocities of currents and the characteristics of the pollution region at different levels of intensity of prognostic wind and stationary currents were found. The results of a comprehensive study allow reliably estimate modern ecological condition of offshore zones, develop predictive models of catastrophic water events and make science-based solutions to minimize the possible damage.

O46. WAVE CLIMATE OF THE BLACK SEA'S COASTAL WATERS DURING THE LAST THREE DECADES

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This study is focused on the alterations and typical features of the wind wave climate of the Black Sea's coastal waters since 1979 till nowadays. Wind wave parameters were calculated by means of the 3rd-generation numerical spectral wind wave model SWAN, which is widely used on various spatial scales – both coastal waters and open seas. Data on wind speed and direction from the NCEP CFSR reanalysis were used as forcing. The computations were performed on an unstructured computational grid with cell size depending on the distance from the shoreline.
Modeling results were applied to evaluate the main characteristics of the wind wave in various coastal areas of the sea.

O47. COMPUTATIONAL RISK ASSESSMENT FOR ST. PETERSBURG FLOOD WARNING SYSTEM

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Floods are one of the most widely distributed natural disasters to life and property in the world. Coastal floods hazard is extremely important issue for many cities with coastal urban area, one of them is St. Petersburg. Flood risk assessment involves two main classes of tasks. The first class analyzes feasible flood damage in the conditions when the barrier system has inoperable state and therefore there is no way to control flood flowing. In this case we use historical data and assessment methods based on principles of extreme value theory. Also for predicted flood that might happen in the nearest time we execute an ensemble on variable input atmospheric data to estimate uncertainty of prediction models. The second class is connected with assessment of produced plans for sluice gate maneuvering. In this case flood evolvement can be controlled. Technical characteristics of the barrier system, model forecast and procedures of plan elaboration add uncertainty in final proposal for making decision phase. Thus the risk assessments also based on ensemble techniques can be useful to decrease possibility of unsafe plan selection. Additional approach for dealing with uncertainty connected with upcoming flood situation is creation a synthetic forecasts as probable scenarios for synoptic situations evolution. A combination of two approaches based on the stochastic model for multivariate extremes and and the synthetic storm model was applied for coastal floods reconstruction.

O48. CHARACTERIZATION OF WATER RENEWAL IN CARTAGENA BAY, COLOMBIA: A HYDRODYNAMIC MODELLING APPROACH

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Cartagena Bay (Colombia) is a semi-enclosed estuarine system in the southern Caribbean with a surface area of 84 km2, an average depth of 16 m and a maximum depth of 33 m. Water exchange in the bay is governed by mixed semi-diurnal micro-tides (range: 20-50 cm) flowing through two seaward straits and by incoming freshwater discharge from the Dique Canal, which produces a highly stratified upper water column. Pollution is a known problem in this bay, making knowledge of the system's water renewal important for the environmental management of the coastal zone. The bay's flow was simulated using the MOHID Water Modelling system: a three-dimensional model based on the finite volume approach, including a baroclinic hydrodynamic free surface model along with eulerian and lagrangian transport models. The vertical turbulence was computed using the well-known GOTM model. Model set-up incorporated a vertical sigma discretization, a variably-spaced Cartesian horizontal grid, and a semi-implicit time-step integration scheme. The hydrodynamics were simulated and a lagrangian approach was used to compute the system's residence time and to characterize the factors controlling water renewal, such as wind, tides and freshwater discharge. Different scenarios were simulated in order to evaluate the influence of each factor on the system's residence time. Results allowed for a comparative analysis of the dynamics between the surface and lower water layers. Wind stress is the controlling factor on surface layer dynamics along with the freshwater discharge. Bottom layers show weaker dynamics governed mainly by tides.

O49. METHOD FOR QUANTIFYING ADVECTION, TURBULENT MIXING, AND GRAVITATIONAL SETTLING OF RIVER-BORNE SUSPENDED SEDIMENTS IN COASTAL AREAS FROM THERMOHALINE AND OPTICAL MEASUREMENTS

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This work presents an original method for quantifying advection and turbulent mixing of river-borne suspended sediments. The main idea of the method consists in joint analysis of surface distributions of salinity and sediment concentration in coastal areas influenced by river discharge. Basing on the Lagrangian approach we represent a river plume as a set of individual water particles, which inflow from a river mouth, mix with ambient sea water during their motion within a river plume and finally dissipate. Surface salinity and sediment concentration of a particle provides information about its turbulent mixing with undelaying ambient sea waters and gravitational settling of its sediments respectively during the period from its origin in the river estuary till the moment of measurement. Using these integrated Lagrangian characteristics calculated for the whole study area we reconstruct advection streamlines within the river plume and ratio between turbulent mixing and gravitational settling of river-borne suspended sediments. This method was applied to coastal areas situated in the north-eastern part of the Black Sea and the western part of the Philippine Sea. High resolution thermohaline and sediment concentration data were collected using a pump-through system equipped by a CTD instrument and a turbidity sensor.

O50. KINEMATIC CHARACTERISTICS OF INTERNAL WAVES IN THE CENTRAL ATLANTIC BASED ON RESULTS 36 AND 40 CRUISE OF "AKADEMIC SERGEY VAVILOV RESEARCH VESSEL"

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World ocean hydrodynamics has a very important influence on the global Earth's climate [1]. In current paper comparison of internal waves forming conditions from 36-, 39- and 40-Cruise of "Akademik Sergey Vavilov" [2,3] research vessel was conducted. Atlantic ocean thermohaline structure was considered. Classification of research polygons, based on hydrology conditions differences was conducted.

O51. RUNOFF CALCULATIONS FOR UNGAUGED RIVER BASINS OF THE RUSSIAN ARCTIC REGION

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Arctic coastal systems are very sensitive to the freshwater budget mainly formed by river runoff. Great biases in estimation of total river runoff load to the Arctic Ocean proposed by the number of various scientific groups and insufficiency of physically-based, short-term, spatially diverse runoff predictions lead to strong necessity of state-of-art hydrological techniques implementation. At the moment the most powerful tools for the land hydrological cycle modeling are physically-based, conceptual or data-driven models. Better model – wider sources of hydrometeorological and landscape-related information we need to use to perform robust calculations. Severe climatic conditions of Arctic coastal region have led to weak river runoff monitoring net and a high level of uncertainties related to difficulties of direct measurements. There is the reason we need to develop modern techniques that allow providing effective runoff predictions by state-of-art models in the case of strong research data scarcity (for ungauged basins). Early stage of research aimed to coupling of conceptual hydrological model, cutting edge machine learning techniques and various sources of geographical data will be proposed with the call for intensification of cross-disciplinary research activities for the Arctic region sustainable development and safety.

O52. ASSESSMENT OF STATISTICAL CHARACTERISTICS OF THE LONG-TERM RIVER RUNOFF IN THE RUSSIAN ARCTIC IN CHANGING CLIMATE

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The problems related to impact of the expected climate change and hydrological response assessment for the coastal zones of the Russian Arctic are discussed. The study presents the approach, which allows to perform climate-based forecasting of multi-year river runoff in form of probability density function (*pdf*) using theoretical distributions from K. Pearson's family. The advantage and limitation of the hydrological model allowing to predict the statistical characteristics of multi-year runoff, without producing projected time hydrological time series are discussed. The regional scale assessment of the multi-year the statistical characteristics of the spring flood peak runoff is evaluated using the climate projections from CMIP5 dataset as suggested by the Intergovernmental Panel on Climate Change (IPCC). The alarm regions, where the socio-economical infrastructure and coastal systems have to be adapted to the expected climate are distinguished.

O53. EVALUATION OF MOUNTAIN AREA AS NON-POINT SOURCE OF NITROGEN FOR SETO INLAND SEA: THE NORTHERN SHIKOKU REGION, JAPAN

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The northern Shikoku region is located in the Western part of Japan and faces towards the Seto Inland Sea. The forest area, which is one of the non-point sources in the Seto Inland Sea watershed, occupies 75% of the land use in the watershed of the northern Shikoku region. The amount of loadings of nutrients and COD in the Seto Inland Sea has been estimated by the unit load method but actually the data has not been investigated. It is however, necessary to know the real concentration of nitrogen in mountain streams to evaluate the role which is the mountain area plays as non-point sources. Therefore, more water samples of mountain streams in the watershed need to be taken and the concentrations of nitrogen analyzed. The mountain streams in the northern Shikoku area were investigated from April, 2015 to November, 2015. The number of sampling sites was 283, in addition to the past data by Kunimatsu et al. The average concentration of nitrate nitrogen in Ehime, Kagawa, and Tokushima was 0.61mg/L, 0.78mg/L and 0.34mg/L, respectively. The environmental standard range for nitrogen in the Seto Inland Sea is from between less than 0.2mg/L and less than 1mg/L. Therefore, the average concentration of nitrogen in these regions was over category II, and those of mountain streams in Kagawa Prefecture exceeded category III. About 20% of mountain streams were more than 1mg/L. It has become clear that mountain areas occupy an important position as non-point sources for the Seto Inland Sea.

O54. ATMOSPHERIC N DEPOSITION TO THE COASTAL AREA OF THE BLACK SEA: SOURCES, INTRA-ANNUAL VARIATIONS AND IMPORTANCE FOR BIOGEOCHEMISTRY AND PRODUCTIVITY OF THE SURFACE LAYER

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Atmospheric precipitations can be an important source of nutrients to open and coastal zones of marine ecosystem. Jickells [1] has published that atmospheric depositions can support 5-25% of nitrogen required to primary production.

Bulk atmospheric precipitations have been collected in a rural location at the Black Sea Crimean coast – Katsiveli settlement, and an urban location – Sevastopol city. Samples have been analyzed for inorganic fixed nitrogen (IFN) – nitrate, nitrite, and ammonium. Depositions have been calculated at various space and time scales.

The monthly volume weighted mean concentration of IFN increases from summer to winter in both locations. A significant local source of IFN has been revealed for the urban location and this source and its spatial influence have been quantified.

IFN deposition with atmospheric precipitations is up to 5% of its background content in the upper 10 m layer of water at the north-western shelf of the Black Sea. Considering Redfield C:N ratio (106:16) and the rate of primary production (PP) in coastal areas of the Black Sea of about 100-130 g C m-2 year-1 we have assessed that average atmospheric IFN depositions may intensify primary production by 4.5% for rural locations, but this value is increased many-fold in urban locations due to local IFN sources.

O55. ASSESSMENT OF NUTRIENT LOAD ON THE PREGOLYA RIVER BASIN (VISTULA LAGOON CATCHMENT) FROM THE ANTHROPOGENIC SOURCES

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The catchment area of the Pregolya River is about 65% of the Vistula Lagoon drainage basin and occupied by Russia and Poland in approximately equal proportions. Nutrient load from the catchment largely controls the eutrophication processes of the lagoon ecosystem. Open statistical data (2011-2014) were used for evaluating the nutrient loads. At present, the nutrient load from the major anthropogenic sources (population, livestock, poultry and crop production) is 53,267 tons N/year and 16,424 tons P/year in the Pregolya River catchment. This results in loads of 23,032 tons N/year and 2,819 tons P/year when the removal of nutrients by the harvest is taken into account. It was found that the load from anthropogenic sources in the Polish part of the catchment higher than in the Russian part by a factor of three times for nitrogen and two times for phosphorus. The reason for this is that Polish territory is relatively more agriculturally developed. In the Kaliningrad Oblast agriculture declined in the 1990-2000's and now about 50% of arable lands are not used, which creates a potential for development. Currently there is a positive trend of the agriculture development and the "Strategy of socio-economic development of the Kaliningrad Oblast until 2020" is expected to increase arable land by 70%, the number of cattle and pigs by factors of 3.5 and 9.5, respectively. This creates a potential for significant increases of the nutrients loading and eutrophication of the Vistula Lagoon

O56. INFLUENCE OF MELTING GLACIERS ON HYDROCHEMICAL STRUCTURE OF COASTAL EOCOSYSTEM OF WESTERN SPITZBERGEN

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The goal of this work was to evaluate a potential influence of the melting glacier on the hydrochemistry of the surrounding coastal waters. The studies were based on 2 expeditions to the Tempelfjord (Western Spitzbergen) performed in winter 2014 and in summer 2015 when there were measured hydrophysical, chemical and biological parameters in the sea water, coastal discharge and the sea ice. Obtained results of the research show that the glacier runoff has a clear impact on the hydrochemical structure of the fjord waters not only in warm season, but in cold seasons as well.

O57. NUTRIENT DECREASE IN THE SETO INLAND SEA, JAPAN, AND THE RESPONSE OF THE PHYTOPLANKTON ASSEMBLAGE TO THE DECREASE

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The nutrient decrease in the eastern part of the Seto Inland Sea and its influence on the lower trophic levels of the coastal ecosystem are discussed based on the information obtained during our previous study. During the high economic growth from the 1960s onwards, the Seto Inland Sea became heavily eutrophicated. Since the enactment of the Law for Conservation of the Environment of the Seto Inland Sea in 1973, nutrient concentrations gradually decreased after 1970 and dissolved inorganic nitrogen (DIN) concentration in particular decreased after 1990. One fundamental explanation for the gradual decrease of DIN concentration from 1970 to the present is the enactment of the above law by the Environmental Agency. However, the reason for the recent decrease of DIN concentrations is still unknown. It was thought that the decrease of the upward nutrient flux across the overlying water-sediment interface greatly affected the water column nutrient concentrations. The response of phytoplankton assemblages to the decrease of nutrient concentrations seemed to be no apparent decrease of biomass but a change of species group and species composition.

O58. SEWERAGE DEVELOPMENT EFFECTS ON THE LONG-TERM VARIATIONS OF ORGANIC MATTERS AND NUTRIENTS – A CASE STUDY OF AKASHI RIVER BASIN IN THE SETO INLAND SEA –

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The long-term variations of the input loads of organic matters (BOD and COD) and nutrients (TN and TP) from river into sea were evaluated. The public water quality observation data set of Akashi river basin (128.4 km2) in the Seto Inland Sea was used, and the population and the land use data were analyzed by GIS technique. The results showed 1) BOD and COD input loads from the late 1970s to 2000s have been reduced by 84% and 69%, respectively, 2) BOD input load including sewage-treated water has been reduced by 40% from the late 1970s to 2000s, while COD input loads are not reduced (6% increase), and 3) BOD and COD input loads into the Seto Inland Sea were provided 70% by the sewerage and did 30% by the river. These results indicate the sewerage development makes the restriction of organic pollution and eutrophication not only rivers but seas though the population increased about three times since 1980s.

O59. RELEASE OF NUTRIENTS FROM BOTTOM SEDIMENTS IN OSAKA BAY, JAPAN IN 2015

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Osaka Bay is the most polluted enclosed sea area, in which is located the eastern part of the Seto Inland Sea, Japan. There are four kinds of sources on loadings of nutrients to Osaka Bay, which are land including rivers and industrial effluents beside coast, ocean sea water, release from bottom sediment to sea water, and wet and dry deposition from air. The pollutant loadings inflowing from the land to Osaka Bay have been cut by various policies since 1970's. The concentrations of nutrients in the inner part of Osaka Bay have showed an obvious decreasing tendency. However, the water quality in offshore sea has not satisfied the environmental standard on nutrients. We investigated the amount of nutrients released from bottom sediments. The core samples were taken at two stations in the inner part of Osaka Bay once a month from February to November, 2015. The core incubation experiment in laboratory was conducted for 24 hours according to Tada et.al. The concentrations of ammonium nitrogen (NH_4-N) and phosphate phosphorus (PO_4-P) were measured by an automatic analyzer. The flux showed similar range with the values investigated in 1986. The results suggested that the flux of nutrients from bottom sediments in the inner part of Osaka Bay has not decreased during summer season at least since 1985. Therefore, the contribution of release from bottom sediment on the nutrients budget would relatively become larger in inner part of Osaka Bay.

O60. ASSESSMENT OF BIOTURBATION ACTIVITY OF *MARENZELLERIA* SPP. IN THE EASTERN PART OF THE GULF OF FINLAND

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Macrofauna is supposed to influence on physic-chemical characteristics of the sea bottom sediments. Through its bioturbation mechanism porosity, area of oxygenated layer and oxygen penetration depth have increased. This lead to alterations in nutrient cycling as well as improvement in redox conditions which define direction of fluxes in the sediments. In oxic conditions phosphorus is transformed into particulate form and thus, its retention and burial increase. Present investigations were carried out for the most abundant benthic species in the Gulf of Finland *Marenzelleria spp.* Those polychaetes are active turbators and their irrigation effect might lead to significant changes in reserves of nutrients. Assessments of irrigation activity of *Marenzelleria spp*. were obtained by means of CANDI (carbon and nutrient diagenesis) model, which was verified on the data of observations in July-August 2015 for the eastern part of the Gulf of Finland. According to the model results, reserves of phosphorus in 0-10 cm sediment layer might be by one third less when bioirrigation effect exists for 5 years comparing with the case of no bioirrigation activity.

O61. CHRONOLOGY OF CONTEMPORARY SEDIMENTATION AND POLLUTANTS ACCUMULATION IN THE BOTTOM SEDIMENTS OF THE SEA OF AZOV

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Bottom sediments formed in the water bodies under the technogenic impact are important environmental factors affecting water quality and hydrobiota. Usually they consist of natural and technogenic material and differ from natural formations by their morphology, chemical and lithological composition, physicochemical and biochemical properties. In the present paper we use the term “sediment layer of anthropogenic impact” to define the sediment layer containing technogenic material and/or chemical pollutants. The determination of its location in the sediment cores, its thickness and accumulation chronology is an important scientific problem. In the paper the results of layer by layer study of Cs-137, Am-241, Pb-210 specific activities as well as concentrations of petroleum components, lead and mercury in 48 sediment cores of the Sea of Azov and the Don River are examined. The sediment core layers are dated by radiological methods. In all the sediment cores the peak of Cs-137 specific activity related to the Chernobyl accident was detected. In the Sea of Azov, this peak is located in the upper sediment layer up to 10 cm thick, however, in the delta and in the near-delta part of the Don River, where the sedimentation rates are more important, it is found at 20 to 40 cm depth. Also in certain sediment cores the second peak of Cs-137 related to the global nuclear fallout of the 1960s was found. The most of petroleum components, lead and mercury quantities are concentrated in the upper sediment layer formed in the last 50 to 70 years, i.e. in the period of the most important anthropogenic pressure.

O62. CHANGES IN BACKGROUND CONCENTRATIONS OF METALS IN THE SEDIMENTS OF MARSH-LAGOON LANDSCAPES OF THE WESTERN CASPIAN

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The last 1978-1995 transgression of the Caspian Sea caused the development of marsh-lagoon system along the Western Caspian seashore. Due to salt marshes are very vulnerable to sea-level fluctuations, complex and dynamic system, they may be considered as a regional model of rapid environmental transformation.
Changing conditions of migration in the soils of marsh-lagoon landscapes during the sea-level rise influenced on the migration of elements of variable valency, primarily Fe and Mn, but also Zn, Cu, Pb, Ni, Co, leading to their mobilization in slightly alkaline and neutral reducing conditions and subsequent deposition on the geochemical barriers.
That led to the emergence of landscape-geochemical anomalies of Fe and heavy metals in the soils of salt marshes with a characteristic time of formation of any persistent anomalies during 5-10 years.

O63. FIELD SURVEY FOR REFRACTORY ORGANIC MATTER QUANTITYIN THE MARINE SEDIMENT OF ISE BAY AND EVALUATION OF ITS EFFECT ON THE PERSISTENCY OF HYPOXIC WATER GENERATION

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This study was performed to investigate the effect of the refractory organic matter (ROM) in the marine sediment on the lengthening of the large scale generation of the hypoxic water in Ise Bay. A field survey for collecting core samples of the sediment was conducted in 2015. The analysis with the data of sedimentation rate revealed many important features. A considerable amount of ROM deposited during the period of excess eutrophication in the past was found in the sediment. The total quantity of the degradable ROM (d-ROM) per unit seafloor area was from 71 to 231 mgC/cm^2. The mean characteristic time of degradation of d-ROM was about 47 years. A pelagic ecosystem -marine sediment coupled model was employed and the long-term simulation from 1950was carried out.The simulation results showed the total quantity of d-ROM reaches its maximum at the year around 2000 and there is about a 20 year delay from the peak time of the eutrophication. This feature caused the prolongation of the higher oxygen consumption as well as the higher nutrient release from the sediment in recent years. The increase of the hypoxic water area and the volume in 2010 due to the excess ROM was about 11% and 18%, respectively. These findings show the substantial effect of ROM in the marine sediment on the persistency of water pollution.

O64. SEDIMENTARY BSI AND TOC IN THE CHANGJIANG ESTUARY, CHINA: SIGNATURE TO DRASTIC CHANGE OF RIVER-BASIN ALTERATION AND WARMING SST

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Degraded ecosystem in the Changjiang Estuary has been a hot academic focus in the last decades, due to density populated mega city of Shanghai and adjacent coast of eastern China. This sedi-ecological study, using sedimentary BSi and TOC as environmental proxies, is to reveal the process-response of such degradation occurring in the last decades, and on this base, drivers from the river-basin and climate change are sought. Our results found that different eutrophication has occurred since last century inn three zone outward the Changjiang Estuary. In inner zone (delta front), the diatom biomass and primary production have slight growth since 1950s, reflected minor increased of core sedimentary BSi and TOC, this ecological change clearly driven by riverine and estuarine SSC reducing of 0.15-0.13kg m-3 due to thousands of dam construction in the Changjang Basin. In the middle zone, increase of the primary production and decrease of diatom biomass and proportion diagnostic by increase 5-10% of TOC together with decrease 5-15% BSi and BSi/TOC, can be controlled by local increase of DIN and DIN, decrease of DSi/DIN and DSi/DIP ratio. In the outer zone, the increase of primary production and diatom biomass and decrease of diatom proportion characterized by increase 15-20 of BSi and 20-30 % of TOC, together with decrease 5-10% BSi/TOC, can be controlled by local increase of SST, DIN and DIN

O65. CARBONATE SYSTEM TRANSFORMATION IN THE SEVASTOPOL BAY (THE BLACK SEA)

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A 20% increase of the carbon dioxide concentration in the atmosphere during the last century and a dramatic increase in nutrient load to marine systems due to human activity have resulted in pronounced carbon cycle transformation in coastal areas. Acidification and carbon dioxide increasing in the water column and appearance of oxygen minimum zones are reported for the worldwide coast. This makes ecological assessment of aquatic systems, including key cycles of elements, an important social and scientific task.
In this study, we present information on the inorganic part of the carbon cycle and its transformation in the Sevastopol Bay (the Black Sea). This semi-enclosed coastal area has been under heavy anthropogenic pressure over the last century. Municipal and industrial sewage discharge, maritime activities, including excavation of bottom sediments, provide additional sources of nutrients and organic carbon. We present data on dynamics of the inorganic part of the carbon cycle from 1998 – 2015. Values of pH and total alkalinity were obtained analytically, whereas CO2, HCO3-, CO32- concentrations and pCO2 values were calculated. Dissolved inorganic carbon (DIC) and its partitioning into CO2, HCO3-, CO32- demonstrate the state of the carbon cycle and its evolution. Our observations reveal up to 2% increase of DIC from 1998 – 2015, but the value of pCO2 has increased by up to 20% in line with declining pH (acidification). Seasonal variations are far more pronounced and reveal extremes for areas of oxygen minimum zones. This results in negative consequences for the ecosystem, but these consequences for the Sevastopol Bay's ecosystem remain reversible and the carbonate system can be restored to its natural state.

O66. DECADAL SCALE VARIATION IN BOTTOM DO AND COD DYNAMICS IN THE INNER AREA OF ARIAKE SEA, JAPAN

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The dissolved oxygen, COD (Chemical Oxygen Demand) and DIN (Dissolved Inorganic Nitrogen) data for more than 30 years in the inner area of Ariake Sea, Japan were analyzed with a box model. The bottom water in this area easily became hypoxic from the 1970s to the early 90s associated with the increase in COD. There were minimal increases in terrestrial COD and nutrient loads in this period and there remained tidal flats over a widespread area. The increase in COD was caused by the increase in internal production (net ecosystem production in the sea). This would be due to the enhanced primary production induced by the increase in freshwater residence time and the decrease in bivalves grazing. The increase in freshwater residence time would have been caused by the decline of tidal amplitude mainly generated by the decrease of outer sea tidal amplitude. There would be a negative feedback control where hypoxia tends to progressively increase leading to declines in bivalve biomass which subsequently remove grazing pressure limiting primary production and on senescence of blooms of phytoplankton enhances hypoxia. The possibility of the influence of the Isahaya sea dike construction and how to improve the hypoxic conditions are also discussed.

O67. HYPOXIA IN THE SEMI-ENCLOSED BOHAI SEA

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Formation of hypoxia zone in coast seas is a critical factor affecting the health of marine ecosystem and has becoming a focus of ocean science. Based on analysis of observation data from cruises conducted in the Bohai Sea in spring (May), summer (August), and autumn (November) of year 2014, this study investigated the spatial characteristics, formation mechanisms of bottom hypoxia zone in the semi-enclosed Bohai Sea and its relationship with the thermocline. The results showed that bottom dissolved oxygen (DO) was > 8 mg/L in Spring and Autumn of the Bohai Sea but a large zone with low bottom DO appeared in Summer, among which are hypoxia zones (DO<3 mg/L) with a total area approximately 4.2×103 km2. The hypoxia zone displayed a south-north "dual core" structure and the spatial characteristic is similar to that of the dual-core structure of cold bottom water in summer. The vertical profile of the cross section at the middle of Bohai Sea showed clear vertical stratification at the south and north depression basin alongside the ridge in the central Bohai Sea, which caused the decreasing DO and substantial acidification (pH<7.8) of bottom cold water. The relatively stable sedimentation environment in the bottom cold water zone has resulted in the substantial higher content of total organic carbon (TOC) and total organic nitrogen (TON) in the surface sediment than other areas. In conclusion, the seasonal stratification in central Bohai Sea and its retardation effect on exchange of DO is the critical physical mechanism for the formation of hypoxia zone. The mineralization of organic matter accumulated in surface sediment is an important driving force causing the low bottom DO and substantial acidification. Appearance of hypoxia zone is a result reflects the dramatic change of the ecosystem in the Bohai Sea and might closely linked with the frequent hazardous algae bloom (HAB) and degradation of fisheries.

O68. MAPPING BIOCHEMICAL FIELDS IN THE UPPER LAYER OF THE BLACK SEA BY THE ADAPTIVE BALANCE OF CAUSES METHOD

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A simple ecosystem model of the upper layer of the north-western shelf of the Black Sea (NWS of BS) was considered. Estimates of phytoplankton, zooplankton, bioresources and oxygen concentrations were used as the basic biochemical characteristics of the ecosystem. The ecosystem was affected by external conditions: the seasonal temperature and chlorophyll-a concentrations. The adaptive balance of causes method was used to construct ecosystem model equations. The equations had the property of dynamic adaptation to variable external influences.

Applying this model we illustrated the two-step method of modeling marine ecosystems processes, using adaptive models. On the first step, dynamics of water masses movement was calculated by a numerical model. On the second step, the ecosystem model made the local adjustment of ecosystem variables to each other, taking into account the available estimates of advection and diffusion of substances. In this simulation advection and diffusion calculated by the hydrodynamic model presented external forces relative to the ecosystem substances in the local volume. Maps of annual spatial and temporal variability of fields of phytoplankton, zooplankton, oxygen and biological resources concentrations in the upper layer NWS of BS were made. It was shown, that using data about the dynamics of marine environment in the adaptive models of ecosystems enable to detail the maps of biochemical fields.

O69. ECOLOGICAL SUBSTANTIATION OF BIOPRODUCTIVITY FORMATION IN PETER THE GREAT BAY (JAPAN/EAST SEA)

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On the basis of the object habitat analysis, on the created data archives of the hydrometeorological and hydrochemical limiting external environment parameters, by means of the reliability theory methodology and the probabilistic analysis, as well as the multidimensional statistics, the algorithm of the ecological substantiation of bio-productivity formation is formulated. On the basis of the above the algorithm of the spatial areas of *Gracilaria verrucosa* possible cultivation in Peter the Great Bay is estimated.

O70. ENERGY TRANSFER EFFICIENCIES ON LOWER TROPHIC LEVELS WITH INTENSIVE OYSTER FARMING IN HIROSHIMA BAY, JAPAN

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In enclosed water areas, organic matters are actively produced by phytoplankton due to abundant nutrient supply from the rivers. In our study area of the semi-enclosed Hiroshima Bay, oyster farming consuming high primary production has been developed since the 1950s, and the oyster production of Hiroshima prefecture have had the largest market share (ca. 60%) in Japan. In this study, species composition of phytoplankton, primary production, and secondary production of net zooplanktons and oysters were determined seasonally at seven stations in the bay between November 2014 and August 2015. In the bay, diatoms including *Skeletonema costatum* dominated during the period of the study. The primary productions markedly increased during summer (August), and its mean values in the northern part of the bay (NB) and the southern part (SB) were 530 and 313 mgC/m^2/d, respectively. The productions of net zooplankton and oyster increased during the warm season, and its mean values in the NB were 14 and 1.2 mgC/m^2/d, and in SB were 28 and 0.9 mgC/m^2/d, respectively. The energy transfer efficiencies from the primary producers to the secondary producers in the NB and SB were 2.8% and 9.1%, respectively. However, the transfer efficiency to the oysters was approximately 0.3% in the bay. This study clearly showed the spatial difference of the productions and transfer efficiencies, and the low contribution of the production of oysters in secondary productions in Hiroshima Bay.

O71. INTERACTIONS BETWEEN BIOGEOCHEMICAL ENVIRONMENT AND SUSPENDED OYSTER FARMING IN SHIZUGAWA BAY, JAPAN

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The impacts of human-induced changes in coastal environments on shellfish farming need to be mitigated. Suspended farming species, such as oysters, greatly impact planktonic communities and benthic environments via filter feeding and bio-deposition. To more effectively manage coastal environments and achieve ecologically sustainable shellfish farming, interactions between coastal marine environments and aquaculture activities need to be properly assessed. We examined interactions between coastal biogeochemical environments and suspended oyster farming in Shizugawa Bay of northeastern Japan. We found that particulate organic matter (POM) produced at the oyster farm (e.g., exfoliated periphyton and/or oyster feces) locally increased the concentrations of chlorophyll *a* and daytime dissolved oxygen in the bottom layer. Based on the estimated budget of POM at the bay scale, the oyster feeding rate was a couple of orders of magnitude lower than the net primary production and POM inputs at the bay boundaries (e.g., offshore and in rivers). The relatively high exposure of the bay and high seawater mixing rate may explain the lack of macroscale environmental impacts of oyster cultures at the bay scale. We also found that despite the oligotrophic environment, the oyster growth rate was higher in the bay, compared with previous estimates in other coastal areas. To understand the mechanisms sustaining the production of phytoplankton and oysters, further examinations from the perspective of nutrient cycling in the bay are required.

O72. FOOD WEB CHARACTERIZATION USING CARBON AND NITROGEN ISOTOPE ANALYSIS IN THE TOYAMA BAY AND THE SEA OF JAPAN

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Toyama Bay receives huge amounts of fresh water from river runoff and groundwater, and water deeper than 200m is filled with the Japan Sea Proper Water. The Sea of Japan is regarded as a miniature ocean sensitive to global climate change. In this study, Toyama Bay is an ideal natural laboratory to understand material cycles and food web structures from land to open ocean under such dynamic climate variability. The supply and transport of terrestrial nutrients to coastal-offshore food webs were investigated using carbon and nitrogen isotope ratios. Low 15N in food web was observed in the coastal water caused by uptake from land. Phytoplankton existing in the surface water is the food source both in the shallow and deep waters, and the 15N values of deep water fish are higher than those of shallow water fish, suggesting former one is under a higher trophic level relative to the latter. However, 13C indicates the benthic microalgae contributing to the coastal consumers about 30-60 % in addition to phytoplankton. The growth rate of phytoplankton in Toyama Bay is estimated to be greater than that in the Sea of Japan based on the 13C values of zooplankton and chlorophyll-a concentration. Moreover, Japanese glass shrimp and firefly squid have their distinctive and invariable 13C and 15N values, integrate the temporal and seasonal changes in research area. We suggest these two species can accomplish as useful indicators to monitor the effect of environmental changes on the food web.

O73. IMPACT ON LOWER TROPHIC ECOSYSTEM IN THE JAPAN SEA ASSOCIATED WITH NUTRIENT TRANSPORT CHANGE THROUGH TSUSHIMA STRAIT

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Enormous materials such as fresh water, nutrient, and jellyfish are horizontally transported by the Tsushima Warm Current from the East China Sea to the Japan Sea. Marine environment in the East China Sea has drastically changed in recent years due to construction of big dam and economic growth in China. The change in the East China Sea might affect to that in the Japan Sea, especially the Tsushima Warm Current region. We have monitored nutrient transport through the Tsushima Strait since 2005. It was found that interannual variation in nutrient concentration in the Tsushima Strati was quite large; mean DIN concentration in summer of 2005 was 6 μmol/l but 2 μmol/l in 2007. The large variation of nutrient concentration in the Tsushima Strait might impact on lower trophic ecosystem in the Japan Sea because nutrients in the strait are horizontally transported into the Japan Sea. Therefore, we try to evaluate how nutrient transport through the Tsushima Strati impact on lower trophic ecosystem in the Japan sea by means of a physical-ecosystem coupled model. As a physical field we use a numerical model called DREAMS developed in Kyushu University, and couple a relative simple ecosystem model based on NEMURO to DREAMS. Our ecosystem model considers DIN, DON, PON, 2 types of phytoplankton and 3 types of zooplankton. We reproduce seasonal variation in lower trophic ecosystem using climatological physical field and boundary condition.

O74. ON THE INTERANNUAL VARIATIONS OF JAPANESE COMMON SQUID (*TODARODES PACIFICUS*) RESOURCES IN THE JAPAN SEA

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Japanese common squid is one of important fishery resources to Japan, Korea and China. It has a clear life cycle: spawns from the shelf slope of East China Sea to southwestern area of Japan Sea; makes a feeding migration from its spawning area to Japan Sea or Pacific side of Japan; makes a spawning migration back to the East China Sea after growing up in the Japan Sea and Pacific side of Japan. In past several decades, its resources in the Japan Sea have large interannual variations. Although some studies paid attention on the influences of environmental conditions (mainly sea surface temperature) on its spawning area, there is still no quantitative argument on what is the most important factor controlling interannual variations of Japanese common squid (*Todarodes pacificus*) resources. In this study, we use a particle tracking model to simulate feeding migration of Japanese common squid larvae to the Japan Sea from 1992 to 2012. In our model, we consider the transport of larvae by ocean current and random walk, the survival condition of larvae by water temperature, and the influence of parent stock on larvae number. The parent stock is likely the most important factor controlling the interannual variation of Japanese common squid resources.

O75. NUTRIENT DYNAMICS IN EELGRASS (*ZOSTERA MARINA*) MEADOW AND THE VARIATION OF NUTRIENT CONTENTS OF EELGRASS

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Nutrient dynamics in seagrass beds and nutrient demands of seagrass biomass are not clear, although nutrient uptake of seagrass has been experimentally studied in the laboratory. We conducted the field observations and the bottom sediment core incubations to estimate nutrient fluxes in the seagrass, *Zostera marina* meadow. DIN (nitrate, nitrite and ammonium) concentrations were always low particularly during the *Z. marina* growing season (from spring to summer), and water exchanges caused by tidal currents hardly supplied nutrient demand for*Z. marina*. Sediment pore water also supplied insufficient nutrients to *Z. marina*, because pore water had less volume than the water column, although DIN concentrations of pore water were 10-100 fold higher than those of the water column. Nutrient flux from sediment to water column estimated by the sediment core incubation experiments showed a similar rate with tidal water exchange. Thus, our results suggested that *Z. marina* adapted for low nutrient concentrations and each nutrient source in the *Z. marina* meadow slightly contributed but could not support *Z. marina* growth. We found that another nutrient source, for example, precipitation, supplied high DIN to the *Z. marina* meadow. After rainfall, the DIN concentration of seawater in the *Z. marina* meadow increased 2-5 times higher. Moreover, nitrogen content of eelgrass also increased 2-3 times higher during several days. Those results suggested that *Z. marina* was usually exposed to a low nutrient concentration but could uptake abundant nutrients from temporary nutrient supplies such as precipitation.

O76. LONG-TERM CHANGES IN ESTABLISHED ZOSTERA BED INSIDE OF THE BREAKWATER

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The breakwater was constructed in 2000 on the coast of Shimokamagari Island in the Seto Inland Sea, Japan. A transplantation of eelgrass has been carried out in anticipation of the calming of the waves in 1999. The eelgrass distribution was expanded in 2002 after about two years of transplanted eelgrass. The purpose of this study is, if you have passed more than 10 years, distribution of eelgrass, reveal a change in the eelgrass beds growing environment. Reduces the seed supply from near the breakwater, it revealed a change in the genetic diversity of eelgrass. The distribution range of eelgrass in the breakwater has been extended to 2003, immediately after the transplanted eelgrass, gradually decreasing, in 2015 was narrower than the transplant range. In addition, benthic organisms and eelgrass leaves on the organism in eelgrass bed inside of the breakwater was less than the surrounding natural eelgrass beds outside breakwater. The wave reduction result in due to the increase in sediment deposition on leaves. The diversity of eelgrass gene in 2015 were analyzed by microsatellite method was lower than in 2006.

O77. IRON AVAILABILITY BY COASTAL DIATOM *CHAETOCEROS SP.* IN THE SHIZUGAWA BAY, JAPAN

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This study aimed to investigate the spatial distribution of dissolved iron from river to coastal waters and iron bioavailability for coastal phytoplankton. Dissolved iron concentrations and other water quality parameters (e.g., pH, concentrations of dissolved organic carbon and trace metals, etc.) were determined in the Shizugawa Bay and its adjacent rivers, northeast Japan. Coastal dominant diatom (*Chaetoceros* sp.) isolated from the bay was used for incubational assay to examine growth kinetics in a range of iron concentrations. As a result, total dissolved iron concentrations of inland waters (75 ± 80 nM) were substantially higher than those of coastal waters (7.2 ± 4.8 nM). Among inland waters, iron concentrations from anthropogenic waters were relatively higher than those for forested river waters. In the bay, relatively higher concentrations of iron were observed in the inner part. From the growth experiment, half-saturation constant of iron for the growth of *Chaetoceros* sp. was determined to be 1.8 - 3.5 nM. The observed dissolved iron concentrations combined with growth response indicate that growth of *Chaetoceros* sp. is in some cases limited by iron availability. However, this study generally suggests that, while dissolved iron concentration largely decreased from river to coastal waters, terrestrial iron inputs potentially including both natural and anthropogenic sources contribute sufficient growth and iron availability by *Chaetoceros* sp. in the Shizugawa Bay.

O78. AGGREGATION IMPACT ON THE FILTRATION AND GROWTH RATES OF MUSSELS *MYTILUS GALLOPROVINCIALIS LAM*.

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This study presents the results of field and laboratory-based experiments performedtodetermine the mussel density effect on an individual mollusk's growth and clearance rates. We measured the weight and length growth rates of single and aggregated mussels exposed into the sea for three monthly periods in summer and autumn 2015. The sample group contained 140 mollusks from natural populations within the length range of 15-20 mm. The average growth rate of aggregated mussels was almost the same as the growth rate of single ones. Clearance rate of single and aggregated mussels was measured in the laboratory using indirect method. There were selected5 groups of mussels within the length ranges: 12-16 mm, 17-18mm, 18-25 mm, 22-23mm, and 35-38mm. The clearance rate was measured for each mussel from the group and then for the whole group aggregated in a clump. Water temperature and seston concentration were the same for single and clumped mollusks. The volume of water in chambers was proportional to the weight of mussels put in water. The ratio of aggregated and single mussels' clearance rates varied from 0.48 to 0.85 at the same density of aggregation and without regard to the animal size. Significant individual variability was recorded in all field and laboratory-based experiments.

O79. LUMINESCENCE OF THE BLACK SEA MICROSCOPIC FUNGI CULTURES

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We studied for the first time luminescence characteristics of the some micromycetes, isolated from the bottom sediments of the Black sea from the 27 m depth. Luminescence parameters were registered at laboratory complex "Svet" using mechanical and chemical stimulations. Fungi cultures of genera Acremonium, Aspergillus, Penicillium were isolated on ChDA medium which served as control. Culture of *Penicillium commune* gave no light emission with any kind of stimulation. Culture of Acremonium sp. has shown luminescence in the blue – green field of spectrum. Using chemical stimulation by fresh water we registered signals with luminescence energy (to $3.24 \pm 0.11)\cdot10^8$ quantum·cm^2 and duration up to 4.42 s, which 3 times exceeded analogous magnitudes in a group, stimulated by sea water ($p < 0.05$). Under chemical stimulation by ethyl alcohol fungi culture luminescence was not observed. Culture of *Aspergillus fumigatus* possessed the most expressed properties of luminescence. Stimulation by fresh water culture emission with energy of $(3.35 \pm 0.11)\cdot10^8$ quantum·cm^2 and duration up to 4.96 s. Action of ethyl alcohol to culture also stimulated signals, but intensity of light emission was 3–4 times lower than under mechanical stimulation. For sure the given studies will permit not only to evaluate contribution of marine fungi into general bioluminescence of the sea, but as well to determine places of accumulation of opportunistic species in the sea.

O80. ANALYSIS OF THE FUNCTIONING OF MARINE ECOSYSTEMS ON CHANGING THE PARAMETERS OF THE BIOLUMINESCENCE FIELD ON THE CRIMEAN BLACK SEA SHELF

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The concept of a new approach to environmental assessment is offered in the system of integrated management of the resource and environmental safety of the coastal area of the Black Sea. The studies of the season and daily changeability in the bioluminescence field in the Sevastopol coastal waters has been conducted. For the first time considerable differences in the bioluminescence field seasonal changes in the surface and deep water layers and the reasons conditioning this phenomenon have been shown using a method of multidimensional statistical analysis.The bioluminescence field vertical profile change at the autumn period at night in the Black sea coastal waters has been studied. It has been shown that according to the character of bioluminescence parameters dynamics water column can be divided to layers: upper (0 – 35 m) and deep water (36 – 60 m). It has been revealed that life rhythms of the plankton community are the main reason of the bioluminescence field intensity variability. It has been revealed that 14-hours periodicity of the bioluminescence field is connected with changes in light and is variations with 2,5…4,5 hours are conditioned by planktonts endogenous daily rhythms. And here biotic factors effect mostly periodicity of the bioluminescence field intensity increase and fall down at the dark time of the day. Abiotic factors are of less importance in circadian rhythmic of the bioluminescence field in the neritic zone.

O81. COASTAL MARINE BIODIVERSITY OF VIETNAM: CURRENT PROBLEMS

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A brief overview of the coastal biodiversity of Vietnam based on surveys conducted by the A.V. Zhirmunsky Institute of Marine Biology, Far Eastern Branch of the Russian Academy of Sciences for last 35 years. Main problems related to threats to biodiversity are discussed on the example of the intertidal communities, coral reefs, and molluscan diversity. Threats to marine biodiversity in Vietnam are summarized as follows: habitat degradation, fragmentation and loss (especially important are mangrove forest destruction, loss of coral reefs, change in landscape mosaic of wetland, estuary, sand and mud flats); global climate change including sea level rise, storm events, rainfall pattern change, warming of the coastal ocean; effects of fishing and other forms of overexploitation; pollution and marine litter; species introduction/invasions; physical alterations of coasts; tourism. Consolidated data of Vietnamese and Russian researchers on biodiversity and coastal zone management can be used in interpretations of ecosystem changes and for development of recommendations for local/national decision-makers.

O82. SEAGRASS RESTORATION: AN UPDATE FROM TRANG PROVINCE, SOUTHWESTERN THAILAND

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Natural disasters may adversely affect coastal resources potentially leading to coastal habitat restorations that incorporate stakeholders and the general public. Appropriate methodologies for habitat restoration are developed to ensure the outcomes of this project. Currently, seagrass bed restoration by means of asexual and sexual propagation techniques have been used worldwide. However, the experience of seagrass *(Enhalus acoroides*) habitat restoration in Trang Province noted that to accomplish this project's strategies involved the application of restoration techniques along with public and stakeholder participation. The application of asexual propagation, specifically the collection of single shoots from donor seagrasses and subsequent transplantation, is a convenient tool. However, from this project results, this process still has conceptual problems as from the large numbers of single shoots collected from donor seagrasses, the survival rate was relatively low. Furthermore, this process was complicated by conflicting interests between local communities near to the donor site and the project's organizers. In order to reduce said conflicts, other techniques to balance stakeholder interests were instigated by this project, namely the development of both asexual and sexual propagation techniques. This project initiated a sexual propagation technique by the collection of wild seeds of *Enhalus acoroides* that were subsequently grown in the laboratory before natural habitat transplantation. This project results showed that seeds can be grown rapidly and can be cultured in large numbers. However, this development technique has a limit on rearing time because seedlings were found to be in decline after the third month of the experiment.

O83. LAND USE IMPACTS ON MANGROVE FISH ASSEMBLAGES: IMPLICATIONS FOR CONSERVATION OF COASTAL RESOURCES IN THE INNER GULF OF THAILAND

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Fish assemblages as reflected from coastal land use in mangrove estuary of Ban Laem District, Phetchaburi Province, Inner Gulf of Thailand had been conducted seasonally during December 2012 and October 2013. Samplings were conducted in blood cockle farms, public benefit channel, mangrove fringe area and Ban Laem estuary, using a push net at both day and night. A total of 29,287 individuals belonging to 11 orders 33 families and 54 species were collected. The Carangidae was by far the most speciose (6 species), with *Arius maculatus* numerically dominating (15,989 individuals, 54.59%). The highest number of individual was recorded in mangrove fringe area (21,051 individuals, 71.88%) in May (18,642 individuals, 63.65%) at day catches (22,149 individuals, 75.63%). The highest value indices of diversity, richness and evenness were 2.59, 3.65 and 0.88 respectively, recorded in mangrove fringe area in October. ANOSIM analysis showed a clearly significant difference of species compositions and abundance among sites, seasons and between day and night (p=0.001). Catches consisted primarily of juveniles or small-sized fishes, indicating that the area is important as a nursery ground. The findings of this study have implications for the conservation and management of mangrove and fisheries resources in Ban Laem and adjacent areas in the inner Gulf of Thailand.

O84. ASSESSMENT OF THE SPATIOTEMPORAL DYNAMICS OF THE MACROPHYTE THICKET ECOSYSTEMS IN THE NEVA BAY AND THE ADJACENT WATERS OF THE EASTERN GULF OF FINLAND

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The macrophyte thicket ecosystems of higher aquatic vegetation in the Neva Bay (NB) and Eastern Gulf of Finland (EGoF) perform many important roles, including acting as the habitats, nesting sites and migration sites for aquatic and semi-aquatic birds, creating the specific conditions necessary for the spawning and growth of many species of fish, and taking part in the self-purification of the aquatic ecosystems. Many anthropogenic disturbances, hydraulic works in particular, have a significant negative impact on these macrophyte thicket ecosystems.

In recent years, the active growth of a new type of macrophyte thicket has been observed in the NB. This is due to the aftereffects of the construction of the Saint Petersburg Flood Prevention Facility Complex (FPFC). It is quite likely that the total macrophyte thicket area in these waters is currently increasing.

In the future, it will be necessary to assess the environmental impacts of the hydraulic works on the macrophyte thicket of the NB and EGoF, taking into account the background processes of the spatiotemporal dynamics of the reed beds in the waters in question. To do this, it will be necessary to carry out a comprehensive study of these ecosystems and identify patterns in their spatial and temporal dynamics. The program of the study has been developed and is currently being implemented by Eco-Express-Service, a St. Petersburg eco-design company.

O85. VARIABILITY OF THE BLACK SEA COASTAL ECOSYSTEM: RESULTS OF LONG-TERM OBSERVATIONS AT THE SIO RAS RESEARCH SITE NEAR GELENDZHIK

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The research site is developed by SIO RAS for permanent monitoring of the ecosystem variability at the shelf and continental slope zone in the north-eastern Black Sea. The site, at which an autonomous measuring platforms are displaced, occupies an area of 10*15 km2 near Gelendzhik, where the Southern Branch of SIO RAS is situated. Three types of autonomous platforms are exploited: 1) acoustic Doppler velocity profiler (ADCP) at the bottom station; 2) thermo-chain at the mooring line; 3) robotic profiler at the moored station. By these platforms the long rows of hydrophysical and bio-optical data (vertical profiles of temperature, salinity, density, current velocity, acoustic backscatter, water transparency, chlorophyll_”a” fluorescence, etc.) of high spatial and temporal resolution are obtained. Data from some of the autonomous platforms are transferred via a telecommunication system to the coastal center for real-time operability. Also a regular year-round ship-born multidisciplinary monitoring is fulfilled at the research site. The obtained data is used for studies of the variability of the marine environment and biota, exchange processes in the "shelf-deep basin" system, ocean-atmosphere interactions, climate change, etc. It is used also for validation of satellite measurements, verification of the results of numerical modeling. In the report some of the results of the studies of coastal ecosystem variability at the research site are presented.

O86. SATELLITE DATA FOR INVESTIGATION OF RECENT STATE AND PROCESSES IN THE SIVASH BAY

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Sivash bay is the shallow-water lagoon of the Azov Sea. Restricted water exchange and high evaporation form Sivash as the basin with very high salinity. This factor leads to different from the Azov Sea thermal and ice regimes of Sivash. Maine aim of the study presented to investigate recent state and changes of the characteristics and processes in the basin using satellite data. Landsat scanners TM, ETM+, OLI, TIRS together with MODIS and AVHRR were used. Additionally NOMADS NOAA and MERRA meteorological data were analyzed. The next topics are discussed in the work:

1. Changes of the sea surface temperature, ice regime and relation with salinity.
2. Coastal line transformation – long term and seasonal, wind impact.
3. Manifestation of the Azov waters intrusions through the Arabat spit, preferable wind conditions.

O87. USING OF MULTI-YEAR REMOTE SENSING DATA FOR THE NEVA BAY AND THE EASTERN GULF OF FINLAND FOR REVEALING PECULIARITIES OF ANTHROPOGENIC IMPACTS OF HYDRO-TECHNICAL FACILITIES BUILDING AND DREDGINGS ON THE COASTAL AND WATER ENVIRONMENT

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This paper is devoted to the use of long-term remote sensing (RS) data for assessment of anthropogenic impacts on the coastal water environment of the Neva Bay (NB) and the eastern part of the Gulf of Finland (EGOF), caused by construction of hydro-ingineering facilities, operations for land reclamation, dredging and underwater dumping. The study period includes past four decades for which airborne and satellite data are available. Results ofusing long-term RS datasets formonitoringand studying coastal water environment, for estimation of levels of water contamination by suspended matter (SM), for revealing spatiotemporal variability of SM distribution under the influence of natural and anthropogenic factors, for studying features of surface waterdynamics andof phytoplankton development, are discussed.

O88. THE ROLE OF REMOTE SENSING DATA FOR COASTAL ZONE MONITIORING AND MANAGEMENT (CASE STUDY FOR THE EAST PART OF GULF OF FINLAND)

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Coastal zone of the Eastern Gulf of Finland is subjected to essential natural and anthropogenic impact. The processes of abrasion and accumulation are predominant. While some coastal protection structures are old and ruined the problem of monitoring and coastal management is actual. Remotely sensed data is important component of geospatial information for coastal environment research. Rapid development of modern satellite remote sensing techniques and data processing algorithms made this data essential for monitoring and management. Multispectral imagers of modern high resolution satellites make it possible to produce advanced image processing, such as relative water depths estimation, sea-bottom classification and detection of changes in shallow water environment. In the framework of the project of development of new coast protection plan for the Kurortny District of St.-Petersburg a series of archival and modern satellite images were collected and analyzed. As a result several schemes of underwater parts of coastal zone and schemes of relative bathymetry for the key areas were produced. The comparative analysis of multi-temporal images allow us to reveal trends of environmental changes in the study areas. This information, compared with field observations, shows that remotely sensed data is useful and efficient for geospatial planning and development of new coast protection scheme.

O89. MAPPING AQUACULTURE FACILITIES IN SHIZUGAWA BAY BEFORE AND AFTER THE HUGE TSUNAMI ON 11 MARCH 2011 BY SATELLITE REMOTE SENSING

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Management of aquaculture facilities are not only ecological problems but also socio-economic ones. A prefectural government permits a spatial extent of area where aquaculture facilities are deployed in each bay to a local fishermen's cooperative in Japan by a law. The local fishermen's cooperative administers this extent on behalf of the prefectural government. However, it is very difficult to map the aquaculture facilities because of their number. Satellite remote sensing is suitable for mapping aquaculture facilities. Thus, we conducted a study to map aquaculture facilities with use of satellite images: commercial multiband satellite images with a high spatial resolution such as Geo-eye and Worldview 2 and non-commercial synthesized aperture radar (SAR) images of ALOS-2. We traced aquaculture facilities in Shizugawa Bay before and after the huge tsunami on 11 March 2011 because aquaculture facilities have been changed drastically. Our study revealed that the former could map not only raft type aquaculture facilities but also buoy and line types of oysters, seaweeds and scallops. The latter could the raft type aquaculture due to their coarser spatial resolution. However, the latter images can be obtained even under cloudy weather. We propose a combined use of both multiband and SAR images when fishermen change deployment of aquaculture facilities seasonally.

O90. VARIABILITY OF BIO-OPTICAL CHARACTERISTICS IN ECOSYSTEMS OF PETER THE GREAT BAY (SEA OF JAPAN)

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Variability of the bio-optical characteristics may be as indicator of changes in the functioning of ecosystems, for example the eutrophication, the organic matter pollution and the hypoxia of water body. In this work we study according to data, obtained by means of the satellite MODIS-Aqua spectroradiometer, the variability of bio-optical characteristics (concentration and fluorescence of chlorophyll-a (Cchl and Fchl), coefficients of light absorption by detritus and yellow substance (adg) and light backscattering by suspended particles of mineral and biological origin (bbp)) along sections extending from the shelf (Amur and Ussuri Bays) toward the seaward area of Peter the Great Bay from January to December of 2007, 2008, 2013, 2014. Features of the seasonal Cchl satellite variability along the selected sections were shown. It is noticed that the highest Cchl satellite values are characteristic for the Amur Bay, usually from place of confluence of the Razdolnaya River from late May - June to August – September. Separate cases of increased values of bbp in area, which stretches from the Vladivostok coast, were revealed. In the first case, the area of the increased values of bbp corresponded to area, having the Fchl values close to zero, and in second case – to area with the increased Fchl. Possible, the first case can be caused by the increase in content of the mineral origin suspension because of some building works, and the second case is due to the discharge of water by reservoirs. It is noticed that the increased values of bio-optical characteristics except Fchl are characteristic for the scenarios with the increased wind speed and after the atmospheric precipitation. Increased Fchl values are characteristic at the sufficient rainfall, contributing to rising of the rivers level, or the increase of wind speed to about 8 m/s and above.

O91. AN EVALUATION OF OIL POLLUTION PORBABILITY IN THE LEVANTINE BASIN OFF ISRAEL

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Recent gas discoveries in the eastern Mediterranean Sea have led to multiple operations with substantial economic interest, and they are accompanied by the risk of oil spills and their potential environmental impacts. In this this study we compute the probability of an area being polluted by oil. The first stage of this computation is to determine what the likely scenarios for oil spills are, where the areas of higher oil spill probability are and what the expected size of the spill is. This study was performed as part of the RAOP-MED project, which considered ship collision scenarios, other accidental spill from ships and rigs, and accidents that might occur during fueling operations. The results of the project include a map of oil spill probability for the eastern Mediterranean that details different scenarios, as well as a map of the maximal spill size. We use these results to create possible oil spill scenarios and run Monte-Carlo simulations of the oil spill's fate. The simulations use the MEDSLIK oil spill propagation model, forced by the realistic atmospheric and oceanic conditions that exist off the Israeli coast, as outlined by the SKIRON and SELIPS numerical models. Potential risk sources in the area are the ship traffic that enters and leaves the Suez channel, as well as the offshore platforms on the Nile Delta and in the Israeli exclusive economic zone. We also examine the impact of the alongshore current on the probability and severity of the pollution.

O92. SELF-CLEANING CAPACITY OF SEACOASTS IN CASE OF OIL POLLUTION

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The sea coasts are especially exposed to the oil pollution harmful influence as they frequently suffer from oil spills relating to the tanker accidents, port and off-shore activities. The objective of the present research is to examine the rates of spilled fuel oil natural destruction on geographically different seacoasts and to evaluate their relationship with principal environmental factors such as climatic and hydrological conditions, coast exposure and geomorphology, sediment types, intensity of biogeochemical cycles. For this purpose, a number of contaminated sectors of the Atlantic coasts of France and Spain (areas of "Erika" and "Prestige" tanker accidents), the Strait of Kerch ("Volgoneft-139" tanker accident) and the Black Sea coast in Russia (area of Novorossiysk sea port) were studied. Long-term (from 6 to 15 years) field observations were carried out there. The oiled samples were analyzed with the use of thin layer and column chromatography, optical and gravimetric methods. The results show that in the course of time, the oil slicks demonstrate an exponential diminution in their size, number and in the ratio of labile hydrocarbons content to conservative asphaltic components content. The half-period of this diminution varies from less than 1 to 12 years, subject to the forms of fuel oil traces and geographical conditions. On the Strait of Kerch coast washed by shallow, slightly salted and highly bio-productive waters of the Sea of Azov the spilled fuel oil tends to disappear twice as rapidly as on French and Spanish coasts of the Atlantic Ocean. The joint examination of the observed rates of oil pollution natural destruction and the geographical conditions of studied sites shows that temperature and seawater salinity are the crucial environmental factors of self-cleaning process.

O93. THE SHIPPING INTENSIFICATION IMPACT ON THE BLACK SEA ECOSYSTEM

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Intensively developing maritime traffic is one of the main elements of the technogenic loading the Black Sea ecosystem undergoes. The objective of our work is to review and assess both negative and positive maritime traffic effects on the Black Sea ecosystem. As a material we used our own acoustical survey data and numerous publications of international and local experimental and field investigations. The data were accumulated during 36-year period (1976-2011) in biophysical ecology department of IMBR as a result of science cruises of R/V "Ak. Kovalevsky" and "Pr. Vodyanitsky" at different regions of the Mediterranean Sea.

The following consequences have been revealed:

1. Pollution of water objects by oil, oil products, bilge waters, fuel, wastes etc.
2. Appearance of a zone of suppression of the water ecosystems normal functioning as a result of maritime routes active intensification.
3. Noise pollution.
4. Introduction of alien hydrobiont species with vessels ballast waters.

The work includes data of the Black Sea regions with the most high level of oil pollution (according to MPL), its impact on some biota members. We described the catastrophic condition of *Zernov phyllophora* field as a bright example of the technogenic loading influence (with data of illumination at bottom layer during 2010); presented the way noise pollution from passing vessels changes migration routes of some fish species. Finally, we considered ctenophore *Beroe ovata* as a useful invasion.

O94. THE BLACK SEA AND MICROPLASTICS: SEVASTOPOL BEACHES MONITORING

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Within the framework of the monthly monitoring the study of qualitative and quantitative composition and distribution of micro- and small macroplastic on sandy and pebbly beaches of Sevastopol is initiated. Microplastics and small macroplastic abundance was estimated from surveys on two of the most popular Sevastopol sandy beaches of the Crimea Black Sea Coast (Omega beach and Uchkuyevka beach). The samples were collected during March - April 2016 from the top 5 cm of the numerous square areas (1×1 m) placed on 20 m long transects perpendicularly 100-meter lines along the shore line. Three type of stainless steel sieves were used: mesh sizes 5 mm, 1 mm and 0,3 mm. In the laboratory, the collected sediments were introduced into a glass tank with a high concentration solution of sodium chloride (NaCl) 140 g l^{-1}, the floating plastic particles recovered, sorted and categorized by type, usage and erosion level.

The mean microplastics densities on Omega and Uchkuyevka Beach were 4,2 ± 0,95 and 2,6 ± 0,95 items m^{-2}, accordingly. Most of micropastics items were rigid fragments (60%), polystyrene (25%) and polyethylene (15%). Number of macroplastic particles (size of 5-100 mm) by 1 m^{-2} ranged from 2.35 to 57, the mean abundance on Omega and Uchkuyevka beaches were 10,1 ± 0,95 and 7,3 ± 0,95, accordingly.

O95. EMODNET MED AND BLACK SEA CHECK POINTS ADDRESSING THE CHALLENGE OF OIL PLATFORMS LEAKS

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The coastal seas, including offshore are important economic zones, where access to marine data can assist in issues related to environment, maritime safety, exploitation of resources. To address the access of marine data the EC has established the European Marine Observation and Data Network-EMODnet, that provides access to data from the EMODnet thematic portals, the Copernicus Marine Service and other initiatives. In order to evaluate how comprehensive and accurate are the data available through these portals, at the Mediterranean and Black seas, 11 challenges were defined. These challenges are of paramount importance for the blue economy sector (offshore industries, fisheries, recreational facilities); environment variability (eutrophication, ocean climate change); emergency management (oil spills); preservation of natural resources and biodiversity (marine protected areas). The chosen challenges provide a way to value the marine data and make choices about suitability of a dataset to solve particular problem. The challenge "oil platform leaks" aims to provide oil spill predictions within 24 and 72 hours for the next 72 hours that determine the likely trajectory of the oil slick and the statistical likelihood that sensitive beaches will be affected. The "oil platform leaks" challenge handles the ability to produce oil spill predictions in the Mediterranean and Black Sea, where the EC generates the oil leak alert on-line. In the framework of this challenge, oil spill predictions can be connected to existing oil spill monitoring platforms (EMSA-CSN) using the well established oil spill modeling systems of MEDSLIK and MEDSLIK II and the data from Copernicus Marine Service, ECMWF or other meteo services and EMODnet portal data.

O96. ON COASTAL - OPEN SEA DYNAMIC INTERACTIONS DEFINING PRODUCTIVITY AND ECOLOGY OF SHELF AND ADJACENT TO SHELF WATERS

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It is known that considerable part of living matter in the ocean falls out of biological cycle irretrievably by way of sedimentation. It means that quasistationary state of oceanic ecosystems is possible only with supply of mineral and organic matter from land, which brings also contaminanting matter. That supply takes place mainly in nearshore regions, concentrating in bottom boundary layers, and is transferred to the open sea via shelves by means of horizontal and vertical mixing. Effective mixing in shelves is carried out by small-scale processes, which are considerably fed by energy of large-scale processes from out-of-shelf regions. The main objective of our paper is to identify mechanisms of energy transfer from large to small-scale motions and from open sea to near-shore areas.

Our experiments and observations in the shelf zone of the Sea of Japan revealed important specific features in stratified bottom boundary layers: 1) Temporal intermittence of internal waves (IW) in near-bottom layers and their transformation into sequences of stratified boluses moving in non-stratified medium. 2) Extremely high horizontal and vertical velocities in the near-bottom layers. 3) Considerable power fluctuations caused by correlated fluctuations of near-bottom pressure and velocity. 4) Non-monotonic vertical structure of temperature and velocity leading to possibility of simultaneous existing of IW breaking and secondary generation of high-frequency IW by turbulence in layers with high curvature of velocity profiles.

O97. DEVELOPMENT OF THE REGIONAL OPERATIONAL OCEANOGRAPHIC SYSTEM FOR THE GULF OF FINLAND AND KALININGRAD SHELF

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This study is aimed at developing of an operational oceanographic system for the Russian sector in the Gulf of Finland and South-Eastern part of the Baltic Sea for operational forecast of hydrodynamic and ecosystem parameters on the basis of high and ultra-high spatial resolution models. The system is presented as a complex of regional and local models; for which a coupled modelling integration at boundary conditions exchange is fulfilled. The models share common mathematical formulation of general motion equations and a unified realization on the basis of programme code modelling modules designed for the ocean modelling – NEMO. The regional model of the Baltic Sea circulation is complemented by a module for the inert matter transport simulation. The latter is set up on the basis of a matter turbulent diffusion model with the use of two consistent equation systems: deterministic and stochastic. The designed operational system consists of two subsystems: operational oceanographic system of the coastal areas of the Baltic Sea and an expert-analytical system of operational monitoring of the aquatic environment and effective response to accidents at sea.
The work was performed as part of the Federal Target Program "Research and development on priority directions of scientific and technological complex of Russia for 2014-2020" the Ministry of Education of Russia, the unique identifier RFMEFI57414X0091.

O98. STORM ICE OIL WIND WAVE WATCH SYSTEM (SIOWS): WEB GIS APPLICATION FOR MONITORING THE ARCTIC

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Working with satellite data, has long been an issue for users which has often prevented from a wider use of these data because of Volume, Access, Format and Data Combination. The purpose of the Storm Ice Oil Wind Wave Watch System (SIOWS) developed at Satellite Oceanography Laboratory (SOLab) is to solve the main issues encountered with satellite data and to provide users with a fast and flexible tool to select and extract data within massive archives that match exactly its needs or interest improving the efficiency of the monitoring system of geophysical conditions in the Arctic. SIOWS - is a Web GIS, designed to display various satellite, model and in situ data, it uses developed at SOLab storing, processing and visualization technologies for operational and archived data. It allows synergistic analysis of both historical data and monitoring of the current state and dynamics of the "ocean-atmosphere-cryosphere" system in the Arctic region, as well as Arctic system forecasting based on thermodynamic models with satellite data assimilation.

O99. NUMERICAL MODELING OF POLAR LOWS OVER THE BARENTS SEA: IMPACT OF WRF PARAMETRIZATIONS ON THE QUALITY OF FORECAST.

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Polar lows are generally characterized by severe weather in the form of strong winds, showers and occasionally heavy snow, which have sometimes resulted in the loss of life, especially at sea. Numerical simulations with mesoscale atmospheric models is a good alternative to investigate polar low phenomenon, because they produce temporally and spatially regular-spaced fields of atmospheric variables with high resolution. To describe the evolution of atmospheric processes the Advanced Weather Research and Forecasting (WRF-ARW) model was used. The principal objectives of this study were 1) the understanding of mesoscale WRF model and adapting the model for the Barents Sea region; 2) to conduct numerical experiments using WRF model with different Planetary Boundary Layer parameterization (PBLs) schemes and investigate the impact of each scheme on the quality of forecast; and 3) the investigation of the capability of WRF model to successfully simulate evolution of polar lows. The impact on the quality of forecast was investigated. The results of the study, obtained by numerical modeling of polar mesoscale low over the Barents Sea. One polar low, near Spitsbergen, from 24 of March to 26 of March 2014 were targeted. The results of numerical experiments showed that each of Planetary Boundary Layer parameterization scheme isn't successful for simulation of polar low.

O100. POLAR LOW DETECTION USING SOLAB SIOWS ARCTIC PORTAL

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The relevance of the polar lows (PLs) research is justified by their great destructive power and creation of threat to the safety of navigation in the high latitudes and along the Northern Sea Route. The most dangerous effects on maritime activities are strong winds, waves and icing. In addition, the study of the PLs acquires relevance due to the sharp decrease of the sea ice area in the Arctic in recent years and the emergence of areas of open water, suitable for the appearance and development of PLs. However, despite the importance of PLs, they are apparently not sufficiently studied. As there are no meteorological observations in the areas of their appearance, the main source of information about them are satellite observations. By using images on the SOLab SIOWS Arctic Portal from multiple satellites operating in the IR and visible ranges (e.g., MODIS and AVHRR), and using near-water wind fields from high resolution synthetic aperture radars (Sentine-1, ASAR) and low resolution scatterometers (ASCAT), we identify polar lows in various parts of the Arctic, revealing statistical regularities in the appearance of PLs, their distribution and intensity. Collected database of Pls and their characteristics will be used for further PLs forecasting model development.

O101. THE MANAGEMENT OF HYDROMETEOROLOGICAL RISKS IN SOCIO-ECONOMIC SYSTEMS OF COASTAL AREAS

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The article considers the problems of functioning and development of complex socio-economic systems of coastal areas in unstable weather-climatic conditions.
It is known that the characteristics of the spatial organization of economy of coastal zones are defined industrial and trade specialization and tourism potential of the area
It is shown that socio-economic systems are subject to a number of factors, including weather and climatic conditions, which can have both positive and negative effects on economic potential. development of the coastal areas. The density distribution and the economic activities should be considered.
The classification of risks of socio - economic systems of coastal areas, due to the influence of hydrometeorological conditions are described.
The need to incorporate the tasks of risk management function and the development of spatial distributed systems in the concept of integrated coastal zone management is justified. The model of management of hydrometeorological risks in the system "territory - economy - natural environment" in the space-time dimension is developed.
Proposed methods of solving the problems of functioning and development of complex socio-economic systems are based on complex research carried out by the authors.

O102. METHODOLOGICAL ASPECTS OF RISK MANAGEMENT DEVELOPMENT OF THE COASTAL AREAS

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Risk management of a development of systems and territories is one of the key problems of managerial decision-making. This is due to the impossibility of carrying out model experiments and the complexity of formalization of characteristics. The necessity of considering the peculiarities of the spatial distribution of subjects and objects of management allows to speak about relevance of geoinformation management.

Compared with other classes of potentially hazardous systems, spatially distributed systems and areas characterised by a significant level of inertia that contributes to sustainability in development, but hinders the development management and allows the dynamics to determine the influence of threat factors. The effects of hazards on the territory are systemic: they are implemented in the spatial system man - the individual society - technosphere - geosystem.

The article describes:

- analysis of dynamics of control conditions for the development of spatially distributed objects and territories;
- classification of risks for coastal management;
- principles of risk management development of the coastal areas;
- the system model (conceptual model) of risk management in its spatial aspect, as well as private models for risk management under the influence of natural factors.

O103. COASTAL ECOSYSTEMS AND CHANGING ECONOMIC ACTIVITIES: CHALLENGES FOR SUSTAINABILITY TRANSITION

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The wide variety of economic activities, which prevail along the coasts, has either direct or indirect connectivity with the coastal ecosystems through its provisioning of a diverse range of goods and services. However, these systems are permanently under pressure due to natural and anthropogenic threats. This field based study documents the changing pattern of economic activities along selected coastal stretches in South Asia at Bangladesh, India and Sri Lanka. Economic activities vary with coastal ecosystem types and service flows there from. Field study sites were identified based on multiple meetings and discussions with the policy makers in each of the countries and they continued to be the part of scientific discussions within ecology-economy framework through the project lifetime. In depth enquiry and analysis were carried out to understand perception of various economic stakeholder groups to natural and anthropogenic threats in the coastal regions and resultant vulnerability and risks. Often threats get intensified by rapid urbanization triggered by changing pattern of coastal economy due to tourism expansion and modernization of traditional activities.

O104. THE APPROACHES TO THE SOLVING ENVIRONMENTAL AND ECONOMIC PROBLEMS OF SUSTAINABLE DEVELOPMENT ON THE SHELF OF THE ARCTIC SEAS OF THE RUSSIAN FEDERATION

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Russian Arctic shelf - rich larder of the hydrocarbons, at the same time Northern Sea Route (NSR) - a strategically important route for transporting them.

The extraction and the transportation of the hydrocarbons along the NSR requires the solution of a number of ecological and economic problems in the first place to ensure environmental and technogenic safety.

For the solving of these problems on the continental shelf it is required a system of comprehensive measures:

- the development of the regulatory framework for environmental support oil and gas projects;
- the introduction and use of integrated methods for monitoring environmental conditions at the sites of technogenic loads on the shelf of the Arctic seas, including the use of drones;
- creating different models for assessing the marginal stability of ecosystems to technogenic loads during production and transportation of hydrocarbons on the continental shelf based on systems of dynamic simulations;
- the development and use of sensitivity maps of coastal areas of the Arctic seas during oil spill response;
- accounting of the results of the analysis of the total environmental benefit in the development of oil spill response plans;
- application of the principle of "zero" resetting, due to the high fishery valuation in Barents and Kara seas and the conservation of marine biological resources.

O105. DEVELOPMENT OF SCIENTIFIC FOUNDATION FOR SOLVING ENVIRONMENTAL AND HYDROBIOLOGICAL PROBLEMS OF INTEGRATED COASTAL ZONE MANAGEMENT

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The work is dedicated to the development of the system of coastal zone environmental assessment, grounding on the principles of integrated approach to the management of resource and environmental safety in the Azov and Black Sea region. The methodological approaches and applied assessments of the quality control analysis of sea water and benthic sediment according to the monitoring data were formed. The methods of the marine environment biomonitoring were offered; its results have a universal basis and can serve both as the index of investigated cenosis structure and its physiological state.

O106. FACTORS INFLUENCING THE FORMATION AND REALIZATION OF THE TRANSBOUNDARY NATURAL MANAGEMENTPOLICY IN AZOV-BLACK SEA BASIN

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The states of the Azov-Black sea basin make an active usage of different transboundary resources, first of all, natural, spatial and anthropogenic for personal use that mostly come into collision with the global purposes of the steady region development. Rather unsteady environment is being formed in the given region when the interference of the inner and outer negative factors of social, economic, anthropogenic political and ecological development occurs. All that leads to the formation of the complex problems demanding urgent solution. For the benefit of the production of recommendations for the effective realization of the state policy of transboundary natural management and finding out strong and weak points, opportunities and threats the SWOT analysis of the factors influencing the realization of the transboundary natural management policy in the Azov –Black sea basin has been performed. Currently the determining role in the formation and realization of transboundary natural management policy is being played by the political factors including geopolitical unsteadiness, absence of agreement in decisions taking and unpredictability of the tendency of international sanctions establishment. In this case on the one hand environmental policy is a "victim" of the political ambitions of the states of the region, on the other hand – it is able to act as consolidating factor for the countries realizing the necessity of solving the problem of the steady natural management facing the common ecologic threats.

O107. NEW DIRECTION FOR ENVIRONMENTAL WATER MANAGEMENT IN THE SETO INLAND SEA

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The Seto Inland Sea, the largest enclosed sea in Japan, experienced sever water pollution problems caused by rapid industrialization and the loss of seaweed bed and tidal flat due to reclamation projects particularly in the period of the high economic growth in 1960s. To resolve these issues, we have carried out water quality improvement programs including reduction of pollutant load. As a result, water quality has improved as compared with Tokyo Bay and other enclosed seas.
However, there are still severe problems including the occurrence of red tide and oxygen deficient water mass in some areas in the Seto Inland Sea. Securing the bio-diversity, bio-productivity and smooth nutrient circulation are also important. Under these situations, the Law and the Basic Plan for Conservation of the Environment of the Seto Inland Sea were revised in 2015. With these law and plan, it has been made clear that our principal objective is to make the Seto Inland Sea a "Bountiful Sea" through conservation of water quality with bio-diversity and bio-productivity. Also the importance to implement environmental measures corresponding local differences in the respective region and seasonality were indicated.
Ministry of the Environment, Japan will continue to conduct corresponding programs based on scientific survey and evaluation on conservation/restoration of seaweed bed, tidal flat, smooth circulation of nutrients.

O108. RECENT SHIFT OF MANAGEMENT POLICIES OF THE SETO INLAND SEA, JAPAN WITH SPECIAL REFERENCE TO PROMOTION OF *SATOUMI* ACTIVITIES

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"The special law" on the environmental conservation of the Seto Inland Sea, Japan and governmental basic plan for the environmental conservation of the sea based on the law were both revised recently in 2015. Two major aims of the previous basic plan (1. conservation of water quality, 2. conservation of natural landscape) were reformed to broader four new major aims (1. conservation and restoration of coastal environment, 2. conservation and appropriate management of water quality, 3. conservation of natural and cultural landscapes, 4. sustainable utilization of fish resources) in the revised basic plan. Historically, environmental management policy of the Seto Inland Sea had firstly made emphasis on water pollution control such as total pollution load control (TPLC). However, this kind of passive conservation policy is gradually being sifted recently to active conservation such as *Satoumi* which includes restoration of biodiversity, biological productivity, habitat and well balanced nutrient cycle between land and sea. Holistic approaches such as integrated coastal management (ICM), ecosystem-based management (EBM) and adaptive management were incorporated into new policy in Japan. These clear changes of management policies of the Seto Inland Sea will make change more detailed policy of every related prefecture and hence will promote *Satoumi* activities in near future.

O109. COLLABORATIVE OBSERVATION OF OCEANOGRAPHIC DRIFT BUOYS DEPLOYED ALONG THE TSUSHIMA IS. COAST TO ESTABLISH AN EFFECTIVE MARINE PROTECTED AREA

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Marine Protected Areas (MPA) are attracting attention not only for protecting biological diversity and conserving the natural environment, but also for promoting sustainable fisheries and tourism on the local level. Surveys were conducted in Tsushima (Nagasaki) and its adjoining seas, where marine protected area policy has been ongoing since 2010. As part of our consideration of "Collaborative oceanographic monitoring grounded in local knowledge", we checked for correspondance between good fishing grounds and physical oceanographic findings. A drift buoy was thrown from a boat onto to the sea surface and its progress followed in February and May 2014, July to August 2015. Information on its location was relayed through a satellite channel and remotely received by email every hour. Each record of the buoy's location and track was in turn made public and discussed through the researcher's SNS. The buoy entered the marine area off the northeast end of the island and followed a gentle northbound track while tracing a circle approximately every 4 days. These circular tracks are what is called the "Tsushima eddy," and suggest the possibility that this swirling current moves northward together with the entire water mass of the Tsushima warm current. The marine area where we observed the eddy approximately coincides with good fishing ground where the fishers of northen Tsushima enjoy abundant catches of a wide variety of species.

O110. INTEGRATED INDICATOR ASSESSMENT OF COASTAL SENSITIVITY TO MARINE PORT ACTIVITIES

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In 2012 the Strategy of port's infrastructure development to 2030 was passed in Russia. Construction of ports and approach channels by dredging works with assessment of its environmental impact assessment have a great impact on marine environment, coastal areas and economic situation on developing of a region and its local municipalities. One of a key issue is necessity to assessment a pressure to the environment due to construction and operation of port facilities. Creation of new marine port structures needs to assess of current state of a territory by both environmental and economical indicators. Developing of integrated indicator approach, based on environmental impact assessment of current situation in a port area and using general economic parameters, shows a complex evaluation of current situation in a region and its local municipalities that reflects a coastal sensitivity to marine port activities. Dimensionless calculated parameters give possibilities to compare municipalities in different regions between each other. The paper present results on comparison environmental and economic indicators for the port of Ust-Luga and Taman port located in Leningradskaya region and Krasnodarskiy krai correspondingly and coastal sensitivity on the regions.
The research is supported by the Russian Science Foundation, project number 16-05-00724.

O111. PREVIOUS EXPERIENCE AND PROSPECTS OF USING CERTAIN QUANTITATIVE METHODS FOR THE ENVIRONMENTAL ASSESSMENT OF HYDRAULIC ENGINEERING CONSTRUCTIONS DURING THE DESIGN PROCESS

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Below is a brief overview of several quantitative methods for selecting the locations of hydraulic engineering constructions (HEC) to minimize the related environmental costs. These methods were developed and tested by Eco-Express-Service, a company with over twenty years of experience in the industry and extensive expertise in designing HECs.
We conduct the following:
1) A multidimensional cluster analysis of the expected human impact;
2) An assessment of the ecological-economic risk in the form of the expected value of the predicted harm to the environment;
3) An express estimation of the expected “environmental cost” of construction activities.
Each of these methods is justified, described and illustrated by a specific example. Their use allows to solve such important practical tasks as quantification, classification and the quantitative comparative assessment of the expected impact on the marine environment. This becomes especially important when choosing the optimal location for an HEC and implementing environmental safety measures.
An important point is that all of these methods can be recommended for use as Marine Spatial Planning (MSP) “instruments”.

O112. INNOVATIVE TECHNOLOGIES FOR DECISION SUPPORT IN SOCIO-ECONOMIC DEVELOPMENT WITHIN COASTAL SYSTEMS OF THE RUSSIAN NORTHERN SEAS TAKING INTO ACCOUNT NATURAL RISKS AND ADAPTATION TO CLIMATE CHANGES

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Socio-economic development within coastal systems of the Russian Northern seas is an important component of the Strategy for development of the Arctic zone of the Russian Federation (AZRF) till 2020 (here and after AS-2020). When implementing AS-2020 important aspect is the management of natural risks. The planning horizon of AS-2020 requires the development of measures to adapt to climate change. Management of natural risks and adaptation to climate change require the development of innovative technologies for decision support based on the principles of geo-information management for spatial areas including marine planning. Here are the results of research on the development of such technologies over the last years in the Institute of Arctic and Subarctic at the Russian State Hydrometeorological University (ASI RSHU). During research we widely use the instruments of international cooperation.
Platform https://www.researchgate.net/profile/Valery_Abramov2/?ev=hdr_xprf gave excellent opportunities to preliminary discussion and data exchange in the frame of this research. The Ministry of education and science of Russia provides financial support for this research with the state order 2525.2014/166.

O113. COASTAL ESSAOUIRA DEVELOPMENT FAIR TRADE PROJECT. MOROCCO

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The city of Essaouira on the Atlantic Coast of Morocco is actively searching for an important change in its economic model, traditionally based on artisanal fisheries and tourism since the sixties of the past century. The circumstances of Morocco, such as the high dependence of import for energy needs (fuel and gas), low development of infrastructures and population growth, have generated in 2014 the opportunity of cooperation between the Commerce Chamber of Essaouira [1] and the research study group, headed by Professor Dr. Pedro Fernández, from Universidad Politécnica de Madrid. A cooperation agreement has been signed on the 15th October 2014. Within this agreement several activities have been implemented. Among them, 5 research projects [2] have been developed during 2015: Study of a New Bus Station Terminal, Creativity Entrepreneur Area (Dermocosmetics industry, agro bio organic market, Renewable Energy, Wood artisanal and Fair Fashion), Viability of Wave Energy Station, Harbor New uses, Offshore Wind Energy Farm. Here it is summarized the outcome of these researches, measured in terms of invest needed and benefits generated, in terms of active participation of people of Essaouira, new activities and companies generated, and profits potentially gained in a short and long term under sustainable and respectful environmental, cultural and social behavior where fair trade, health, person to person business and less is more are the bones and the heart of all proposals.

O114. MODEL SITES EXERCISES FORICM IMPLEMENTATION IN JAPAN

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The basic act on ocean policy has been enacted since 2007 in Japan, and the basic plan on ocean policy has been endorsed by cabinet originally in 2008, and revised in 2013. The Integrated Coastal Management (ICM) is stated as one of basic measures in the basic act and one of measures the government should take comprehensively in the basic plan. Within the revised basic plan, a clear message of government to "offer assistance to regions" that strive to formulate their own plans (for comprehensively manage land areas and marine zones together) has been described. Nevertheless, specific measures by government are not yet implemented in sufficient level. The Ocean Policy Research Institute have set up 5 model sites with collaborative local governments. Since 6 years exercises, ICM implementation processes has been grouped in 5 phases namely, 1) situation understanding, 2) consensus building, 3) ICM planning, 4) adaptive implementation and 5) post assessment process. Variation of phases and necessary assistances will be described based on case studies. One of typical example is a collaborative capacity building course with OPRI and Ministry of Land, Infrastructure, Transport and Tourisms (MLIT). It can be an activating event for ICM implementation, and enforcement of local-national network.

O115. AN ATTEMPT OF MULTISTAGE MANAGEMENT FOR COASTAL AREAS BASED ON SATOUMI

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The purpose of this study is to propose a hypothesis of a multistage management model for coastal areas consisting of Satoumi and Satoumi-network, referring to case studies. Satoumi, which is a type of Coastal Management, has been increasing from the 2000s in Japan. As Satoumi is mainly created and managed by local residents and local governments, its activities is called a bottom-up approach. Through this study, we could follow the developing processes and changing organizations. For example, in Hinase, activities for seagrass bed conservation and enhancement have been carried out since 1985. As a result, the range of seagrass bed has increased dramatically and the management organization has become including diverse sectors of the region. So we can call these activities a whole of region approach. On the other hand, Satoumi cannot cover wider coastal areas like a prefecture jurisdiction and provide coastal infrastructure like water quality regulations and coast protecting facilities. Such coastal infrastructure should be provided by prefecture governments as ICM through integrated and top-down management process. In Omura Bay, the Nagasaki prefecture government has established such a management system. Whole projects relating to Omura Bay are to be collected and adjusted through its management process. So I'd like to call this a whole of government approach. Unfortunately, this system is not good at networking voluntary activities by local residents. In Kagawa Prefecture, to resolve this weakness, an intermediary activities are provided by the Kagawa prefecture government. The government has established "Kagawa Satoumi Creating Vision" whose main theme is to connect and network relating activities. It is called a support providing approach or intermediating approach.

O116. DEVELOPING TOOLS FOR PRODUCING ENVIRONMENTAL REPORT CARDS

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The Basin Report Card Initiative, a partnership between the University of Maryland Center for Environmental Science (UMCES) and the World Wildlife Fund (WWF), is actively producing report cards, publishing a practitioners guide, and developing web resources so that interested parties will have access to the tools and expertise to produce their own environmental report cards. UMCES has been developing report cards for enclosed coastal seas like Chesapeake Bay, Long Island Sound, and the Great Barrier Reef, and WWF has created a network of on ground personnel throughout the world. By combining resources, UMCES and WWF are establishing best practices models, and evaluating report card effectiveness to elicit positive environmental results by developing and testing report cards in different regions. Report cards are developed with strong stakeholder engagement and tailored to each region. A selection of indicators and thresholds is developed with stakeholders to rate and rank different areas within the reporting regions. Scientists and resource managers working in enclosed coastal seas can benefit from report card development so that they can a) track the integrated status and trends of ecosystem health, b) compare and contrast effectiveness of different management approaches, and c) catalyze public interest in ecosystem protection and restoration. The partnership is developing modeling tools to provide guidance to stakeholders on the actions needed to improve report card scores (future card). All of the advances in report card methods and techniques are being shared on line to facilitate widespread application.

O117. ECOLOGICAL QUALITY OBJECTIVES APPROACH TO THE ENVIRONMENTAL PROBLEMS IN THE NORTHWEST PACIFIC REGION

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Northwest Pacific including Sea of Japan and Yellow Sea is a transboundary region for several countries with very different socio-economical situations: China, Japan, Republic of Korea, North Korea and Russia. UNEP NOWPAP (Northwest Pacific Action Plan) is one of the UNEP Regional Seas programs with aims to support ecologically based management of coastal and marine environment. Development of the Ecological Quality Objectives (EQOs) is one of the NOWPAP activities for the time being and near future. Aims of this paper are to suggest the list of EQOs for the northwest Pacific, as well as targets and indicators, which can be used for the monitoring of the achievements of them. Another goal is to assess relevance for the northwest Pacific the proposed targets and indicators including analysis of the problems and limitations based on the experience of EQOs implementation in other regions. Main feature of the EQOs approach in the NOWPAP region is the absence of unified monitoring system for the countries and reliable legislative basis for the regional integration of the environmental data.

O118. THE PRINCIPLES AND ACTIVITIES OF THE NATIONAL SCIENTIFIC DEVELOPMENT STRATEGY IN THE ARCTIC ZONE OF THE RUSSIAN FEDERATION

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The paper considers the priorities of the state policy of the Russian Federation in the Arctic, from the point of view of the development of scientific research, identified by the main strategic documents of national policy and security in the Arctic zone of the Russian Federation. Measures for implementation of priorities in the development of scientific research in the Arctic can be divided into three main sections.
1. Scientific projects and expeditions in the Arctic;
2. International activities;
3. Coordination and implementation of integrated research in the Arctic.
Note that currently the Ministry of education and science of the Russian Federation develops the Analytical Coordination Program вЂњComprehensive research of the Arctic and AntarcticвЂќ, in cooperation with the federal state bodies and Governance of the Subjects of the Arctic zone of the Russian Federation. The mechanism of the Program will ensure coordination between state bodies for integrated scientific researches in the Arctic in the interests of economic and scientific development of the region, and the creation of the scientific, technical and technological reserve in order to ensure of national security in the Arctic zone of the Russian Federation.
The research is supported by the Ministry of education and science of Russia, project 5.7.2016/HM, and the Russian Science Foundation, project number 16-05-00724.

O119. WHAT AFFECTS PUBLIC WILLINGNESS TO CONSERVE COASTAL AREAS?

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Public involvement in conservation and management of coastal areas is important especially in those countries, such as Japan, where fishermen are decreasing. Both local residents living adjacent to the ocean and urban residents could contribute to sustainable management of coastal areas through various activities. In order to effectively foster public participation in sustainable management of coastal areas, factors that affect people's behavioral intentions for coastal conservation need to be identified. We conducted studies to understand cognitive factors affecting residents' 1) willingness to invest in time and efforts to make a coastal area a better place, and 2) willingness to make financial sacrifices for the sake of the coastal area. Questionnaire survey was distributed around Hinase Bay (western part of Japan). Total of 2,851 responses were collected. Multiple regression analysis revealed that residents' willingness to know more about wildlife of the coastal area had the strongest effect on their behavioral intentions for conservation of the coastal area. Our findings followed the findings of the previous study conducted in northern part of Japan and revealed that residents living in different regions showed similar cognitive mechanism regarding their intentions for conserving coastal areas. Suggestions for fostering public participation in coastal conservation included promoting wildlife and biodiversity of coastal ecosystems to residents. These outreach programs could increase residents' interests and curiosity toward wildlife which would consequently raise their willingness to contribute to coastal conservation.

O120. THE APPLICATION FEATURES AN INTEGRATED ASSESSMENT METHOD FOR THE ANALYSIS OF TOURIST AND RECREATIONAL CAPACITY ON THE EXAMPLE OF THE MUNICIPALITY OF TUAPSINSKY DISTRICT

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Analysis of tourist and recreational potential of the territory represents a rather urgent problem. Despite the relatively large number of different evaluation methods in the field, in the scientific literature there is no single approach that would allow a comprehensive analysis of the various components of the tourism potential of the region. Therefore, we have devised a comprehensive analysis and evaluation of recreational resources based on the construction of integral models. Based on this model, we propose to use two types of indicators: indicators of natural environmental and socio-economic component of tourism and recreational potential of the territory, which in the end are reduced to a single integral indicator of tourist and recreational potential. Approbation of this method was carried out on the example of urban and rural settlements included in the municipality Tuapse district, based on the data of official statistics and administrative sources.we can conclude that the proposed model of integrated assessment allows us to provide a comprehensive assessment of tourist-recreational potential of territories most effectively to analyse trends in the development of the tourism industry. This method can be successfully applicable for the purposes of strategic planning of development of the whole region and separate entity.
The research is supported by the Russian Science Foundation, project number 16-05-00724.

O121. CURRENT TOURISM TRENDS ON THE BLACK SEA COAST

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Black Sea coast has a number of natural features that define the high tourism and recreation potential of the territory. The unique combination of different resources creates conditions for the development of various forms of tourist activity. In general, current trends in the development of tourism in the Black Sea coast is determined by several factors: 1) The presence of significant historical and cultural potential and the unique culture of local communities. 2) Tourism public policy. 3) Mass sports and other events. 4) The new geopolitical and geo-economics conditions in Russia and in the world. 5) Other factors. The current trends in the development of tourism in the Black Sea coast are: 1) Development of new areas for tourism and development of existing tourism and recreation systems. 2) Integration processes in the management of tourism. 3) Increased role and participation of the state in the process of tourism development. 4) Involving local tourist market in the process of globalization. 5) Activation of event tourism to ensure the occupancy of Olympic infrastructure. 6) Transformation of hotel services market as a result of the XXII Olympic and XI Paralympic Winter Games. 7) Safety and security control. 8) Tourism market changes according to new geopolitical and geo-economic conditions in Russia and in the world. Supported by the grant from the Russian Science Foundation and the Administration of Krasnodar region №15-12-23010 a(p)

O122. EVALUATING SHORELINE, URBAN AND ROADS CHANGES IN THE HURGHADA AREA, EGYPT, USING MULTISPECTRAL SATELLITE IMAGES

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The Red Sea is one of the most important repositories of marine biodiversity all over the world. It is the habitat of over 1,000 invertebrate species, more than 1200 species of fishes, and 200 soft and hard corals. Egypt`s Red Sea coast is an area that has been targeted and developed for tourism purposes. It is largely dependent on the surrounding environment such as sand and water quality, and especially coral reefs, which are sensitive to tourist activity, with low government control in the area and growth in private investments.
The objective of this paper is to investigate coastal changes at Hurghada coastal area using remote sensing technique. Three satellite datasets, Landsat Thematic Mapper (Landsat 5 TM), Landsat Enhanced Thematic Mapper Plus (Landsat 7 ETM+) and Terra / Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER), acquired during years 1984, 1992, 2004 and 2011, respectively, were used to detect and evaluate Hurghada's coastal changes. Five change detection techniques were tested to detect areas of change. The techniques considered image differencing, image ratio, image overlay, multidate Principal Component Analysis (PCA) and post-classification comparison. The post-classification comparison was found to be the most accurate procedure and produced three Land Use / Land Cover (LULC) maps of the years 1984, 1992, 2004 and 2011 with overall accuracies of 87.8%, 88.9%, 92.0% and 94.1% respectively.

O123. MANAGEMENT AND SPATIAL PLANNING IN THE COASTAL ZONE OF THE CHEBOKSARY RESERVOIR

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Cheboksary reservoir impact to the coast is manifested in the geophysical impact associated with abrasion activities. Geomorphological area of influence at the moment reaches a width of about 40m, where are the coasts reformation (erosion, collapse, slumping, sliding, transfer or accumulation of sediments, water logged processes). Hydrogeological impact is effect on the level of groundwater.

We have proposed the conceptual foundations of functional zoning of the reservoir banks that will help to optimize its operation. Selection zones came in accordance with the principles of landscape planning:

1. The zone of strict water protection: the main purpose – preservtion of needing special protection areas.
2. The zone of moderate restrictions: preservation extensively used landscapes.
3. The zone of partial restrictions: improving the pre-emptive particularly vulnerable areas and changing intensity or type of use.
4. The zone of conservation of natural components in agricultural landscapes: ensuring health of the natural environment in the habitats used in agricultural economy.
5. The zone of preservation of vacant space and the natural environment in the settlements: to maintain the required quantity and quality ofavailable greenspace in the large towns.
6. The zone of improving heavily used areas: elimination of harmful stress and environmental sanitation in the countryside where economic activities and the lack of measures to reduce their risks lead to degradation natural system.

O124. THE BACKGROUND OF MARITIME SPATIAL PLANNING OF THE EAST PART OF GULF OF FINLAND

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"Social and economic development Strategy" states the federal city of St. Petersburg as the center of Baltic Region in Russia. Water area of the east part of Gulf of Finland and the Neva bay is under jurisdiction of Russia. St. Petersburg, being one of the Russian territorial entities, sweeps its coasts on this water area but does not have any powers in the maritime activities regulation area. The west neighbor of the city is Leningrad Oblast, which had fixed its districts borders on the water area of Gulf of Finland with a foundation of only regional legislation. According to regional laws, 3 districts of L. Oblast have water area in their borders. Also, there was given an east sea border between the city and L. Oblast in the line of Zelenaya Roscha "Schepelevo". As the result of piecemeal action between these territorial entities of Russia appeared a closed water area without attribution neither to the federal city nor to L. Oblast outside constitutional legislation. In the frame introduction of St. Petersburg Master Plan amendments some prepositions of St. Petersburg borders expansions were offered by means of including closed water area to St. Petersburg entity. This decision allows reasonably give functional zoning to all the water area of the east part of Baltic sea in the Russian Federation borders. It is a great opportunity for substantiation of regulations and urban conditions, economic and maritime activities for support the sustainable city development.

COASTAL VULNERABILITY ASSESSMENT: AN INTEGRATED FRAMEWORK TO ANALYZE LOCAL DECISION MAKING AND ADAPTATION TO SEA-LEVEL RISE IN SANTOS, SAO PAULO-BRAZIL

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The METROPOLE Project is an international collaboration between Brazil, the United Kingdom, and the United States designed to evaluate local decision making processes and to provide feedback to local urban managers on possible actions toward adaption to sea level rise (SLR). The goal of the project is to help coastal communities better understand factors that facilitate or hinder their intrinsic, local decision-making processes related to planning for adaptation to risk. The test used case sea level rise to develop case studies on long-term planning by local government and society as a means to gauge the of municipalities in different settings to address possible future risks. The framework was designed by an interdisciplinary team that incorporated social and natural scientists from these three nations, and which included local government officials. This paper focuses on some of the factors that affect decision-making in the coastal city of Santos, in the state of Sao Paulo in southeastern Brazil, and provides insight on possible actions that a coastal city, such as Santos, can do to prepare for impacts of SLR.

FLUSHING OF ENCLOSED LIMESTONE LAGOONS

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Limestone lagoons are enclosed systems where the tidal exchange of water is controlled by flow over the reef crest and through tunnels in the limestone. The water residence time varies between 80 days for Ahe lagoon in French Polynesia, 2.5 years for the jellyfish marine lake in Palau, and 100 years for Clipperton lagoon in the eastern Pacific Ocean. In Palau's jellyfish marine lake, the tunnels have hypoxic waters that form a chemical barrier to mixing of species between the lagoon and the surrounding sea, thus creating an isolated system with a peculiar ecology. This marine lake is slightly stratified in salinity and temperature and highly stratified in dissolved oxygen with an anoxic bottom layer and an aerated surface layer. Biogenic mixing by 107 golden jellyfish as well as the baroclinic currents generated by the tidal inflow at rising tide through the tunnels of denser oceanic water, are important in mixing and aerating the surface layer.

COMPARISON OF A SATELLITE-DERIVED HIGH-RESOLUTION CURRENT MAP AND NUMERICAL MODELLING OF SUBMESOSCALE EDDIES IN A SHALLOW-WATER DOMAIN

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Interaction of flow with the reefs and islands that lie within the Great Barrier Reef (GBR) area of northeastern Australia create a rich submesoscale field of dipolar vortices, unsteady wakes, lee eddies, and free shear layers, all of which impact both the aggregation and dispersion of coral spawn, cyanobacteria and pollutants. A unique and detailed view of the submesoscale variability in a part of the GBR having a number of small islands has been obtained by using a "stereo" pair of 0.5 m-resolution visible-band satellite images that were acquired just 54 seconds apart. These were analysed using an optical-flow technique to extract the near-surface current, vorticity, and divergence fields. To help understand features in the imagery and in the image-derived flow fields, an unstructured-mesh, finite-element model, SLIM (www.climate.be/slim), was used to simulate conditions at the time imagery was collected. While aspects of the simulated flow field are in agreement with the observations, there are several unanticipated differences. These discrepancies are not expected to be a consequence of the mesh resolution, and so an analysis was made of the model sensitivity to formulations of bottom drag and eddy viscosity. Eventually, the way the model treats the separation flow was examined.

O125. CLIMATIC REGIME CHANGE IN THE ASIAN PACIFIC REGION, INDIAN AND SOUTHERN OCEANS AT THE END OF THE 20TH CENTURY

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Multiple scale climate variability in Asia of temperate and high latitudes, Pacific, Indian and South Oceans, their features and linkages are studied by using statistical analyses of monthly mean time series of Hadley, Reynolds SST, surface net heat flux (Q), atmospheric pressure (SLP), air temperature (SAT) from NCEP NCAR reanalyses (1948-2015). Three multidecadal climatic regimes were revealed for the whole area studied by using cluster analyses via Principal Components of differences between values of Q, SLP, SAT in tropical and extratropical regions of the Asian Pacific, Indian and Southern Oceans. The climate regime change in 70s of the 20th century in this area is confirmed by this method. It is also found that the climate regime is significantly changed at the end of the 20th century in both same area and World Ocean. The characteristic features of recent climate regime after 1996-1998 are SLP increase in the central extratropic area of Indian Ocean, North and South Pacific being prevailing in boreal winter. It is accompanying SLP increase and precipitation decrease in South Siberia and Mongolia prevailing in boreal summer. Inversed SLP and precipitation anomaly associated with increase of cyclone activity and extreme events in the land-ocean marginal zones including Southern Ocean, eastern Arctic, eastern Indian, western and eastern Pacific margins. It is known that low frequency PDO phase is also changed at the same time.

O126. WINTER CLIMATIC ANOMALIES IN THE JAPAN, OKHOTSK SEAS, BAIKAL LAKE BASIN AND THEIR LINKAGES

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Winter climatic anomalies of various time scales in the Japan, Okhotsk seas and Lake Baikal Basin are revealed and compared with anomalies in the Pacific, Indian and Arctic oceans. Time series of ice extent in the Japan and Okhotsk seas, ice thickness and winter ice duration in the Lake Baykal, as well as Hadley Sea Surface Temperature (SST), surface net heat flux, wind velocity, atmospheric Sea Level Pressure (SLP) fields from meteorological NCEP reanalyzes and different climatic indices are analyzed. The decadal winter climate anomalies in the Japan and Okhotsk seas, as compared to anomalies in the eastern area of the Subarctic Pacific and South Siberia regions, usually have a reversed sign. Alternating cold/warm decadal anomalies in different longitude zones of the North Asian Pacific are accompanied by alternating meridional wind and SLP anomalies at temperate latitudes. Alternating zones of inversed anomalies in temperate latitudes of the Asian Pacific are related to teleconnections with anomalies in Arctic, Pacific, Indian, Atlantic and Southern oceans. Negative SST anomalies (SSTA) in eastern/central tropical-equatorial Pacific and positive SSTA in El Nino area accompanies rise of northern wind and ice extent in the Okhotsk/Japan Seas in mid-winter. The best predictors of the high cold anomaly in February in the western subarctic Pacific and marginal seas are reduction of the SST and net heat flux from the atmosphere to the ocean in north-eastern and central Subarctic Pacific during warm period of a previous year. On the multidecadal time scale the warming/cooling in the Northeast Pacific accompany winter warming/cooling in the Lake Baykal area during all period of observation.

O127. CLIMATE CHANGE: HOW DOES THIS INFLUENCE ON ECOSYSTEM HEALTH IN THE LAGOON OF THE BALTIC SEA?

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Lagoons are one of the most vulnerable ecosystems to impacts of natural environmental and anthropogenic factors. The Curonian and Vistula Lagoons are one of the largest lagoons of Europe. The Curonian Lagoon is choke mostly freshwater, while the Vistula Lagoon is restricted brackish water. Hydrological, chemical and biological researches were carried out monthly since 1991 to 2015. Reductions of nutrients loading in 1990s did not result in improvement of the ecological situation. Hydrological and chemical parameters are the main factors that influence on the algal blooms and ecosystem health in these lagoons. The Curonian Lagoon may be characterized as hypertrophic water body with "poor" water quality. Climate change in 1990s-2010s combined with other factors (freshwater, slow-flow exchange, high nutrients concentrations) creates conditions for Cyanobacteria “hyperblooms”. Harmful algal blooms result in deterioration of the water chemical parameters and death of fish. "Hyperblooms" is the most dangerous for coastal towns and tourist resorts (UNESCO National Park "Curonian Spit"). Climate change in 1990s-2000s have been also observed in Vistula Lagoons (mean annual temperature increased by 1.4°C for 40 years), but brackish water prevent harmful algal hyperblooms. After the invasion of the filter-feeding mollusk Rangia water quality was significantly improved from “poor” to “satisfactory” level in 2011-2015, but ecosystem productivity remained at a stable long-term level.

O128. GLOBAL WARMING IMPACT ON URMIA LAKE VULNERABILITY AND HAZARD

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The main goal of the research is to analyze the global warming impact on Urmia lake vulnerabiliy and hazard. By the study of topographic maps, satellite images and field research, the various types of coasts were identified: mud flats, salt marshes, sandy or cliffed coasts, and islands. Moreover the interpretation of seismic profiles, has led to recognize so important morphological features in the lake bed, such as: erosive channels, colos, mud volcanoes, the raised sandy masses and under water mounts. The main results illustrate the variable morphological behavior of Urmia Lake in different parts of the lake.

O129. INTEGRATED ALGA-CULTURE IN INUNDATED COASTAL FARMLANDS OF INDIAN SUNDARBANS AS A SUSTAINABLE ADAPTATION FOR MARGINAL COMMUNITIES TOWARDS CLIMATE RISK REDUCTION

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Algae has a great potential for quick capture of biological carbon and its storage in saltwater-inundated coastal wetlands and can also be introduced as a climate adaptive alternate farming practice. An intervention with native algal flora *Enteromorpha sp.* in enclosed coastal Sundarbans in India on two open water culture techniques, viz. U-Lock & Fish-Bone, shows that growth in native algal stock is influenced by seasonal variations of salinity and other limnological factors. Sundarbans, facing the odds of climate change is fast loosing arable lands to sea level rise. Algaculture in inundated coastal areas can be an adaptive mitigation for the same. Perusal of results show that daily growth rate (DGR%) increases with increasing salinity of the intruding tidal waters to an extent and biomass increment under salt stress results in accumulation of metabolites those are having nutrient values and can yield bio-diesel as well. Algal growth recorded mostly in post monsoon period, has impacts on pH and Dissolved Oxygen (DO) of the ambient water to facilitate integrated pisciculture. The paper suggests that alga-culture has unrealized potentials in carbon sequestration and can be significantly used for extraction of Biodiesel.

O130. VIEWPOINTS OF THE CHESAPEAKE: INFLUENCING LOCAL AND GLOBAL CITIZENSHIP IN THE FACE OF CLIMATE CHANGE

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Within the Chesapeake Bay region there is a spectrum of perspectives regarding climate change despite the immense and scientifically acknowledged ramifications it holds for the region and its people. Students attending Washington College in Chestertown, Maryland explore these perspectives through a 16-week experiential program each fall, called the "Chesapeake Semester". This immersive program emphasizes interdisciplinary coursework, ethnographic studies, field experiences, and a comparative study in the Caribbean. Through analysis of our interactions and personal experiences from two consecutive Chesapeake Semester programs, we identify key perspectives, discern the implications of diverse stances when preparing for the consequences of climate change, and address how this knowledge influences both local and global citizenship. The authors explore the potential reasons for the incongruous perspectives in the Chesapeake region and Caribbean as well as compare the advantages and obstacles that result. We seek to understand these attitudes for the purpose of preparing for the imminent effects of climate change and conclude that while diverse perspectives often lead to rich cultural heterogeneity, misinformation can stymy necessary social and environmental awareness necessary for effective policy formation.

POSTER PRESENTATIONS

P1. MONITORING OF THE THERMOABRASIONAL AND ACCUMULATIVE COASTS NEAR THE UNDERWATER GAS PIPELINE ROUTE ACROSS THE BAYDARATSKAYA BAY, KARA SEA

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The coasts of Baydaratskaya Bay are composed by loose frozen sediments. At Yamal Peninsula accumulative coasts are predominant at the site where pipeline crosses the coast, while thermoabrasional coast are prevail at the Ural coast crossing site. Coastal dynamics monitoring on both sites is conducted using field and remote methods starting from the end of 1980s. As a result of construction in the coastal zone the relief morphology was disturbed, both lithodynamics and thermal regime of the permafrost within the areas of several km around the sites where gas pipeline crosses coastline was changed. At Yamal coast massive removal of deposits from the beach and tideflat took place. The morphology of barrier beach, which previously was a natural wave energy dissipater, was disturbed. This promoted inland penetration of storm surges and permafrost degradation under the barrier beach. At Ural coast the topsoil was disrupted by construction trucks, which affected thermal regime of the upper part of permafrost and lead to active layer deepening. Thermoerosion and thermoabrasion processes have activated on coasts, especially at areas with icy sediments, ice wedges and massive ice beds. Construction of cofferdams resulted in overlapping of sediments transit on both coasts and caused sediment deficit on nearby nearshore zone areas. The result of technogenic disturbances was widespread coastal erosion activation, which catastrophic scale is facilitated by climate warming in the Arctic.

P2. SUSPENDED MATTER CONCENTRATION ALONGSIDE THE NORTHERN COASTLINE OF KALININGRAD REGION (SOUTH-EASTERN PART OF THE BALTIC SEA)

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South-Eastern part of the Baltic Sea undergoes strong man-caused impact due to high level of shore usage. Suspended matter is an important carrying agent for pollutants. The Kaliningrad region has both the abrasion shore (Sambian peninsula) and the massive accumulative body (Curonian Spit), which is World Heritage site. The interannual and seasonal distribution of suspended matter concentration along the northern shore of Kaliningrad region against the hydrological conditions were studied. The research was made on five-year (2011-2015) monthly (April - October) data-array, consisting of surface and bottom water samplings. Two types of interannual and seasonal distribution of suspended matter concentration (SMC) revealed: Sambian type is defined by vertical gradient of SMC with descending of concentration from surface to bottom, while Curonian type – by horizontal gradient of latter.

P3. SEDIMENT MAPPING AND TRANSPORT PATHWAYS IN THE NEARSHORE ZONE OF THE RUSSIAN PART OF SOUTH-EASTERN BALTIC SEA

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To achieve a more robust interpretation of sediment conditions and transport, our study combines the two different interpretation techniques. A side-scan sonar survey was used as a basis for detail sedimentological investigation. Grab samples allows to provide sediment grain size distribution as well as interpretaion of sonar data. The new detail lithological map of the underwater shore slope of the northern Sambian peninsula and the Russian part of Curonian spit in 1:50 000 scale is created. For the first time zone of very fine sands is outlined on the depths of 25-30 m of Curonian spit underwater slope. These sands are relict, their formation connected with accumulative processes on the ancient shores of the Baltic Sea during previous stages of its development. Separate morpho-lithidynamic cells are distinguished on the submarine slope of the Sambian peninsula northern coast up to the depth of 20 m.

P4. DYNAMICS OF THE NEARSHORE ZONE OF KALAMITSKIY GULF (BLACK SEA) UNDER INFLUENCE OF WIND WAVES

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Coastal zone dynamics is especially interesting for interdisciplinary researchers. This is due to general retreat of the coast of the Western Crimea and the fast response in the beach area. This justifies the need for monitoring of morphodynamic processes in the coastal zone of Crimea with the aim of qualitative and quantitative assessments of modern coastal transformation, as well as forecasts of possible changes. XBeach model has been used to simulate dynamics of waves and currents, sediment transport and changes in bottom topography, as well as the processes of drying and flooding of coastal areas. Erosion and sedimentation processes for the bottom sediments of the coastal zone of the Western Crimea have been numerically studied. The bottom profile has been reconstructed on the basis of bathymetric investigations in the coastal zone of the Western Crimea. Numerical simulations have been performed for various parameters of the bed composition and wind waves. Two fractions of bottom sediments have been considered for numerical experiments. The obtained results show that XBeach model can be successfully applied to simulate the bed profile evolution and changes in bottom sediment fractionation.

P5. CRYOGENIC DYNAMICS IN THE COASTAL ZONE OF THE LAPTEV AND EAST SIBERIAN SEAS

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The shores of the Laptev and East Siberian seas have been rapidly retreated in some areas, while in others have been increasing. Comparison of multitemporal remote data on the coastal zone of the Lyakhovsky Islands and the southern shore of the Dmitry Laptev Strait, received in the 1950s, 2000s and 2010s shows that the retreat of icy coast of the study area is the most large-scale process. It is peculiar to areas composed of ice and alas complexes and alluvial-marine terraces. During the 50-year period (1951-2000) an area of 27.2 km2 of the Bol'shoy Lyakhovsky Island has been washed away and 12.4 km2 of the mainland coast. Over the past 13 years alone coastal area, equal to 10.3 and 6.5 km2, respectively was added to the eroded area. Retreat rate averaged for all retreating coasts in the region of 3.2 m per year over the period up to 2000 and 6.4 m per year during the past 13 years. Thermoabrasion of ice complex on the banks of the cliff 15-20 m high and more is accompanied by thermodenudation. Its rate in recent years has also increased more than 1.5 times.

P6. COASTAL EROSION IN THE GULF OF KALAMITA AS A RESULT OF LONG-TERM ANTHROPOGENIC INFLUENCE

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The Gulf of Kalamita is located in the Black Sea off the west coast of the Crimea and is known to be a major recreational area. However, in the last 30 years, its famous sandy beaches have drastically degraded. Degradation of sandy beaches was expressed in erosion of the coastal line (30-70 m) and reduction of the total area of beaches; disappearance of sand in a number of areas in the near-shore zone and openings of marl; sharp increase of fragments of limestone in the composition of beaches. In the last 60 years, the level of the Black Sea has risen by 14 cm. Only this factor, as the calculations show, has caused about 15 mln m^3 deficiency of deposits. According to direct observations, shoreline response to changes in the sea level at the inter-annual scale changes comprises 0,3 m per 1 cm. Climate changes in trajectories of passing cyclones have resulted in a 2-3 times increase in storm activity over the past 30 years. The contribution of natural factors into the shoreline changes do not exceed 10-15% according to our estimates. The main contribution is related to the background and point anthropogenic impacts. The first group includes overall reduction of sediment in the sea due to construction of reservoirs, cliffs closing with concrete embankments, reducing populations of benthic mollusks for various reasons, etc. The second group includes construction of hydraulic structures which do not address lithodynamics peculiarities in particular stretches of coastline. in the composition of beaches. In the last 60 years, the level of the Black Sea has risen by 14 cm. Only this factor, as the calculations show, has caused about 15 mln m^3 deficiency of deposits. According to direct observations, shoreline response to changes in the sea level at the inter-annual scale changes comprises 0,3 m per 1 cm. Climate changes in trajectories of passing cyclones have resulted in a 2-3 times increase in storm activity over the past 30 years. The contribution of natural factors into the shoreline changes do not exceed 10-15% according to our estimates. The main contribution is related to the background and point anthropogenic impacts.

P7. SOME FEATURES OF THE EQUILIBRIUM COASTAL PROFILE FOR DIFFERENT INITIAL BED SLOPES BASED ON MODELLING STUDY

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Modelling study of the equilibrium profiles formed on sandy coasts of different bed slopes and grain sizes under the various wave conditions was realized by using the CROSS-P and Xbeach morphodynamic models. A special criterion taking into account a total volume of bed deformations per one hour was suggested to determine the conditions of profile stabilization. For both models the time scales of equilibrium profile formation were found to be the same. However, the deformation magnitudes differed significantly. Bed deformations were computed on the whole profile length over the 200-hours duration of wave impact. It was concluded that both models predict a trend of the bed slope toward a stable value. CROSS-P model shows the widening of accumulative terrace during the profile evolution. The mean slope of the equilibrium profile was found to depend on the initial bed slope.

P8. AN ARTIFICIAL BEACH AS A MEANS FOR SEA COAST PROTECTION FROM STORM SURGES (BY THE EXAMPLE OF THE EASTERN GULF OF FINLAND)

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A model of an artificial beach is suggested for protection of coasts under erosion due to intense storm surges. It is shown that the coarser beach sand results in decrease of the beach width and growth of nourishment volume. At the same time relative material loss due to long-shore sediment transport diminishes too. The model has been applied to three sections of the coasts of Kurortny district of S.-Petersburg (eastern part of the Gulf of Finland). It recommends medium sand for the beaches construction. Modeling of extreme storms effect shows only minor deformations for designed beach profiles. For the beaches more than 1 km long even in 30-50 years more than a half of the initial beach volume conserves without additional nourishment.

P9. VARIABILITY OF THE SUSPENDED SEDIMENT DYNAMICS UNDER IRREGULAR WAVES

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The main objective of this paper is an analysis of the impact of the frequency distribution of wave energy on the dynamics of bottom sediment suspension as well as a study of the features of bottom sediments suspension during the passage of waves groups of varying shape and intensity. It is shown that the concentration of wave energy in the primary spectral peak promotes redistribution vertically suspended solids. Laws of suspension within the group are largely determined by the parameters of bottom roughness and the presence (absence) of ripples.

P10. METHODOLOGICAL ASPECTS OF THE SUSPENDED SEDIMENT CONCENTRATION MEASUREMENT IN THE COASTAL ZONE

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Results of the suspended sediment concentration study in the coastal zone on the basis of field and laboratory experiments are analyzed. Data from field experiments, performed in the coastal zone of the North, Mediterranean and Black seas, are used. The laboratory researches were fulfilled in the Big Wave Channel of the Hannover University. It is shown that to increase the accuracy of measurement it is necessary to take into account the convective mechanism of the sediment suspension, as well as the size, the direction of the rotation axis and other parameters of the turbulent vortices transporting sand sediments. The presented information will help to improve the quality of field data collection.

P11. COASTAL ALTERATION AND CHANGES IN SHORELINE MORPHOLOGY DUE TO ARTIFICIAL STRUCTURES IN MIIRAKU TOWN ON FUKUE IS. IN THE GOTO ARCHIPELAGO

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A construction of breakwaters and other shoreline structures on part of a coast influences drift sand transport in the bay, and causes comprehensive topographic changes on the beach. This study investigated shoreline and coastal changes, taking as an example of Shiraragahama Beach in Miiraku on the northwestern end of Fukue Island, Nagasaki Prefecture (Kyushu, Japan). Miiraku, adjacent to Saikai National Park, appears in the revered 8th century poetry collection "Manyoshu" and served as a port for a ship taken by the Japanese envoy to China during the Tang Dynasty (618-709). Because of the recent development of breakwaters for a fishing harbor, the shore environments of this beach have changed significantly. In this study, the status of silt deposits and topographic changes on this beach arising from the construction of a harbor breakwater were evaluated by comparing aerial photographs taken in different years. Next, the changes in the shoreline visible from aerial photographs from 1947 to 2014 were analyzed. Lastly, the altitude of the beaches was measured using accurate survey methods. The following results were obtained: 1) coastal erosion made rock cliffs to fall off along the shore and deposited sand on this beach; 2) the more serious advances or retreats of the shoreline took place around shoreline structures; 3) sandbars and beach cliffs were formed.

P12. PARAMETERIZATION OF NONLINEAR WAVE TRANSFORMATION ABOVE UNDERWATER STRUCTURES

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On the base of laboratory experiment a nonlinear wave transformation above underwater reef and trench was investigated. It was revealed that underwater trench and reef can decrease the mean wave period. Dependencies of changes of mean wave period and significant wave height on relative length of underwater structure and water depth above it were obtained. The changes of symmetry of waves passing above underwater structures are discussed.

P13. PHYSICAL INTERPRETATION OF WAVE BREAKING CRITERIA

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On the base of experimental data it was revealed that type of wave breaking depends on wave asymmetry against the vertical axis at wave breaking point. The asymmetry of waves is defined by spectral structure of waves: by the ratio between amplitudes of first and second nonlinear harmonics and by phase shift between them. The relative position of nonlinear harmonics is defined by a stage of nonlinear wave transformation and the direction of energy transfer between the first and second harmonics. The value of amplitude of the second nonlinear harmonic in comparing with first harmonic is significantly more in waves, breaking by spilling type, than in waves breaking by plunging type. The waves, breaking by plunging type, have the crest of second harmonic shifted forward to one of the first harmonic, so the waves have "saw-tooth" shape asymmetrical to vertical axis. In the waves, breaking by spilling type, the crests of harmonic coincides and these waves are symmetric against the vertical axis. It was found that limit height of breaking waves in empirical criteria depends on type of wave breaking, spectral peak period and a relation between wave energy of main and second nonlinear wave harmonics. It also depends on surf similarity parameter defining conditions of nonlinear wave transformations above inclined bottom.

P14. INTERANNUAL VARIABILITY OF COASTAL DYNAMICS HYDROMETEOROLOGICAL FACTORS IN PECHORA AND KARA SEAS

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The Arctic shore is a complex, actively changing and evolving natural system. Coasts of the Russian northern seas are for the most part composed of disperse loose material, usually frozen, and actively retreat under the force of sea waves, which erode the coast, and heat (atmospheric, sea water), which melts the ground ice. Arctic coastal dynamics is driven by hydrometeorological (HM) factors, which fluctuate from year to year and from decade to decade. The interannual variability of Arctic coastal dynamics HM factors is analyzed basing on observation and reanalysis data for the period of 1979 - 2015. Air temperature, wind and ice conditions are in focus. Also a synthetic wind-wave energy parameter is calculated by Popov-Sovershaev method. The research is conducted for the Pechora and Kara Seas, where the coastal dynamics observation took place starting from 1990 up to now. The periods of low, moderate and high HM stress are revealed. It was found out that on western parts of coasts mechanical and thermal factors of coastal dynamics fluctuate synchronously and facilitate/weaken the impact on coasts all together: in periods of high energetic stress, high temperatures were observed too; low wind-wave stress is accompanied with low thermal impact. There was a lull in coastal dynamics HM forcing in 1995 – 2003. The latest period of 2004 – 2014 is characterized by unprecedented HM stress, which is 20 – 40% higher than in 1980-ies. This is borne out by coastal retreat rate data.

P15. MORPHODYNAMICS OF THE SHORES OF THE VISTULA SPIT (THE BALTIC SEA) IN A PERIOD OF 2002-2015 BY RESULTS OF IN-SITU MEASUREMENTS

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For the first time, the quantitative characteristics of the Vistula Spit shore dynamics based on the ground-based monitoring data for 2002-2015 were presented. On the sea shore, 3 sections can be distinguished by the direction of coastal processes, i.e. the stable section to the north of the Strait of Baltiysk, the eroded 4-km section to the south of the Strait of Baltiysk, with maximum erosion rate up to 2 m/year; in the remaining area of the Spit (21 km) to the Polish border there is an alternation of stable, eroded and accumulative areas. Since 2011, a steady erosion (in the stable segments of the third section) and general weakening of the erosion rate (in the second section) have been recorded. 50% of the length of the lagoon shore was the subject to annual active erosion (0.2 - 1.4 m/year). The beaches of the sea and lagoon shores of the Vistula Spit were mainly composed of medium sands. The alongshore variability in particle size distribution on the sea and lagoon shores (according to the 2015 survey data) actually fail to correlate with long-term dynamic processes, with the exception of the steadily eroded 4-kilometer area on the sea coast to the south of the Strait of Baltiysk. Variations in the composition of sediment along the shore on the shoreline are most likely associated with the results of the latest wave processing (or storm processing and eolian transport in the case of an average beach sample).

P16. SEDIMENT BALANCE OF THE VISTULA LAGOON

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Vistula Lagoon is the second largest lagoon in the Baltic Sea with maximum depth 5.2 m and average depth 2.7 m. Water volume and area are 2.3 km^3 and 838 km^2. Lagoon is connected with the Baltic Sea by single inlet 400 m wide and 10-12 m deep. Sediment budget estimation were made using literature sources, results of field measurements (hydrology, suspended sediment content, upper layer sediment structure, direct measurements of sedimentation in summer and winter conditions). The budget for terrigene and biogenic components of sediments were made, considering their contributions from the rivers, inflow from the Baltic Sea, coastal erosion and aerial flux, biological production within the lagoon, totally - ca. 730 thousands ton per year. Nearly half of total gain is washed out (105 and 244 thousands ton per year of terrigene and biogenic components), another half is dissolved and mineralized (biogenic component), and only 10% is deposited on the bottom, resulting in rather low sedimentation rate - 0.4 mm/year during last 100 years. Paper explain the reason of difference with estimation made in (Chubarenko & Chubarenko, 2002) and concludes that the clarification of estimates of the amounts of sediments transported from the lagoon to the Baltic Sea is a critical element for understanding the evolution of the Vistula Lagoon as a sedimentation system.

P17. SIMULATION OF NEARSHORE WAVES AND CURRENTS ALONG SALALAH COAST (OMAN) DURING THE TROPICAL CYCLONE ARB01

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Sea level and wave data at Salalah coast (Oman) were used to simulate nearshore waves and current during the tropical cyclone ARB01 (9 May2002). STWAVE model (Steady State Spectral Wave) was applied for nearshore wave simulation, while M2D model ((Two-Dimensional Depth Averaged circulation model) was used to simulate nearshore current.
The results of simulations (taking into account the mutual effects of both current and waves) showed that:
The significant wave heights generally decrease from about 6m at the domain boundary to about 1 m close to the coast. The wave heights during the ebb period were higher than that during the flood period by about 1.5m. Along Salalah coast, higher waves were found along the eastern side of the domain. This is because the shielding effect of breakwater, which protect the western part of the coast from high waves.
Relatively Strong current with values up to 1.5 ms^{-1} were found in the nearshore region during both ebb and flood periods. The M2D model results also showed cyclonic circulations during these periods which help in the renewal of harbor waters. Generally, the model results showed good agreements with observations in the investigated area.

P18. ACCUMULATIVE COASTS AS RELIABLE INDICATORS OF THE KINEMATICS OF THE SEA LEVEL DURING THE HOLOCENE

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Currently, there is no single view of the Holocene global sea level kinematics. At the same time, the question of a possibility of it exceeding the current sea level by several meters is being debated. The accumulative coasts of nearly tide-free seas, in areas where the vertical direction of coastal movement remained unchanged are the most convenient objects for studying this major paleogeographic issue. Effects of the sea level fluctuations are revealed in the resulting geomorphological structure and in the nature of sediment areas of the coastal zone developing in an accumulative mode. If the Holocene sea level exceeds its modern marks, then ladders of accumulative terraces would have formed over different parts of the coast. The heights of the terrace ladders would correspond to the amplitudes of these exceedances. The lower sediment levels should reflect the transgressive character of their formation in the structure of geological section, while the higher levels would reflect the regressions. The coast of the Thatcher Peninsula, located in the Bay of Cumberland microcontinent of the South Georgia (Antarctic) was the focus of our research. It was established that the Holocene sea level in the region reached its current state no later than about one thousand years ago and did not exceed it, being subjected to only minor fluctuations of the synoptic scale. The accumulative terraces are located in fragments. The differences in their absolute elevations are related to their correspondence to different tectonic units experiencing differentiated uplift.

P19. THE CURRENT STATE OF THE BLACK SEA COASTAL GEOSYSTEMS IN THE NORTH-EASTERN SECTOR

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This work is a multi-disciplinary research aimed to develop common approaches to estimating the current state and forecasting evolution of coastal geosystems. From 2010 to now, the state of coastal zone geosystems of the Crimean and Caucasian Russian coast has been studied. The research tasks are solved using up-to-date IT based integrated analysis of historical and new observational data.

P20. DEFLATION PROCESSES ON THE SEA SHORE OF THE CURONIAN SPIT

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Coastal foredune relief of the Curonian Spit is characterized by several blowouts. Basically, blowouts is on sea slop and top of the foredune. Sand moves under the influence of the wind from sea slope and top of the foredune to the area behind foredune. More than 200 blowouts are on the foredune of the Curonian Spit. Such an amount of the blowouts arises by reason of intensive deflation processes. The anthropogenic impact (trampling of the grass on foredune surface) promotes to the development of the deflation processes. Intensity of the deflations processes (for example of the development of blowouts) has determined by satellite images (for period from 2002 to 2014 years), results of laser scanning realized in the year 2007 y. and field observations using GIS methods. Evaluation of variability of volume and area blowouts, the volume of transported sandy material depending on the action of natural and anthropogenic factors is the result of this work.

P21. SPECIALIZED OCEANOGRAPHIC DATABASE FOR INFORMATION SUPPORT OF THE BLACK SEA COASTAL ZONE STUDY

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The information resources of the Federal State Budget Scientific Institution "Marine Hydrophysical Institute of RAS" (FSBSI MHI) oceanographic data bank (MHI BOD), which contains about 115,000 oceanographic and more than 27,000 hydrochemical stations accomplished in the Black Sea coastal zone, as well as experience accumulated while providing information support of the coastal zone research, main directions of activities, and short-term plans are considered.

P22. A DIFFERENT-SCALE VARIABILITY OF THE VERTICAL THERMAL STRUCTURE OF THE KALININGRAD REGION'S MARINE COASTAL WATERS

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Baltic Sea hydrology is quite well explored. Nevertheless, the majority of classical and recent colligative research of Baltic Sea was focused on its off-lying part, shaping several regional databases – HELCOM, ICES. Thus data for 12-mile near shore zone in the Russian part of South-Eastern Baltic is nearly not represented.

IKBFU and ABIORAS employees have gathered an array of measurements, made by CTD probes in Kaliningrad region coastal area during the last 15 years. It was this fact, which make possible to examine a seasonal variability of thermal and halinic structure of shallow marine areas.

The pre-analysis revealed that there is only slight variability in salinity (at about 0.5 psu) in the region of interest. Therefore, the main aim of following work is to analyze a different-scale variability of the vertical thermal structure of Kaliningrad region's marine coastal areas.

This analysis showed two types of the variability – long-term and short-term. The long-term one is represented by seasonal cycle of meteorological features, affecting in a strong way on the hydrological behavior of Baltic Sea. The short-term one are regarded as brief, but violent perturbations – storms.

While carrying out this research, the quantitative estimates of thermal structure alteration time were made along with features of thermal structure variability for marine coastal areas.

P23. NUMERICAL SIMULATION OF THE SEMIDIURNAL TIDAL WAVE IMPACT ON THE BLACK SEA CLIMATIC CIRCULATION

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The Black Sea is an enclosed deep marine basin, where the structure of tidal movements is dominated by the direct influence of the tidal force on the proper water body. We investigated the spatial structure of its climatic circulation under the impact of tides. We developed a program module extending the numerical general circulation model of the Black Sea which was designed in the Institute of numerical mathematics, Moscow. It allows the lunar semidiurnal harmonics (M_2) influence to be taken into account explicitly via the discrete analogues of the differential equations of motion. Our work reflects the main results of the numerical experiment on the 4x4 km horizontal grid and 40 vertical y-levels. It was a one-year model run using the CORE atmospheric climatology forcing. We compared the first and the last weeks of simulation and found out that the characteristics of a tidal mode M2 were established at a very short period of time (7 days), which is the estimate of the model's energy redistribution time scale. The coastal areas where the tidal impact is substantial (~10 cm) were located mainly at the shallow-shelf inlets highly influenced by the climate change. Validation of the cotidal maps showed the reliability of our model at the climatological time scale. In future we will focus on the baroclinic tidal movements and validation with the Marine Hydrophysical Institute database in order to shed new light on physical and ecological processes at the frontal zone along the Rim Current.

P24. SELF-PURIFICATION OF SEA COASTAL WATER AREAS UNDER CLIMATIC AND ANTHROPOGENIC CHANGE

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The ability of a bay and gulf ecosystems to self-purification was estimated and the current ecological state of the Sevastopol Bay in whole and the separated parts of the bay was given as an example. A zoning by type of anthropogenic impact subject to the water exchange with the open sea and an influence of the Chernaya River run-off were taken into account. A comparative analysis of assimilation capacity of the most environmentally disadvantaged part of the Sevastopol Bay (the Southern Bay) and the clean water area, bordering on the open sea, was carried out. The hydrodynamic regime of the Sevastopol Bay was described using numerical modelling. The prospect, opportunity and examples of the methodology for assessing the assimilation capacity of marine ecosystems are demonstrated.

P25. APPLICATION OF ONSHORE LASER SCANNING DATA FOR MATHEMATIC MODELING OF COASTAL PROFILE CHANGES

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The easternmost part of the Gulf of Finland is characterized by intense coastal processes where erosion dominates. Onshore laser scanning of a beach surface of three coastal zone segments of the Kurortny District, St. Petersburg was carried out during the process of realisation of the CliPLivE project and coastal monitoring investigated by VSEGEI and "Mineral" company. One of the goals of the CliPLivE project was a prediction of coastal evolution by 2100 year based on retrospective analysis of the last century remote sensing data. The average annual range of coastal transformation was used for the mathematic modelling of beach profile changes. The model takes into account changes of sea level and possible increase of storm events occurrence. The onshore laser scanning was carried out each summer since 2012. After series of storms in 2015 the repeated scanning was carried out in December. It gave an opportunity to calculate volume and area of redeposited sand during the last storm that shows that a part or almost all sand material from eroded foredune was deposited in a middle part of the beach. This material forms an onshore sand bar in front of a new formed erosion escarpment. The comparison of the beach relief elevation models of 2012 and 2015 shows that another part of sand (up to 30-40% of volume of all mobilized beach sand) was washed out from the beach to offshore. The data of onshore laser scanning confirmed that the mathematical model of prediction coastal changes works.

P26. SURFACE GPS-DRIFTERS FOR STUDY COASTAL WATER DYNAMICS IN THE BLACK SEA.

RESULTS AND EXPERIENCE FROM 2013 TO 2015 YEAR.

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This work presents the description and results of drifter experiments which were held in coastal zone of the Black Sea every summer and sometimes in autumn since 2013. Surface GSM/GPS drifters were used for observation coastal currents with spatial resolution 100–200 m and temporal variability from 5-10 minutes. Some parameters of sub-mesoscale eddies was described due to experiments. An optional battery pack allowed to extent autonomy to 19 days (one of the drifters covered a distance of ~ 300 km).The results of experiments include a comparison of the drifter trajectories with bottom-tracked ADCP and moored ADCP data. The speed and direction of current velocity from the ADCP data coincide with the data from drifters. We demonstrate that using drifter data for analysis of water dynamics gives a more comprehensive pattern of actual processes in comparison to using the ADCP data alone.

P27. GEOLOGICAL RISKS OF BAIKAI COASTAL ZONE

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The geologic-geophysical researches including focused on geological dangers in 2015 captured a coastal zone of the southern hollow of Baikal. The methodical basis of these works is made by lake profile and areal surveillance with application of side location, continuous seismoacoustic profiling, a protsezionny ekholotirovaniye, underwater television monitoring, interpretative sampling and reconnoitering coastal monitoring from a board and from the water area. These forms most often represent openings in Baikal seabed with various shapes, depth and width of disclosure. In many cases the central openings or "craters" of these forms are sources of eruption of gas bubbles. Intensity of this eruption changes from minimum to massive in the form of vertical gas streams. On sonar records these forms are represented as black points or lines. Echo sounding presents it as powerful vertical images "columns" which are often going from ground objects to the water surface and defined these forms as "gas griffins". Big attention considering possible geological risks (connected with mass methane saturation of water) payed to larger forms of a ground relief which are conditionally assigned to group of "pockmark".

P28. MAPPING TIDAL CURRENTS AND RESIDUAL CURRENTS BY USE OF COASTAL ACOUSTIC TOMOGRAPHY

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A coastal acoustic tomography (CAT) experiment for mapping the tidal currents in the Zhitouyang Bay was successfully carried out with seven acoustic stations during July 12 to 13, 2009. The horizontal distributions of tidal current in the tomography domain are calculated by the inverse analysis in which the travel time differences for sound traveling reciprocally are used as data. Spatial mean amplitude ratios M_2 : M_4 : M_6 are 1.00 : 0.15 : 0.11. The shallow-water equationsare used to analyze the generation mechanisms of M_4 and M_6. In the deep area, velocity amplitudes of M_4 measured by CAT agree well with those of M_4 predicted by the advection terms in the shallow water equations, indicating that M_4 in the deep area where water depths are larger than 60 m is predominantly generated by the advection terms. M_6 measured by CAT and M_6 predicted by the nonlinear quadratic bottom friction terms agree well in the area where water depths are less than 20 m, indicating that friction mechanisms are predominant for generating M_6 in the shallow area. Dynamic analysis of the residual currents using the tidally averaged momentum equationshows that spatial mean values of the horizontal pressure gradient due to residual sea level and of the advection of residual currents together contribute about 75% of the spatial mean values of the advection by the tidal currents, indicating that residual currents in this bay are induced mainly by the nonlinear effects of tidal currents.

P29. CLIMATE CHANGE RISK ASSESSMENT: A REVIEW OF TOOLS, METHODS AND BEST PRACTICES FOR THE OIL AND GAS SECTOR

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Climate change is causing serious threats on both natural and human systems worldwide. The oil and gas industry is particularly exposed to the impact of climate change due to the environment in which industrial complexes and energy infrastructures operate (e.g. offshore regions, low-lying coastal areas) and to the susceptibility of the natural resources used in the technological/industrial processes. As a consequence, the energy companies are encouraged to develop a business approach to climate change, considering risks and opportunities for the oil and gas services (from up-stream to distribution) and identifying the best portfolio of adaptation strategies. The main aim of this study is to provide a literature review of available tools, methodological guidelines and best practices for conducting climate change risk assessments in the oil and gas sector. Key concepts (exposure, vulnerability, risk, adaptive capacity) as well as relevant climatic drivers are reviewed in order to identifying major cause-effect relationships, vulnerability thresholds in different phases of the life cycle of energy installations and infrastructures. The main outcomes of the review, including highlights on the major issues to be tackled by the climate change impact community and a snapshot of reviewed literature based on different categories (e.g. indicators and index-based approaches, scenario analysis, quantitative risk analysis) will be here presented and discussed.

P30. VARIATIONS OF SEA LEVEL AND GLOBAL CLIMATE IN MODERN CONDITIONS

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Global warming can result in the rise of Sea Level (SL) by 40–100 cm by the end of the XXI century with possible catastrophic consequences for coastal zone. Study and prediction of long-term fluctuations of sea level is among the most important problems of modern hydrometeorology. A series of studies of SL interannual fluctuations have been carried out in RSHU. A reconstruction of SL fluctuations during the observation period of 1861-2010, i.e. 150 years, was performed on the basis of the developed statistical model showing a powerful linear trend describing 94% of the initial row dispersion. During the XX century the trend approached 1.8 mm/year. The comparison of actual and calculated SL trends for two periods (1980–2005 and 1993-2003) has shown that the residual error makes respectively 0.21 and 0.22 mm/year that is three times less, than in the Fourth IPCC report. Also, for the first time the complex of methods of SL longterm forecast was developed: the main advantage of a simple statistical model of SL longterm forecast is a minimum of initial information, but the model accuracy is comparable with complex and expensive ocean and atmosphere circulation models. The two-decade range physical-statistical sea level prediction model was developed for the first time based on the idea that Global Air Temperature (GAT) is a major factor of SL changes. It was experimentally shown that there is a long delay (20 and 30 years) of SL fluctuations with respect to Global Air Temperature

P31. IMPACT ASSESSMENT ON STORM SURGE RISKS TO CONTAINERS CONSIDERING GLOBAL WARMING

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Container yards tend to be located along waterfronts that are exposed to high risk of storm surges. However, risk assessment tools such as vulnerability functions and risk maps for containers have not been sufficiently developed. In addition, damage due to storm surges is expected to increase owing to global warming. This paper aims to assess storm surge impact due to global warming for containers located at three major bays in Japan. First, we developed vulnerability functions for containers against storm surges using an engineering approach. Second, we simulated storm surges at three major bays using the SuWAT model and taking global warming into account. Finally, we developed storm surge risk maps for containers based on current and future situations using the vulnerability function and simulated inundation depth. As a result, we revealed the impact of global warming on storm surge risks for containers quantitatively.

P32. "CLIMATE CHANGE" TO CHANGE THE WORLD, "HUMAN REVOLUTION" TO CHANGE THE FUTURE: THE IMPORTANCE OF GLOBAL CITIZENS BASED ON "HUMAN REVOLUTION"

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On March 11, 2011 the largest earthquake to hit Japan occurred. This magnitude 9.0 earthquake triggered a huge tsunami and killed 2,563 people. It led to the nuclear disaster at nuclear power plant in Fukushima. It was classified as a level 7 event - the same as Chernobyl. In our area we also have nuclear power plants and we are expected to have an earthquake which is estimated to be much larger than the one encountered on March of 2011. Through funding of 30 billion Yen we are building a 13m high seawall stretching 17.5km from the Tenryu estuary to Lake Hamana which is an enclosed coastal sea. In cooperation with our citizens we are planting trees on its slopes to help protect the natural landscape and to keep to a minimum any damage from the next tsunami. Risk management at a global scale due to Climate Change is very important concern involving our children's future and happiness. Global-warming prevention education is crucial for the survival of mankind. This is because there is a possibility of falling into a huge crisis that we cannot get out of. I would like to introduce my practical environmental education for the past 25 years at a technical high school and also introduce the ideas of two great Japanese educators, Tsunesaburo Makiguchi and Daisaku Ikeda. Furthermore, I would like to refer to the importance of global citizens through education for global warming prevention which is based on the way of thinking of Dr. Ikeda which is called "Human Revolution".

P33. A MODELING SYSTEM FOR CLIMATE CHANGE RISK ASSESSMENT, MANAGEMENT AND HEDGING IN COASTAL AREAS

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Every aspect of human operations faces a wide range of risks, some of which can cause serious consequences. By the start of 21st century, mankind has recognized a new class of risks posed by climate change. It is obvious, that the global climate is changing, and will continue to change, in ways that affect the planning and day to day operations of businesses, government agencies and other organizations and institutions. The manifestations of climate change include but not limited to rising sea levels, increasing temperature, flooding, melting polar sea ice, adverse weather events (e.g. heatwaves, drought, and storms) and a rise in related problems (e.g. health and environmental). Assessing and managing climate risks represent one of the most challenging issues of today and for the future. The purpose of the risk modeling system discussed in this paper is to provide a framework and methodology to quantify risks caused by climate change, to facilitate estimates of the impact of climate change on various spheres of human activities and to compare eventual adaptation and risk mitigation strategies. The system integrates both physical climate system and economic models together with knowledge-based subsystem, which can help support proactive risk management. System structure and its main components are considered. Special attention is paid to climate risk assessment, management and hedging in the Arctic coastal areas.

P34. METEOROLOGICAL CONDITIONS AFFECTING THE CURONIAN SPIT DUNE FORMATION (SOUTHEASTERN BALTIC COAST)

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This article presents a study of the geomorphological changes of the Curonian Spit during last century. The analysis was conducted for both geological maps and satellite images. The eastward shift the southern part of the Curonian Spit dune ridge with velocity from 2 to 5 m per year takes place. The comparison of the slopes incline directions with denudation areas was done. In addition, the meteorological parameters affecting aeolian processes on the southeastern Baltic coastal were investigated for the period of 2005-2014. On average, dunes can be dispersed by wind throughout 36±17 days in a year. Velocity and direction of the wind, as well as precipitation, are of dominating importance for the dune shift.

P35. AN APPROACH TO PARAMETRISATION OF COASTAL SOURCES OF MICROPLASTICS PARTICLES IN NUMERICAL MODELS

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An overview of modern approaches to the problem of parametrisation of sources of marine waters microplastics pollution from the coastline is conducted. The estimates of Europe's plastic production along with mismanaged plastic waste percentage that might be the source of microplastics particles input to marine environment are presented. A semi-empirical formulation for the particles source intensity is suggested. It considers the main factors of local anthropogenic pressure for the coastal spot location for the given coordinates. Both advantages and disadvantages of such an approach along with possible ways for improvement are discussed.
The research is supported by the Russian Science Foundation grant number 15-17-10020.

P36. BALTIC AMBER MIGRATIONS AS A MODEL OF MICROPLASTICS BEHAVIOR IN THE SEA COASTAL ZONE

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The problem of microplastic pollution is of increasing concern. Behaviour of microplastic particles (0.5 mm < L < 5mm in the largest dimension) in marine environment is difficult to predict, and no field observations are available up to now. Baltic amber (succinite), with its density of about 1.05-1.09 g/cm3, fits the range of densities of slightly negatively buoyant plastics: polyamide, polystyrene, acrylic, etc. Baltic citizens have observed amber migrations for centuries, and the collected information may shed some light onto general features of microplastic particles behaviour. Events of “amber washing-out” at the sea shore of the Sambian peninsula (Kaliningrad oblast, Russia) typically take place in autumn-winter time. Experience of divers indicates that amber is washed out from the depths as deep as 15 m. Massive presence in amber-containing debris of the red algae *Furcellaria lumbricalis*, dominating in the sea at depths of 6-15 m, proves this fact. From oceanographic viewpoint, important for the “amber washing-out” are: strong and long-lasting storm, phase of wind decrease or direction change, developed long surface waves, shore exposure to wind. Analysis of characteristic wave lengths after long storms, dimensions of their surf zone, and changes in underwater bottom profile is carried out. Conclusion is that slightly negatively buoyant microplastic particles should migrate for a long time between beaches and underwater slopes until they are broken into small enough pieces that can be transported by currents to deeper area and deposited out of reach of stormy waves.
The research is supported by the Russian Science Foundation grant number 15-17-10020.

P37. INFORMATION-PREDICTION AUTOMATIC SYSTEM FOR THE SEA SHORE OF KALININGRAD OBLAST (IPAS): USE IN 2006-2015 AND DEVELOPMENT PROSPECTS

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Information-Prediction Automatic System (IPAS) was developed for the Baltic Sea shore within the Kaliningrad Oblast in 2005-2006 and implemented in the State Organization of the Kaliningrad Oblat "Baltberegozaschita" (coastal management authority) in 2007. It is used as database for shore protection engineering and a tool for analyses and forecasting of coastal processes, and has three segments - database, forecast block and information-cartographic block. Information-cartographic block regularly accumulates the results of annual monitoring - surveys on shore segments with returning period of 6-7 years using reference system of permanent monitoring bench marks each 500 meters on the Vistula Spit, shore of Sambiya Peninsula and the Curonian Spit. IPAS is regularly used for processing and analysis of data, preparation of analytical notes for the Government of Kaliningrad Oblast and for municipal authorities. Information stored in IPAS was used for development of two programs of actions: "Protection of the shore of the Baltic Sea, the Vistula and Curonian lagoons within the Kaliningrad Oblast for the period 2014-2020 years" and "The concept of integrated development of shore protection in the Kaliningrad Oblast for the period 2013-2020 years". Optimal engineering solutions were recommended by using of the forecast block of IPAS for promenade protection constructions in Zelenogradsk and Svetlogorsk as well as for the project "Construction of beach protection in Svetlogorsk".

P38. MODERN TECHNOLOGY IN DUNE COMPLEXES MONITORING ON THE VISTULA SPIT

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Modern technologies, which provide fast and accurate acquisition of high-resolution spatial data, have found widespread application in the monitoring of coastal processes. This paper reports the results of four years' monitoring of a huge deflation/blowout/wind-scour basin *dynamics* at the Vistula Spit (southeast coast of the Baltic Sea). Information about the volume and size dynamics together with deflation/accumulation schemes and 3D elevation maps is presented. Basing on the obtained results, forecast of the deflation basin dynamics for 2016 was proposed. This paper implements the Terrestrial Laserscanning (TLS) method to the coastal processes investigation and demonstrates its high potential in this field.

P39. CORRELATION OF THE BLACK, MARMARA AND AEGEAN SEAS DURING THE HOLOCENE

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A mathematical model describing the change in the Black Sea level depending on the Aegean Sea level changes is presented in the article. Calculations have shown that the level of the Black Sea has been repeating the course of the Aegean Sea level for the last at least 6,000 years. And the level of the Black Sea above the Aegean Sea level in the tens of centimeters for this period of time.

P40. EXPERIMENTING ON SETTLING VELOCITIES OF NEGATIVELY BUOYANT MICROPLASTICS

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Presence of small plastic particles (< 5 mm), defined as microplastics, in the ocean and, especially, in coastal areas became evident in the last decade. From physical point of view, this fact indicates emergence of a new type of particles in the ocean. In contrast to the abundance of studies concerning sources, actual distribution and ecological effects of those particles, there are almost no detailed descriptions of physical mechanisms determining their distribution and behavior in the water column. Settling velocities of microplastics were measured in a series of experiments conducted in a 1-meter high glass tank filled with distilled water, in accordance with the typical methodology used in sedimentology. At first approximation, we supposed that the semi-empirical formulations developed for the natural sediments would be applicable to the microplastics. Results of preliminary experiments on microplastics of simple shapes justified this hypothesis. The majority of the implemented equations of settling velocity fitted well with the experimental data. Next step would be to test these formulations on the marine microplastic particles with greater variability in shapes.
The research is supported by the Russian Science Foundation, project number 15-17-10020.

P41. MODELING STORM SURGES AND WAVE CLIMATE IN THE WHITE AND BARENTS SEAS

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Russian priority - the study of storm surges and wave climate in the Arctic seas due to the active development of offshore oil and gas. Researching the formation of storm surge and wave are necessary for the design and construction of facilities in the coastal zone, as well as for the safety of navigation. An inactive port ensues considerable economic losses. It is important to study the variability of storm surges, wave climate in the past and forecast the future. Consequently, this information would be used for planning the development of the Arctic in accordance with the development programme 2020. Mathematical modeling is used to analyze the characteristics of storm surges and wave climate formation from 1979 to 2010 in the White and Barents Seas. Calculation of storm surge heights in the seas is performed using model AdCirc on an unstructured grid with a 20 km pitch in the Barents Sea and 100 m in the White Sea. The model AdCirc used data of wind field reanalysis CFSv2. The simulation of storm surge was conducted with/without pressure, sea state, tides. A non-linear interaction of the surge and tide during the phase of destruction storm surge was detected. Calculation of the wave climate performed using SWAN spectral wave model on unstructured grids. Spatial resolution is 500 m-5 km for the White Sea and 10-20 km for the Barents Sea. NCEP/CFSR (~0.3°) input wind forcing was used. The storminess of the White Sea tends to increase from 1979 to 1991, and then decrease to minimum at 2000 and increase again till 2010.

P42. COMPREHENSIVE MONITORING OF ICE GOUGING BOTTOM RELIEF AT KEY SITES OF OIL AND GAS DEVELOPMENT WITHIN THE COASTAL-SHELF ZONE OF THE RUSSIAN ARCTIC SEAS

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Ice gouging is a dangerous natural process typical for the coastal-shelf zone of the Russian Arctic; because it leads to damaging of the infrastructure it can also be related to the category of catastrophic processes. To lower the risks of occurrence and to prevent emergencies and their consequences, comprehensive monitoring of the dangerous natural processes is necessary. With all lithologic and geomorphologic conditions being equal, the intensity of the ice gouging on the bottom is mostly determined by the changing condition, area and thickness of the ice cover. To assess the real intensity of the ice gouging impact during a given ice season, repeated sounding of the sea bottom topography is necessary; it helps to select the ice gouges which were created in the period between the two consequent observations. At present, the methods and technologies of the monitoring of ice gouging processes are not standardized, and the monitoring, if it is conducted, is often sporadic and lacks systematization. Therefore, the development of a united technology of comprehensive monitoring of ice gouging processes in the coastal and shelf zone is one of the most important tasks of the modern science and practice. Our team was the first one to apply such integrative technology in 2005-2015 in the framework of investigations for the purpose of construction of the underwater gas pipeline at its crossing of the Baydaratskaya Bay, Kara Sea.

P43. SEASONAL VARIATION OF TRANSPORTATION OF ASARI CLAM, *RUDITAPES PHILIPPINARUM*, LARVAE IN HIROSHIMA BAY

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Hiroshima Bay is located in western part of the Seto Inland Sea, and there is high productivity of Asari clam. However, the landings amount of the clam was rapidly decreased and production areas came to be limited in the northern part (bay head). Here, the clam has the planktonic larval stage. Then, it is important to reveal the transportation process of larvae to clarify the habitat connectivity of the clam. Therefore, in this study, we try to clarify the transportation process of the clam larvae in the Hiroshima Bay by numerical model experiments. As a result of model experiments, in June (rainy and heating season), the larvae are transported to southward in western area of Hiroshima Bay. In November (dry and cooling season), distribution of larvae is limited in the northern area of Hiroshima Bay. These results are corresponding to the field observation results. In the Seto Inland Sea, it is said that there is spawning time of the clam twice a year (spring and autumn). However, in a recent Hiroshima Bay, the density of the larva in spring is very low than that in autumn. These facts suggest that the production of the clam is limited in the northern area of Hiroshima Bay because the density of the larva is low in spring when the larvae can extend to the south.

P44. EDDY FORMATION BEHIND A COASTAL CAPE BY TRANSIENT LONGSHORE WINDSTRESS (NUMERICAL EXPERIMENTS)

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It is shown thatthe processof eddy formationbehind a coastal cape-like obstacleessentially depends on themethod of generatingthe longshorecurrent. Numerical simulations of the flow around a cape generated by transient longshore wind reveal different modes of eddy formationin rotating stratified environmentdepending ondimensionless parameterssuch as the burgerandkibel-rossby numbers, bu and ro, respectively. Atro<0.6 depending on the magnitude of bu either trapped anticyclonic or cyclonic eddy at bu<0.2 or periodic eddy shedding at bu>0.2 is realized. The eddies are weakenedandstretched along the coastline at 0.4–0.6<ro<1.4 and ultimatelydisappear atro>1.4.

P45. SITE-SPECIFIC EQUATIONS OF STATE FOR COASTAL SEA AREAS AND INLAND WATER BODIES

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This article presents a new method of laboratory density determination and construction equations of state for marine waters with various ionic compositions and salinities was developed. The validation of the method was performed using the Ocean Standard Seawater and the UNESCO thermodynamic equation of state (EOS-80). Density measurements of water samples from the Aral Sea, the Black Sea and the Issyk-Kul Lake were performed using a high-precision laboratory density meter. The obtained results were compared with the density values calculated for the considered water samples by the EOS-80 equation. It was shown that difference in ionic composition between Standard Seawater and the considered water bodies results in significant inaccuracies in determination of water density using the EOS-80 equation. Basing on the laboratory measurements of density under various salinity and temperature values we constructed a new equation of state for the Aral Sea and the Black Sea water samples and estimated errors for their coefficients.

P46. PROBLEM OF HEAVY METAL SURFACE SEDIMENT CONTAMINATION IN THE EASTERN GULF OF FINLAND

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The project defines heavy metals pre-industrial values in sediment sequences of Late Holocene for the Eastern Gulf of Finland. Comparative analyze revealed differences and similarities in heavy metals concentrations in the surface bottom sediments and pre-industrial levels. It was found that maximal concentrations of heavy metals in the bottom sediments of the Gulf of Finland and the Neva Bay were fixed in 1950-1990. Since 1990-s the trend of slow decreasing of contamination level is fixing, however concentrations of some heavy metals in bottom sediments are still high.

P47. CHANGES IN WATER QUALITY AND FISHERY PRODUCTIONIN JINHAE BAY

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For the better understanding of long-term variations of water quality in Jinhae Bay after establishment of special law, we analyzed the archive data monitored in Jinhae Bay during the last 17 years (1997-2013). And change on fish catch due to the variations of water quality was investigated.
A marked decrease in the number of red tide occurrence is due to the effectiveness of the law and sewage treatment plant that has targeted the reduction of COD in the effluent water since early 2000. Although the improvement of water quality, increase in fishery production was not observed in Jinhae Bay. For the recovery of fishery production, processes for restoration of entire ecosystem such as restoration of artificial intertidal flat and seaweed bed and remediation of organic-rich sea bed should be accompanied with improvement of water quality.

P48. AZOV-BLACK SEA COAST OF KRASNODAR REGION: ESTIMATION OF RECREATIONAL POTENTIAL BASED ON THE DYNAMIC PROCESSES, NATURAL AND ANTHROPOGENIC FACTORS

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This article is devoted to the estimation of recreational potential based on the dynamic processes, natural and anthropogenic factors of the Azov-Black Sea coast of Krasnodar region as an example. Bioclimatic figures are considered as the dynamic processes and natural factors, the degree of the development of exogenous geological processes. Anthropogenic factors are represented by the multi aspect business activities in the coastal zone.

P49. COMPARATIVE CHARACTERISTIC OF SEA RADIANCE COEFFICIENT SPECTRA MEASURED REMOTELY IN COASTAL WATERS OF FIVE SEAS

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Sea radiance coefficient, defined as the ratio of the sunlight reflected by the water bulk to the sunlight illuminating the water surface, is one of the most informative optical characteristics of the seawater that can be obtained by passive remote sensing. We got the sea radiance coefficient spectra by processing the data obtained in measurements from board a moving ship. Using sea radiance coefficient optical spectra it is possible to estimate water constituents concentration and their distribution over the aquatory of interest. However, thus obtained sea radiance coefficient spectra are strongly affected by weather and measurement conditions and needs some calibration. It was shown that practically all the spectra of sea radiance coefficient have some generic peculiarities regardless of the type of sea waters. These peculiarities can be explained by the spectrum of pure sea water absorption. Taking this into account a new calibration method was developed. The measurements were carried out with the portative spectroradiometers from board a ship in the five different seas: at the north-east coast of the Black Sea, in the Gdansk Bay of the Baltic Sea, in the west part of the Aral Sea, in the Kara Sea with the Ob' Bay and in the Philippine Sea at the coast of Taiwan. The new method of calibration was applied to the obtained spectra of the sea radiance coefficient that enabled us to get the corresponding absorption spectra and estimate the water constituents concentration in every region. The obtained concentration estimates were compared to the values obtained in water samples taken during the same measurement cycle and available data from other investigations.

P50. LANDSCAPE STUDY OF CHEBOKSARY AND KUYBYSHEV RESERVOIRS COASTS FOR RECREATIONAL USING

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The plot of study is Cheboksary and its suburbans and located on the joint of two landscape zones: a forest zone and a forest-steppe zone. The border between the zones goes along the Volga River, which establishes favourable environment for recreation. There has been observed slope type of areas on the right bank of the Volga River of the Cheboksary and Kuybyshev Reservoir. It has 3º and more incline, with washed-off soil and broadleaved woodland (relict mountainous oak woods), subjected to considerable land-clearing. In the immediate bank zone of the Volga River, where abrasive-soil-slipping and abrasive-talus processes mostly develop, the main types of natural areas have been marked out:

1) Abrasive landslide cliffs at the original slopes of Volga Valley of 60º steepness, more than 15 m high, with permanent watering as a result of underground waters leakage;
2) Abrasive cliffs of terraces above flood-plains of 2 m high;
3) Abrasive cliffs of original slope of the valley of the river Volga of 2 m high, with distinctive abrasive niches in the lower part of the slope or temporary concentration of caving demolishing material.

Left coast is lowland plain, the part of taiga landscape zone. Low terraces above flood plain of Volga are formed by sand with loam layers, with sod-podzol sandy and sandy loam soil in combination with marshy soil, with fir-pine forest, with from lichen bogs to sphagnum bog; in lowlands, on old felling plots, on abandoned peat mines deciduous forests with mostly birches and aspens prevail.

P51. ANALYSIS OF MARINE PHYTOPLANKTON IN THE YODO RIVER ESTUARYBY THE NUMERICAL ECOSYSTEM MODEL

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In order to understand the temporal variation of the physics and fluid structure of Yodo River estuary in detail, we had made in-situ observation. And the temporal variation of *Alexandrium tamarense* which cause the shellfish poisoning of natural freshwater clam was analyzed by the numerical ecosystem model which is considered the salinity effects. Stratification develops in the downstream side. Chl.a concentration is high in the seawater region. *A. tamarense* is detected in the downstream side. The numerical ecosystem model including the salinity effect for *A. tamarense* was formulated. *A. tamarense* grow only in the bottom layer in daytime, and the daily mean of it is 7 % of it transported from Osaka Bay. *A. tamarense* is transported to the upstream in flood tide. 81 % of it transported from Osaka Bay goes to the upstream zone. Much *A. tamarense* transported to the upstream zone in nighttime due to the vertical migration. Therefore when it is the flood tide in nighttime, more of *A. tamarense* might be transported to the upstream zone.

P52. A FUNDAMENTAL STUDY ON CARBON STORAGE BY *ZOSTERA MARINA* IN ISE BAY, JAPAN

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Blue Carbon, which is carbon captured by marine organisms, has recently come into focus as an important factor for climate change initiatives. This carbon is stored in vegetated coastal ecosystems, specifically mangrove forests, seagrass beds and salt marshes. The recognition of the C sequestration value of vegetated coastal ecosystems provides a strong argument for their protection and restoration. Therefore, it is necessary to improve scientific understanding of the mechanisms that stock control C in these ecosystems. However, the contribution of Blue Carbon sequestration to atmospheric CO2 in shallow waters is as yet unclear, since investigations and analysis technology are ongoing. In this study, Blue Carbon sinks by *Zostera marina* were evaluated in artificial (Gotenba) and natural (Matsunase) Zostera beds in Ise Bay, Japan. 12-hour continuous in situ photosynthesis and oxygen consumption measurements were performed in both areas by using chambers in light and dark conditions. The production and dead amount of *Zostera marina* shoots were estimated by standing stock measurements every month. It is estimated that the amount of carbon storage as Blue Carbon was 237g-C/m^2/year and 197g-C/m^2/year in the artificial and natural *Zostera marina* beds, respectively. These results indicated that *Zostera marina* plays a role towards sinking Blue Carbon.

P53. SPECIES DIVERSITY AND THE THREAT OF INTRODUCED MACROALGAL SPECIES ARRIVING ON NORTHWESTERN AMERICAN SHORES VIA JAPANESE TSUNAMI MARINE DEBRIS (JTMD)

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Due to the tsunami generated by the 2011 Great East Japan Earthquake, large amounts of debris from Japan have been arriving on NW American coasts since June 2012. Numerous marine organisms have arrived alive (macroalgae and benthic invertebrates including herbivores) and there is a considerable threat that they may invade the coast. In order to determine the diversity of macroalgal species on debris and to provide basic information for evaluating the introduction risk, we have undertaken a monitoring project supported by PICES and MOE. Using both morphology and molecular study, we have identified 66 macroalgal species (19 green, 24 brown and 23 red algae) on 36 debris items collected from Oregon and Washington. On these items, more than 75% of the species were fertile, indicating a high risk for recruitment occurring along the coast. More than 33% of the species, including several large taxa over 50 cm in length (e.g. Alaria crassifolia, Saccharina japonica, Undaria pinnatifida, Neodilsea yendoana), are not known in the NE Pacific, and their introductions would substantially impact the ecosystem. Even among the debris species that are common to both the NW and NE Pacific (e.g. Petalonia fascia, Palmaria mollis), there are genetic differences that could pollute the populations. New populations of these species have not yet been found in the coasts, but careful monitoring and molecular screening are required to reveal the impact of JTMD on native algal populations.

P54. FIRST CASE OF IMPOSEX IN *NEPTUNEA CONVEXA* (GASTROPODA: BUCCINIDAE) FROM BATHYAL DEPTHS (SEA OF OKHOTSK, >1400 M)

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Owing to its worldwide use as an anti-fouling agent, tributyltin (TBT) is a common contaminant of marine ecosystems. Its wide distribution, high hydrophobicity and persistence have raised concern about bioaccumulation, potential biomagnifications in food webs, and adverse effects on the environment and human health. The most frequent and acute effect of TBT is found in gastropods, usually living in shallow waters, rarely at depths more than 100 m. This study reports about the first case of imposex in a deep water buccinid whelk *Neptunea convexa* collected at 1437 m in the Sea of Okhotsk. Among five collected specimens, the two were imposex females at the 1st stage of imposex development, while the rest three were males with normally developed penises. Most probably, TBT entered the whelk's body by eaten benthic organisms, which feed on detritus with traces of TBT, but other reasons, such as heavy metal pollution, are also discussed.

P55. DISTRIBUTION OF DISSOLVED METHANE IN SURFACE COASTAL WATERS OF THE NORTHEASTERN PART OF THE BLACK SEA

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Studying of methane formation and distribution in natural waters is important for understanding of biogeochemical processes of carbon cycle, searching for oil and gas sections and evaluation of CH_4 emissions for investigations of greenhouse effect. The Black Sea is the largest methane water body on our planet. However, relatively low values of methane concentration (closed to equilibrium with the atmospheric air) are typical of the upper aerobic layer. At the same time, the distribution pattern of CH_4 in surface waters of coastal areas is complicated by the influence of coastal biological productivity, continental runoff, bottom sources, hydrodynamic processes and anthropogenic effect.

The investigation is focused on the spatial variability of dissolved methane in the surface layer of the sea in coastal regions affected by the continental runoff and anthropogenic pressure. Unique *in situ* data on methane concentrations were collected along the ship track on 2 sections between Sochi and Gelendzhik (2013, 2014) and 2 sections between Gelendzhik and Feodosia (2015). Overall 170 samples were obtained. Gas-chromatographic analysis of the samples revealed increase of CH_4 saturation in the southeastern part of the Crimean shelf and the Kerch Strait area. Such a pattern was apparently caused by the influence of the Azov Sea water spread westward along the Crimean shore from the strait. This work was supported by the Russian Science Foundation, Project 14-50-00095 and the Russian Foundation for Basic Research, Project 16-35-00156 mol_a.

P56. MONITORING CORAL RECOVERY AT NEARSHORE CORAL REEFS IN PHANGNGA PROVINCE, THE ANDAMAN SEA FOLLOWING THE 2010 CORAL BLEACHING EVENT

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Mass bleaching and subsequent mortality of scleractinian corals in response to elevated seawater temperatures has been considered as one of the most impacts of global climate change. Three extensive coral bleaching events in the Andaman Sea were reported, in the years 1991, 1995 and 2010. Studies on survival of coral colonies, coral recruitment and community structure of coral reef associated macrofauna would predict the trends for coral recovery from the impacts of coral bleaching events. The present study aimed to examine the status of coral communities, density of coral recruits and coral reef associated macrofauna at nearshore coral reefs in Phangnga Province, the Andaman Sea following the 2010 coral bleaching event. The dead coral cover was high (>50%) while the live coral cover was in the range of 13-21%. There was high diversity of coral recruits on natural substrates. The average densities of macrobenthic fauna varied from 1.9 to 2.6 individuals.m^{-2}, with significant differences among study sites. The dominant macrobenthic species were a soft coral (*Lobophytum* sp.), a sea star (*Linckia laevigata*) and a sea urchin (*Echinostrephus molaris*). Coral recovery at these coral reefs would be possible but local anthropogenic stressors must be overwhelmingly reduced in order to enhance coral reef resilience. The long-term monitoring programs in the Andaman Sea are required for decision makers to support their adaptive management approaches.

P57. HEAVY METALS IN WATER, SEDIMENTS AND MARINE FISHES FROM BULGARIAN BLACK SEA

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In this study, the ecosystem marine water-sediment-biota was investigated and the pollution was assessed. The concentrations of eight elements were determined in marine water, sediments and four fish species collected from Black Sea (Varna), Bulgaria during 2013. Marine water recorded the highest concentrations of Zn (15-22 мg/L), As (1.1–1.2 мg/L) and Pb (0.7-0.8 мg/L) while Zn (31-52 мg/g), Pb (21-29 мg/g) and Cu (20-34 мg/g) and show the highest concentrations in sediments. Water and sediments showed similar spatial distribution patterns for the highest mean values of the different metals. In the analysed fish species, the highest concentration of the metals Cu and Zn were found in *Trachurus Mediterrneus* (0.42 mg/kg w.w) and in *Sprattus Sprattus* (12.7 mg/kg w.w), respectively while the heavy metals As and Hg were found with maximum values in *Pseta Maxima* (3.99 mg/kg w.w and 0.08 mg/kg w.w respectively). The results from this study were compared with our data for a previous period (2004-2006) and they show decrease in the levels of heavy metal.

P58. POLYCHLORINATED BIPHENYLS IN EDIBLE FISH FROM BLACK SEA, BULGARIA

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Polychlorinated biphenyls (PCBs) can still be a problem for the aquatic environment. Fish species are a suitable indicator for the environmental pollution monitoring because they concentrate pollutants in their tissues directly from water. Concentrations of PCBs were measured in marine fish, collected from Bulgarian Black Sea coast in order to monitor the dynamics of these pollutants in 2007, 2010 and 2015. The fish species: goby *(Neogobius melanostomus),* sprat *(Sprattus sprattus sulinus),* horse mackerel *(Trachurus Mediterraneus ponticus)* and grey mullet *(Mugil cephalus)* were chosen because of their characteristic feeding behavior. The PCBs were determined by gas chromatography system with mass spectrometry detection. The Total PCBs ranged from 93.8 to 513.3 ng/g lipid weight (in grey mullet and goby, respectively). Levels of PCBs in goby and grey mullet decreased in 2010 and 2015. In order to assess the safety of fish as food were calculated TEQ. They are determined by the results of dioxin - like (dl) PCBs. TEQs were calculated from 0.01 to 0.04 pg TEQ/g ww and did not exceed the EC limit of 3 pg TEQ/g ww. The levels of PCBs in fish from Bulgarian Black Sea were comparable to those found in neighboring seas.

P59. WHAT DOES HAPPEN IN THE NATURAL FOREST WATERSHED OF JAPAN?

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The watersheds in mountain regions are important in the regional environment as the place in which water and much woody organic matter (litter, stems, branch, and bark)are produced and are also important for the global environment because water, woody matter, and its carbon-based components are circulated in the ecosystems of forest, river, sea and atmosphere. It is not enough for us to simply understand the circulation of water and woody matter. For woody matter of watersheds of mountains, three unresolved questions remain. "When does woody matter move?" "Which woody matter does move?" "How much does woody matter move?" We have carried out every tree census, 4 times (every 6 years: 1992-2010). We also reported the transported CPOM (Coarse Particulate Organic Matter: stems, branch, bark, leaf, others and fine: 1.8 - 13.2kg/ha/yr) measured from about 8 hectare watershed of a mountain region in Japan from 2001 to 2010. The values of dry weight of the transported CPOM of Yusen watershed are also in reasonable agreement with those of the Hubbard Brook Experimental Forest (2.5 - 18.5 kg/ha/yr.) for 8 years, from 1965 to 1972.

P60. EXTREME VALUES OF SEA SURFACE TEMPERATURE ASSOCIATED WITH LONG-PERIOD PHENOMENA OCCURRED DURING 1960-2015 IN THE COLOMBIAN PACIFIC OCEAN

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Sea Surface Temperature Anomalies (SSTA), in four coastal hydrographic stations of Colombian Pacific Ocean, were analyzed. The selected hydrographic stations were: Tumaco (1°48'N-78°45'W), Gorgona island (2°58'N-78°11'W), Solano Bay (6°13'N-77°24'W) and Malpelo island (4°0'N-81°36'W). SSTA time series for 1960-2015 were calculated from monthly Sea Surface Temperature obtained from International Comprehensive Ocean Atmosphere Data Set (ICOADS). SSTA time series, Oceanic Nino Index (ONI), Pacific Decadal Oscillation index (PDO), Arctic Oscillation index (AO) and sunspots number (associated to solar activity), were compared. It was found that the SSTA absolute minimum has occurred in Tumaco (-3.93°C) in March 2009, in Gorgona (-3.71°C) in October 2007, in Solano Bay (-4.23°C) in April 2014 and Malpelo (-4.21°C) in December 2005. The SSTA absolute maximum was observed in Tumaco (3.45°C) in January 2002, in Gorgona (5.01°C) in July 1978, in Solano Bay (5.27°C) in March 1998 and Malpelo (3.64°C) in July 2015. A high correlation between SST and ONI in large part of study period, followed by a good correlation with PDO, was identified. The AO and SSTA have showed an inverse relationship in some periods. Solar Cycle has showed to be a modulator of behavior of SSTA in the selected stations. It was determined that extreme values of SST are related to the analyzed large scale oscillations.

P61. CANONICAL CORRELATION BETWEEN LARGE SCALE OSCILLATIONS, TEMPERATURE AND PRECIPITATION IN COASTAL REGIONS OF COLOMBIA

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This study examines relationships between available surface meteorology variables and climatic oscillations using canonical correlation analysis (CCA). Canonical loadings and cross loadings from CCA are evaluated for meteorological stations located over coastal regions of Colombia. The tests were carry out using temperature and precipitation data and three oscillations – the Ocean Niño Index (ONI), North Atlantic Oscillation (NAO), and Quasi-biennial oscillation (QBO). The results show the power of this statistical method to identify associations with an acceptable level of confidence using multivariate approach. The analysis reveals relationships mostly between the variables and the ENSO for all cases and a discrete connection with the NAO and QBO. Add climate indices to the group of independent variables increased the explained variance rates between 3 and 7% and therefore contribute to a better understanding of climate dynamics in the country.

P62. TRANSFER EFFICIENCY FROM PRIMARY PRODUCERS TO *RUDITAPES PHILIPPINARUM* ON AN INTERTIDAL FLAT IN HIROSHIMA BAY, JAPAN

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Fish yields of *Ruditapes philippinarum* have been decreased and the resources have not yet recovered. It needs to clarify food sources of *R. philippinarum*, and relationship between primary and secondary production of it. The purpose on this study is to reveal transfer efficiency from primary producers to *R. philippinarum* and food sources of *R. philippinarum*.

The field investigation was carried out to quantify biomass of *R. philippinarum* and primary producers on intertidal sand flat at Zigozen beach in Hiroshima Bay, Japan. In particular, photosynthetic rates of primary producers such as *Zostera marina*, *Ulva* sp. and microphytobenthos were determined in laboratory experiments. The carbon and nitrogen stable isotope ratios for *R. philippinarum* and 8 potential food sources (microphytobenthos, MPOM etc) growing in the tidal flat were also measured.

In summer 2015, the primary productions of *Z. marina*, *Ulva* sp. and microphytobenthos were estimated to be 70.4 kgC/day, 43.4 kgC/day and 2.2 kgC/day, respectively. Secondary production of *R. philippinarum* was 0.4 kgC/day. Contribution of microphytobenthos to *R. philippinarum* as food source was 56-76% on the basis of those carbon and nitrogen stable isotope ratios. Transfer efficiency from microphytobenthos to *R. philippinarum* was estimated to be 10-14%.

P63. LONG-TERM MONITORING OF SEASONAL AND INTERANNUAL VARIABILITY OF HYDROLOGICAL STRUCTURE IN COASTAL ZONE OF THE NORTH-EASTERN BLACK SEA

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The work demonstrates the results of the 6-years complex ship-borne monitoring of coastal zone in the north-eastern part of the Black Sea, carried out by the Southern Branch of P.P.Shirshov Institute of Oceanology, RAS, on a marine cross-section at the Blue Bay (Gelendzhik) beam 1-2 times per month. Climatic changes and eutrophication exert a significant impact on the sea water at the coastal area. In case of the Black Sea these factors pile up with a permanent hydrogen sulphide contamination of the sea water below 80-200 meters depth (depending on the season and distance from the shore). Strong pycno-halocline at the depths from 70 to 160 meters, formed due to the inflow of high salinity water from the Marmara Sea, inhibits the mixing between the water layers and, as a result, also limits the oxygen transport into the deeper layers. The winter cooling reduces the pycno-halocline and enriches the top active layer, down to the cold intermediate layer (CIL), with oxygen and nutrients, which subsequently lead to a vernal phytoplankton bloom. Formation of the thermocline and upper quasi-homogeneous layer (UQL), caused by the water warming in spring, at large extent determines a thickness of phytoplankton-rich layer during the spring and summer seasons. The work demonstrates seasonal and interannual dynamics of the UQL, thermocline, CIL and hydrogen sulphide boundary position in the coastal zone of the north-eastern part of the Black Sea.

P64. THE DISTRIBUTION OF RADON VOLUMETRIC ACTIVITY ABOVE THE SURFACE OF TAMAN PENINSULA

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The work is devoted to solving the problem of radon mapping of the Taman peninsula as a problem of interaction between the region's ecosystems and population. An express method of calculating the radon volumetric activity for decay energy of secondary products designed and implemented. Data of the 3-year's field investigations allowed us to plot the map of distribution of radon volumetric activity in the coastal zone of the Azov and Black seas of the Taman Peninsula, as well as over its surface. Some potentially dangerous territory identified. Average values of radon volumetric activity determined in the zones of tectonic disturbances and for the main territory of the Taman.

P65. CARBONATE DISSOLUTION AND ULTRASTRUCTURAL BREAKDOWN IN PLANKTONIC FORAMINIFERA IN THE SEA OF OKHOTSK

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80 sediment stations collected along the meridian transect across the Sea of Okhotsk were studied in order to reveal patterns of dissolution based on planktonic foraminifera. The degree of calcite dissolution intensity from planktonic foraminifera determined by different indices (degree of fragmentation, presence of susceptible to dissolution species, benthos/ plankton ratio). The highest degree of dissolution evidenced by a large number of shell fragments and corroding walls were found in sediments from the area of the Kuril Islands. The most revealing measure of probable dissolution of foraminiferal shells in the central part of the sea is a low number and lack of thin-walled species. The effects of dissolution on foraminiferal shells were studied for dominated species *Neogloboquadrina pachyderma* sin and *Globigerina bulloides* using a scanning electron microscope. The results are important for understanding processes of sedimentation, the paleo-oceanologial reconstructions and for obtaining reliable results in isotope analyzes.

P66. COMPARATIVE ANALYSIS OF TRANSFORMATION OF DISSOLVED MATTER RUNOFF IN THE MOUTH AREAS OF THE MEZEN' RIVER AND OTHER RIVERS OF THE WHITE SEA BASIN

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Conservative behavior of dissolved forms of major ions (Na, K, Mg, Ca, SO4, HCO3) and most part of studied trace elements (F, B, Li, Rb, Cs, Sr, Mo, and others) is determined in the Mezen' River mouth area. However, uranium and barium are intensively desorbed into solution from river suspended matter which long contacted with salinized waters in tidal estuary. At the same time the conservative behavior is peculiar to uranium and barium desorption from suspended matter reaches no more than 33% of its concentration in river waters in the Onega River, the Northern Dvina River and other rivers of the White Sea basin. Distribution of dissolved forms of mineral phosphorus and silica in the Mezen' River mouth is supervised, apparently, by process of organic matter remineralization in bottom sediments which by virtue of hydrological features of the estuary is regularly grow turbid and contact to vertically mixing water column. Except for the Mezen' River mouth, dissolved phosphates and silica during the productive period are removed from the continental runoff along the White Sea coast due to the biological assimilation of these elements.

P67. DISTRIBUTION OF DISSOLVED CHEMICAL ELEMENTS IN THE YENISEI RIVER ESTUARY AND ADJACENT WATER AREA OF THE KARA SEA

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The distribution of dissolved chemical elements (major ions, nutrients, and trace elements) in the Yenisei River estuary and adjacent water rea in 2009 and 2010 are presented. These results were compared to the data obtained during previous hydrochemical studies of this region. The transport of major cations (Na, K, Mg, Ca) and some trace elements (Rb, Cs, Sr, B, F, As, Mo, U) in the estuary follows conservative mixing. Alkalinity also belongs to conservative components, however this parameter exhibits substantial spatial heterogeneity caused by complex hydrological structure of the Yenisei Bay and adjoining part of the Kara Sea formed under the influence of several sources of desalination and salty waters inflow. Concentrations of P_{min}, Si, and V in the desalinized waters of photic layer decrease seaward owing to uptake by phytoplankton. The losses of these elements reach 30–57, 30, and 9% of their supply by river runoff, respectively. The content of dissolved phosphates and vanadium in the intermediate and near-bottom layers of the Yenisei River estuary strongly increases with salinity due to regeneration of precipitated organic matter, whereas silica remineralization is much less pronounced. Barium is characterized by additional input of dissolved forms in the mixing zone in the quantity comparable to that carried out by river runoff. This may be caused by its desorption from river suspended matter due to ion exchange. The transport of dissolved Al and Mn in the estuarine zone is probably controlled by the coagulation and flocculation of organic and organomineral colloids.

P68. HIERARCHICAL REGIONALIZATION SYSTEM FOR BARENTS AND KARA SEAS IN CONNECTION WITH THE MULTI-LEVEL ENVIRONMENTAL MONITORING OF MACRO-PROJECTS

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The interest to ecosystems of the Barents and Kara seas (BKS) increases recently in connection with (1) growing anthropogenic impact, including development of oil-and gas sector and construction of new ports, and (2) necessity to protect biological diversity of marine ecosystems. In our study, the case of BKS is used to exemplify construction principles for a hierarchical system of landscape- and biome-based regionalization ranging from local to global scales. The units of sea basin regionalization are regions, districts, and undersea landscapes. A special place in this system belongs to the concept of natural bottom complexes regarded as morphological units. The description of the spatial irregularity of undersea landscapes is based on distinguishing of the morphological units by vertical and horizontal partitioning. The variegated mosaic of the natural bottom complexes is formed over a rugged relief featuring combinations of rocky and soft grounds with different communities, constructed by macro-, meio- and microbenthos. Being a prerequisite for rational exploitation and protection of marine biological resources at different levels, developing of hierarchical regionalization system can be used for organizing the multi-level environmental monitoring of macro-projects – such as exploitation of Stockman gas field, and construction of Sabetta port complex.

P69. AVAILABILITY OF NUMERICAL MATHEMATICAL MODELS TO SOLVE THE APPLIED PROBLEMS OF WATER QUALITY MANAGEMENT OF SHELF ECOSYSTEMS

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The problems appeared during development and calibration of one-dimensional (vertical resolution) biogeochemical block of water quality model, are discussed. It is extremely useful in the initial stage of shelf ecosystems research because of its simplicity in as implementation as result interpretation. To describe the environmental parameters dynamics we used the Model for Estuarine and Coastal Circulation Assessment, which consists of hydrodynamic model; model of conservative impurity transport; chemical and biological model. The seasonal of biogenic elements and phytoplankton variability in the Sevastopol Bay is studied as an example.

P70. ON THE RESPONSE OF COASTAL PHYTOPLANKTON COMMUNITIES TO ANTHROPOGENIC AND CLIMATIC CHANGES

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The study is focused on assessment of phytoplankton community alterations associated to variation of nutrients loads in the Bulgarian Black Sea coastal area due to interaction of human activities and meteorological conditions and the sensitivity of selected phytoplankton traits to respond to environmental pressure. The analysis was based on array of environmental (nutrients, Secchi depth) and meteorological data and a suit of phytoplankton community features (phytoplankton numerical variables, taxonomic based metrics and biodiversity indices and an integrated phytoplankton index-IBI) over the period 2000-2014. Eutrophication index TRIX was used as an integrated measure of eutrophication level. The sensitivity of phytoplankton traits were analyzed employing RDA to disclose seasonal patterns of response to nutrients and the source of pressure, while the environmental variables were verified by PCA. Statistically significant correlations (RDA) were found between phytoplankton metrics and nutrient loads of different seasonal pattern associated to eutrophication origin. In summer most of the phytoplankton metrics were highly correlated to increased nutrient fluxes originated from the watershed, associated to episodic rain-storms events. The results show that climatic variables act as factors that modulate the anthropogenic nutrient enrichment patterns controlling phytoplankton growth.

P71. INDIVIDUAL VARIATION OF GROWTH AND FILTRATION RATES OF MUSSELS *MYTILUS GALLOPROVINCIALIS* LAM

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Research on individual variation of the filtration and growth rates of mussels was based both on the authors' field and laboratory experiments and literature data analysis. High individual variability of these characteristics was recorded during the tests. The coefficient of variation grew up as the mean rate diminished. Under low specific growth rate the coefficient of variation (ratio of root-mean-square deviation to the sample mean) could exceed 100 %. Tests revealed the power-law relation of the coefficient of variation from the average for studied characteristics. That relation could be seen in filtration and growth rate charts; it was also true for estimates of production energy and metabolic costs. The exponent varied from -0.36 to -0.77. Individual growth rate variation of mussels was concluded to be an important criterion of the favorability of environmental conditions.

P72. ASSESSING CORAL REEF RESILIENCE AND MANAGEMENT INTERVENTION IN THE WESTERN GULF OF THAILAND

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The mass coral bleaching events in 1998 and 2010 caused widespread coral mortality in the Western Gulf of Thailand. The assessment of coral reef resilience to global change is necessary however it is very difficult to investigate because of a lack of empirical ecological data. The present study aimed to quantitatively assess important ecological indicators and local threats to coral reefs at Mu Ko Samui, the Western Gulf of Thailand. The results exhibited that low percentages of live coral cover following the 1998 and 2010 coral bleaching events were observed at most study sites, including Laem Sed and Ao Thong Tanote. Low densities of coral recruits (<1.0 recruits.m^{-2}) were also recorded at most study sites. The analyses of ecological indicators in combination with threats to coral reefs, especially land-based pollution, tourism impacts and illegal fishing, resulted in proposed measures for coral reefs management interventions of those reef sites. The coral reef resilience varied among the study sites according to their community structure. This study implies that coral reefs at Ko Samui are relatively low resilient to global change, particularly coral bleaching events and impacts from coastal development, based on empirical scientific data. The long-term coral reef monitoring program is very important in the management of coastal resources.

P73. COMPARATIVE ANALYSIS OF THE INFLUENCE OF NATURAL AND ANTHROPOGENIC FACTORS ON THE VISTULA SPIT FOREDUNE EROSION (THE BALTIC SEA)

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The study gives quantitative estimation of natural landforms sensitivity of accumulative type coasts exposed to human influence. Foredune is an essential element of a morphological structure of thebarrier spits located at the Baltic Sea sand coasts. The study compares contribution of the beach erosion and deflation (soil drifting) to the foredune degradation on the sea shore of the barrier spit with or without the recreational impact. The analysis is performed for three typical polygons located on the Russian part of the Vistula Spit. Chosen polygons present shore segments with various intensity of tourism: visitors from the village, unregulated camp tourism, and nearly natural conditions.

Detailed geodesic survey was carried out on these three polygons (length 515 m, 265 m, and 521 m respectively; total area – 125000 m^2) in July of 2015. It was done with single-frequency geodesic GPS Trimble 5700L1 (base station) and TrimbleR3 (rover). Two DEMs were developed using the results of laser scanning of 2007 and the survey of 2015. Volume deformation for whole polygons and its particular parts (beach and foredune ridge) was made by comparison of the DEMs.

In the case of touristic load the effect of deflation is 5-15 times higher than the marine erosion of foredune edge. If not affected by an anthropogenic factor the foredune erosion is caused mainly by the sea, and its impact is 6 times higher than that of the natural deflation.

P74. MATHEMATICAL MODELING OF NUTRIENT LOADING FROM SMALL CATCHMENTS OF THE VISTULA LAGOON

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Vistula Lagoon as a part of the coastal zone translates nutrient load from catchment to the Baltic Sea. Catchments of the Primorskaya River (small settlements, mostly agricultural area, 120 km^2) and Banówka-Mamonovka River (transboundary catchment between Russia and Poland, relatively big settlements, food production enterprises, agricultural activity, 490 km^2) were selected as test ones for the Vistula Lagoon catchment (23 870 km^2).

Assessment of the retention of total nitrogen and phosphorus in the catchment and the transformation of nutrient load from anthropogenic sources while passing the catchment were studied by using open source numerical modeling tools. Initial data comprises the geomorphic characteristics, river net data, information on land use and nutrient point sources, time series of temperature, precipitation. Runoff was simulated by hydrological model HYPE considering the evaporation and infiltration into the soil. Retention and transport of nutrients were accessed using the model FyrisNP.

Source apportionment was made for the nutrient load discharging from both catchments to the Vistula Lagoon. The greatest amount of nutrients in final discharge is coming from the arable land (50-80%), point sources constitute a smaller proportion (5-30%). The results will be used to obtain the first order approximation of the nutrient load from other small rivers of the Vistula Lagoon catchment and from the biggest river in the area, the Pregolya River (15 300 km^2) by analogy.

P75. LABORATORY STUDIESOF THE OF EDDY FORMATION IN ROTATINGAND NON-ROTATING FLUID DUE TOSPATIALLY NON-UNIFORMWIND FORCING

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Laboratory investigation of eddy formation mechanism due to spatially non-uniform wind impact was fulfilled. Experiment was provided in a cylindrical and a square form tank filled with homogeneous or stratified fluid and displaced on a rotating platform. In the absence of the platform rotation, an impact of the single air jet lead to the formation of a symmetric vortex dipole structure that occupied the whole water area in the tank.In the presence of the platform rotation, a compact anticyclonic eddy was formed in a part of the dipole with anticyclonic vorticity, while in a part with cyclonic vorticity no any compact eddy was observed. The laboratory results were successfully compared with the field observation results fulfilled in the at the Black Sea coastal zone near Gelendzhik.

P76. ECOLOGICAL AND GEOMORPHOLOGICAL ASSESSMENT OF THE VULNERABILITY OF THE COASTS OF THE KARA SEA TO THE OIL SPILL

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International experience of oil spill response in the sea defines the priority of coastal protection and the need to identify as most valuable in ecological terms and the most vulnerable areas. Methodological approaches to the assessing the vulnerability of Arctic coasts to oil spills based on international systems of Environmental Sensitivity Index (ESI) and geomorphological zoning are considered in the article. The comprehensive environmental and geomorphological approach allowed us to form the morphodynamic basis for the classification of seacoasts and try to adapt the international system of indexes to the shores of the Kara Sea taking into account the specific natural conditions. This work has improved the expert assessments of the vulnerability and resilience of the seacoasts.

P77. THE IMPACT OF WIND CONDITIONS ON THE LEVELS OF TOTAL IRON CONTENT IN THE SEA OF AZOV

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The distribution and behavior of certain of trace elements in sea water is greatly affected by both physical, chemical and hydrometeorological conditions that are showed in the scientific works of prof. Yu.A. Fedorov with coauthors (1999-2015). Due to the shallow waters last factor is one of the dominant, during the different wind situation changes significantly the dynamics of water masses and interaction in the system "water – suspended matter – bottom sediments". Therefore, the study of the behavior of the total iron in the water of the sea at different wind situation is relevant. The content of dissolved iron forms migration in The Sea of Azov water (open area) varies from 0.017 to 0.21 mg /dm^3 (mean 0.053 mg /dm^3) and in Taganrog Bay from 0.035 to 0.58 mg /dm^3 (mean 0.11 mg /dm^3) and it is not depending on weather conditions.The reduction in the overall iron concentration in the direction of the Taganrog Bay → The Sea of Azov (open area) is observed on average more than twice. The dissolved iron content exceeding TLV levels and their frequency of occurrence in the estuary, respectively, were higher compared with The Sea of Azov (open area).There is an increase in the overall iron concentration in the water of the Azov Sea on average 1.5 times during the storm conditions, due to the destruction of the structure of the upper layer and resuspension of bottom sediments, intensifying the transition of iron compounds in the solution.

P78. ACCUMULATION OF PLASTIC FRAGMENTS AND MICROPLASTICS ON THE BEACHES IN THE SOUTH-EAST BALTIC SEA

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The sediment sampling from different areas of the beaches in the south-eastern part of the Baltic Sea (in Kaliningrad region) was executed for the purpose of studying the quantitative and qualitative composition of the microplastics particles (range 0.5-5 mm). Preference is given to those beaches that are exposed to maximum anthropogenic pollution. From June, 2015 to January, 2016, there were 14 expeditions along the coastline of the Baltic Sea (in Kaliningrad region) to collect experimental materials. The majority of samples were collected on the most recent flotsam deposited at “wracklines”, in the supralittoral zone. The primary examination of those samples revealed the presence of abundant microplastic particles of the required size range (0.5-5 mm). Quantitative distribution of microplastics in beach sediments was obtained in milligrams per gram of sediment and milligrams per m^2: on average 0.05-2.89 (mg per gram of sediment) and 370-7330 (mg per m^2), accordingly.
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P79. BOTTOM SEDIMENTS OF LAKES AND STREAMS OF DVINA BAY OF THE WHITE SEA COASTAL AREAS AS AN INDICATOR OF ANTHROPOGENIC IMPACT (BY THE EXAMPLE OF MERCURY POLLUTION)

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The article analyzes the data of expedition studies conducted by the team of the leading scientific school of Professor Fedorov Yu.A. in the Archangelsk region for more then 10-years period of researches. The materials of mercury content obtained for samples of bottom sediments sampled in the mouth area of the Northern Dvina River, the lakes of Arkhangelsk and the surrounding areas, at Dvina Bay and different areas of the White Sea. Based on the available data and having considered the results of the authors working on the subject of mercury pollution in the subarctic region, conclusions about the level of anthropogenic impact on water bodies and streams of the Arkhangelsk region are justified. Factors that contribute to the formation of relatively high and low concentrations of mercury in sediments identified. The effects of mechanical, hydrochemical, hydrological barriers analyzed. The natural background of mercury in the bottom sediments of the region revealed. Comparative analysis of the accumulation of mercury in the bottom sediments of the study area and other parts of the subarctic region realized. Opportunities and conditions for existence of the effect of "secondary pollution" discussed.

P80. CONCENTRATION OF HEAVY METALS AND OIL PRODUCTS IN THE SEABED SEDIMENTS OFF THE COAST OF THE CURONIAN SPIT (THE SOUTHEASTERN PART OF THE BALTIC SEA)

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During spring and summer (2014) environmental investigations of the sea coastal zone, conducted in the frameworks of the Baltberegozaschita (Kaliningrad) program, determinations of content of heavy metals and oil products in the bottom sediments along the shore of the northern coast of the Kaliningrad Region were performed. The highest values of their contents were found in the middle part of the Curonian Spit (near the border with Lithuania). According to Swedish classification WGMS 2003-SSQC these values correspond to the highest 4 and 5 Classes of Contamination. At the Curonian Spit, which is a protected area, unknown any significant sources of anthropogenic pollution. Supposedly, the origin of the detected anomaly is connected with influence of along shore bed load, directed from abrasive coast of the Sambia Peninsula along the Curonian Spit, to its middle part, where accumulation of sedimentary material is dominated. The shore of the Sambia Peninsula is much more populated and used for recreational purposes, and can therefore be considered as a possible source of contamination.

P81. OIL POLLUTION OF THE SOUTHEASTERN BALTIC SEA SURFACEAND POSSIBLE DIRECTIONS OF ITS PROPAGATION

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Ships, seeps from the seabed, municipal and industrial waste waters, and the atmosphere are the main sources of sea water contamination with oil and oil products. During the satellite monitoring of the Kravtsovskoe oilfield (D-6) (2004-2015) the area west of Sambia Peninsula and anchorage in front of entrance to Kaliningrad Sea Canal were localized as the most polluted area of the Southeastern Baltic Sea. Oil spill drift forecast from these areas with a help of Seatrack Web model (SMHI, HELCOM) has shownthat the average annual direction of oil pollution drift is directed to the North-East. In some cases, leakage of oil or oil products from ships west of Sambia Peninsula could be a reason of oil contamination of beaches of the “Curonian Spit” National Park.

P82. IMPACT OF NONYLPHENOL ON THE PHYSIOLOGICAL ACTIVITY OF FUNGI FROM THE COASTAL AREA OF THE GULF OF FINLAND

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Nonylphenol (NP) is the most abundant environmental estrogen listed as one of the priority hazardous substances in the Water Framework Directive (EC 2000) and the priority pollutant of Baltic Sea (HELCOM 2010). The present study aims to compare the effects of technical nonylphenol (tNP) on the cellulase, amylase and protease activity of the terrestrial fungal strains played a significant role in aquatic ecosystems due to their high adaptive capacity and a large range of functional activity. The study also attempts to understand the mechanisms behind the varying sensitivity of the terrestrial fungi to tNP. The fungal strains were isolated from the bottom sediments of the coastal area of the eastern part of the Gulf of Finland. The terrestrial fungi were identified based on their morphological characteristics and nucleotide sequence analysis of internal transcribed space region. One reason for significant differences in sensitivity to the toxicant studied among the fungi is the change in the fungalcell permeability, in particular in cell membrane permeability, induced by NP. Environmentally relevant concentrations of tNP cause significant changes in activity of hydrolytic enzymes in the terrestrial fungi *Aspergillus tubingensis, Penicillium expansum, Penicillium glabrum*, and *Cadophora fastigiata* involved in organic matter degradation in bottom sediments. There can be increasing or decreasing trend, depending on both the type of enzyme and the tNP concentration. The revealed changes may disrupt the destructive processes in bottom sediments, as well as succession and stability of microbial communities functioning in the aquatic environment.

P83. INTERANNUAL VARIATIONS IN BENTHIC FORAMINIFERA ASSEMBLAGES UNDER MARICULTURE SITES IN ALEKSEEV BAY (POPOV ISLAND, THE SEA OF JAPAN)

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Modern benthic foraminiferal assemblages in Alekseev Bay (Popov island), the Sea of Japan were studied during mariculture farming of Japanese scallop (*Mizuhopecten yessoensis*) and after its liquidation. Results of foraminiferal analysis pursued in period from 1985 to 2007 years show gradual changes in assemblage composition – increase of species richness from 86 to 107, number of agglutinated species from 2-3 up to 5-13 species and their distribution area under the mariculture. The most dominant families are Elphidiidae (*Cribroelphidium frigidum*, *Protelphidiumasterotuberculatum*, *Elphidium advenum depressulum)*, Discorbidae (*Buccella frigida)* .The most abundant agglutinated families are Trochamminidae и Ataxophragmiidae (*Trochammina inflata, Eggerella advena*).

P84. CLEANING UP EMERGENCY OIL SPILLS FROM THE WATER SURFACE WITH MAGNETIC ADSORBENTS

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There was suggested a method of obtaining a complex adsorbent with magnetic properties for the oil spill clean-up from the water surface by means of controlled magnetic field. As magnetic filler a finely-dispersed iron-ore concentrate in the form of magnetite, obtained by wet magnetic separation of crushed iron ore, was suggested. As an adsorbing component the disintegrating electric-furnace steelmaking slag, obtained by dry air-cooling method, was selected. The mass ratio of components slag: magnetite is 1(1,5÷2,0). For cleaning up emergency oil spills with the suggested magnetic adsorbent a facility, which is installed on a twin-hulled oil recovery vessel, was designed. The vessel contains a rectangular case between the vessel hulls with inlet and outlet for the treated water, the bottom of which is a permanently moving belt. Above the belt, at the end point of it there is an oil-gathering drum with magnetic system. The adsorbent is poured to oil-products layer from a hopper, provided with drum feeder. Due to the increased bulk weight the adsorbent sinks rapidly into the oil layer on the water surface. If the large non-floating flocculi are formed, they sink and sedimentate on the moving belt and are moved to the oil-gathering drum. The saturated adsorbent is removed from the drum surface with a scraper, connected with a gutter, with contains a rotating auger.

P85. EXTREME DETERIORATION OF WATER QUALITY AND FISH SUFFOCATION PHENOMENA IN THE MARINE ESTUARY

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The factors that provoke fish suffocation in an estuary, namely: natural (small river runoff, high air and water temperature, water stratification) and anthropogenic (regulation of river, etc.) were marked. Taking into account these factors the calculations were carried out and the possible areas of the Dnieper-Bug estuary, where fish kill of different scale and genesis is found out were identified.

P86. THE REGULARITY OF HEAVY METALS DISTRIBUTION AND BEHAVIOR IN THE BOTTOM SEDIMENTS ON THE PROFILE "NORTHERN DVINA RIVER – WHITE SEA"

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A study was conducted to investigate the level of heavy metals in bottom sediments of the Northern Dvina mouth area and the White Sea in various seasons since 2004. Of greatest interest for the study was presented as such heavy metals as Hg, Pb, Cd, Cu, Ni, Zn, Cr, which belong to the priority group of toxic elements. The heavy metals concentrations were determined with atomic absorption spectrometer. Also the grain-size composition, concentrations of organic carbon and values of hydrogen ion exponent (pH) and redox potential (Eh) in bottom sediments were determined. It was found that the levels of heavy metals in sediments significantly changed in the lateral radial direction. There is a tendency to increased concentrations of some heavy metals downstream of the river. The high concentrations of heavy metals were found within the influence of cities and towns. So the extremely high mercury concentrations were found in the sediments of small and shallow channels crossing the Arkhangelsk city. The study of heavy metal concentrations in the bottom sediments along the profile "the Northern Dvina - Dvina Bay - White sea" showed that the marginal filter contributes to the coprecipitation with suspended metals of anthropogenic genesis. These processes greatly reduce the contamination risk of the White Sea. Thus, the impact of the river on the ecosystem of the White Sea outside the marginal filter is significantly less.

P87. THE "MIZBERING" ZUIBAIJI RIVER CONFERENCE: A SEARCH FOR CONTINUITY IN THE ZUIBAIJI RIVER BASIN

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The Zuibaiji River located west of Fukuoka city has a rich natural environment and history but various problems as well. In order to solve some of these problems, stakeholders need to observe and talk about the river. Also recently, the "MIZBERING Project" has been opening up possibilities for renewing riverside uses of lost activities from the old days in Japan. This project is being conducted by citizens, companies and government administrations with an interest in waterside areas.
The First MIZBERING Zuibaiji River Conference was held to discuss the issues of the Zuibaiji basin. Its purpose was to visit and search out the nature and history of the entire Zuibaiji basin from its mountains to the sea and to rediscover the Zuibaiji basin, and finally to discuss future plans for the Zuibaiji basin and Imazu tidal flat at its outlet.
After visiting the Zuibaiji basin, we discovered a problem in that the Zubaiji Dam is holding not only water but also sand, and this problem affects the environment of the Zuibaiji basin such as its ecosystem and topography. Finally, we provided a venue for the local people to discuss problems and future plans for the Zuibaiji basin.

P88. RECOGNIZING ECOSYSTEM SERVICES THROUGH EDUCATION FOR SUSTAINABLE DEVELOPMENT THAT UTILIZES THE SEA IN THE REGION

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The relationship between people and the sea is weakening every year. We have conducted education for sustainable development (ESD) of the sea, aimed at deepening their understanding of the relationship between humans and the sea. We get method and we think that it can be a model to be implemented in other areas. The content of the lessons introduced on this occasion, we think that children were able to learn broadly about the ecosystem services of the sea, and became interested in the sea from many angles. we conducted more lessons, the willingness to take action by themselves has been nurtured.

P89. PERSPECTIVES OF THE PRACTICAL USE OF THE KIZILTASHSKY LIMAN GROUP

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The Kiziltashsky limans are the largest water bodies of land-to-sea interface zone of the Krasnodar region Black Sea coast separated from the Black Sea by Anapa bay-bar. Their territory is included in the Perspective list of the Ramsar Convention as a unique wetland of international importance. Currently, the main type of recreational use of the liman water area is active rest. A diversity of natural conditions, a small degree of economic transformation of the landscape in combination with good transport access makes it possible to combine the active recreation forms with health-improving rest at the Anapa resort. In the presented paper the different proposals for economic use of the Kiziltashsky limans are analysed in terms of influence to geoecosystem.

P90. ENVIRONMENTAL EDUCATION FOR SCHOOLCHILDREN IN A SEAWATER POND FOR CREATING A SATOUMI

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In 2006, Hyogo prefecture opened the "*Araihamakaze*" park on reclaimed land leased with cooperation from some companies, and set up a seawater pond called "*KonourafunaIke*"in the park.The initial plan was to make this seawater pond into a *Satoumi*, but since the water in the pond was stagnant, algae flourished making it uninhabitable for other living creatures. The authors conducted investigative research to implement activities for improving the environment and popularizing the park. This report is a summary of the results obtained and challenges faced while conducting these activities in the area over one year, which included involving the local schoolchildren in constructing tidal flats.

The answers to the questionnaire revealed that schoolchildren understood that the nutrients in the seawater pond "go round and round" through the food chain and are utilized by living creatures. They realized that this process is called "circulation."To the question, "Do you want to develop tidal flats?" 9 of the 10 children answered YES. However, only 50% of the children understood that a measure to prevent the degradation of the environment of the seawater pond is to "Construct tidal flats," which suggested that there is a need to correlate the issues and the solutions to enhance their understanding.

P91. THE EFFECTS OF A SEASIDE ENVIRONMENTAL EDUCATION PROGRAM FOR PRESCHOOL CHILDREN AS SEEN IN THE CONTENTS OF BEFORE-AND-AFTER DRAWINGS

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In this study, an environmental education program for preschool children was conducted at the seaside, and its effects were evaluated by examining pictures of marine environments drawn by the children before and after the program. The purpose of the education program was to heighten children's levels of interest in the sea, encourage them to perceive the seaside as a space for play, and increase their familiarity with it. When the children's pictures drawn before and after the program are compared, the most striking difference is whether or not people are included in the picture. Of the 16 kids who drew both pictures, only one put a person in the picture before the program, but this increased to six afterward, and five of these depicted "sea animals and me" together. There was also one who drew "sea animals, my friends, and me," and another who drew a four-panel comic strip telling a story. In addition, eight of the 16 children drew living things small and weakly beforehand, but more powerfully and dynamically afterward. As we have seen, the hands-on seaside experience during this education program acted on five senses and caused a change in their internal mental models. It also enabled them to perceive a connection between the sea and themselves, and in some cases to understand and express the relationship between human beings and the sea and between other children and themselves. In future studies, we intend to increase the number of case studies of this type of program.

P92. POSSIBILITIES OF IMPLEMENTATION IN THE SPANISH COAST, OF COMMERCIAL AND PRE-COMMERCIAL WAVE ENERGY TECHNOLOGIES

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This paper presents an initial analysis of the technical viability, of the application for the commercial and pre-commercial wave energy technologies, to the Spanish coasts. This analysis provides an optimal framework for future research, choosing one technology and considering a concrete point of the Spanish coast, with their respective constraints such as, the regulatory aspect of the fees to be applied to such technology, and the restrictions related to the protection of the ecosystems, and other local activities not compatible with the technology.This work is continuing the initiative started by the Project Enola. Enola is a software that provides comprehensive and complete information, about the potential electric production, based on wave energy of the Spanish coast. After evaluating all the wave energy technologies available at this point, those more mature and viable have been selected; the parameters under which they are productive have been analysed; and the ideal areas for implementation on the Spanish coast have been determined, according to the potentials provided by Enola and the technical limitations of the technologies themselves. The results is a summary document where one can easily identify the best locations for the deployment of wave power plants (optimum output).

P93. A NOVEL WAVE ENERGY CONVERTER

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Within the frame of the sustainable use and development of coastal resources and the fight against the climate change, a technologic development essay is released, focused on a novel wave energy converter.
The enormous wave energy potential, has not been used successfully by the humanity, so far. The lacks on the existing technologies in the current technique are mainly the lack of the regularity in the electric generation and the low power supplied. In order to improve these aspects and after an exhaustive revision of the prior art, a novel wave energy converter is released. The converter module, is characterized by a vertical detachable movement.
This converter allows obtaining an enormous gravitational potential, then transform it into electric energy, independently of floating part of the converter.
A converter module is basically: structure attached to the seabed; a watertight casing that contains an active mass and a generator; a float; a coupling/detachment system that allows the detachable movement of the converter, and a computer in charge of the procedure. The function is divided in two phases: ascent and descent-generation. In the ascent phase, coinciding with the ascent of the wave, the float and the active mass ascent in union, when the active mass reached its highest gravitational potential, the float is detached of the rest of the module. In the descent phase, the gravitational potential of the active mass, is extracted as electric energy.

P94. ENVIRONMENTAL EDUCATION: LEARNING THE CYCLE OF LIFE BY CONNECTING SEA AND SOIL OF AMAGASAKI

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In order to remove the excessive nutrient salt at Port of Amagasaki, we have established the method to utilize the cycle of life: by cultivating seaweed at the port, removing shellfish from the upright sea walls, and turning them into compost. In cooperation with the local junior high school students, local citizens, experts, and administration, the junior high schools of Amagasaki provided the environmental study through this activity, based on the theme of "Cycle of Life". In this report, we describe about the effects of this study. 1) Before the study, a survey showed that most of the students had bad impression toward Amagasaki Sea, such as "dirty" and "smelly". However, after the study, the impression turned into better impression such as "fun" and "more familiar". 2) In the Technology class, the students successfully cultivated more than 50 kinds of vegetation. As the students cooked and ate the vegetables and fruits they grew, the study also developed into "Food Education"-learning the connection between their health, environment, and food. 3) The students cooked using the oil extracted from the seeds of rape blossoms cultivated with their compost. Then they watched waste oil being refined and turned into bio diesel fuel, which activated car engine. Through such experiences, many students realized the cycle of life as "the life continues in different forms", and the respect for life as well as developing their awareness to improve the natural environment.

P95. DESIGNING AN EFFECTIVE ACTION PLAN FOR SUSTAINABLE LOCAL RESOURCES AND THE COASTAL ENVIRONMENT: A CASE STUDY OF MITSU BAY, HIROSHIMA, JAPAN

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"The Healthy Plan of Enclosed Coastal Environments" was a project implemented from 2011 to 2013 to design an effective action plan for restoring a healthy environment in Mitsu Bay, Hiroshima, Japan. After collecting and analyzing natural and social background information, two controversial issues associated with the bay's ecosystem were identified: a decrease in oyster production that may be due to oligotrophication of the bay, and deterioration of sediment quality caused by oyster culture. Four mitigation approaches were proposed by the committee and their effectiveness was evaluated using numerical calculations. An application of hot air-dried oyster shells (HACOS) to the sediment was considered the most effective measure, because the remediation of sediment quality by adsorbing hydrogen sulfide may increase benthos biomass and fisheries production. Improved conditions were estimated to continue for 10 years. The application of HACOS is easy for fishermen, and is very cost effective because it is a by-product of extensive oyster culturing in the bay. Thus, the approach is also considered advantageous for establishing a recycling-orientated community. The effective action plan for sustainable fisheries and restoration of the environment outlined in this study is proposed as a leading model of design and implementation.

P96. INTEGRATION OF COASTAL ZONE DATA INTO THE BLACK SEA GIS

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While creating the Black Sea GIS, the primary attention was paid to selecting free and platform independent software capable of providing necessary functionality and to possible extending the system with new data and facilities. To use coastal zone data, a special module was developed. At present, it includes data for the coastline of about 105 km from Magry to Adler. These data were obtained in SB SIO RAS and transferred to MHI data base in framework of their joint activities.

P97. IDENTIFICATION AND PRIORITIZATION OF HOT SPOTS IN MANAGING RISKS TO BLACK SEA COASTAL REGIONS

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In implementation of the Bucharest Convention (http://www.blacksea-commission.org/), the first regional List of Black Sea (BS) Hot Spots (HSs) has been prepared in 1996. It included municipal and industrial sources of pollution located in the BS coastal zone. Since then, the regional HSs List has not substantially changed, although a few non-harmonised revisions have been undertaken at national levels. The non-harmonization occurred due to the lack of an agreed regional methodology, which would clearly specify the term 'hot spot' and give criteria for HSs identification and ranking in support of decision-making in BS protection.

Recognising this gap in the knowledge-based management of BS land-based sources of pollution (LBSs), in 2015we developed such a methodology and undertook revision of the regional BS HSs List. To automate the HSs Methodology application we developed a unique BS LBSs Database and a HSs software.

This paper presents our approach to hot spots evaluation, which is applicable to any other sea. Results of identification and prioritization of BS HSs are discussed in view of their crucial role in managing risks to coastal regions and in investment planning aimed at reduction of BS pollution.

P98. SUSTAINABILITY IN THE FUTURE DEVELOPMENT OF THE MARITIME TRANSPORT IN CUBA

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The change in the present conditions and the end of the United States embargo to Cuba is expected that is going to produce a big deal transformation in the whole production system. Cuba as an Island is bound to use the sea as the main way of transportation. That means that a huge increase in the use of the coastal waters as well as in the lands that will be occupied by the new ports facilities. This paper will deal with a modelization of the future development of the maritime transport and the effect that it will cause to the population and the environment. Different scenarios are going to be considered and an assessment of the affection of each one is going to be analyzed. The aim is to balance a legitimate future development that the population deserves with the preservation of the enormous value of the Cuban natural maritime assets.

P99. THE THEORETICAL BASES OF PORT AREAS AND ACCESS CHANNELS DEPOSITION CALCULATION

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The paper discusses the configuration options of port waters and channels affected by deposition in coastal flow of sediment transport (with/without waves). Performed typing the possible configuration options structures, hydro- and litho-dynamics conditions that lead to reducing the depth of areas and channels. Proposed the engineering method of port areas and channels deposition calculating depending on their configuration, nature and intensity of currents.

P100. THE FEATURES OF BIODESTRUCTION PROCESSES OF THESURFACES OF HYDRAULIC ENGINEERING CONSTRUCTIONS

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The surfaces of building materials of hydrotechnical constructions undergo the process of algae biofouling. The degree of damage depends on the environmental factors that are affected by the level of anthropogenic load areas. Modeling the biofouling process of concrete with algae under laboratory conditions has allowed determining their impact on the building material, accompanied by changes in chemical and mineralogical composition of the surface of products. The microscopic examination of sample's surfaces and evaluation of the effectiveness of various ions leaching from building materials shows the results of "algal attack" related to the acceleration of biodegradation of materials under the influence of aggressive metabolic products, mechanical action neoplasms, creating optimal conditions for the development of subsequent aerobic microbial decomposers. To clarify the nature of chemical processes in the system "algocenosis – concrete" the changes of chemical and phase (mineralogical) composition of the surface layer of concrete sample were studied. The effect that algae produce on hydraulic engineering constructions is due to the fact that these organisms, belonging to phototrophs and standing at the beginning of the food chain, initiate new microbial growth.

P101. SCENARIOS FOR AN EXPANDING DEMAND OF TOURISM ON THE COASTS OF CUBA

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The opening of relationships between United States and Cuba could be a drive for a huge increase in the affluence of tourism to Cuba and especially to the coast areas. Cuba has been for many years an important tourist destination for people from many countries, but almost forbidden for US citizens. The proximity of the USA, its amount of population as well as their great acquisition power will increase in a very substantial way the demand for accommodation and other uses in the proximity of the coasts. There will be a need to implement a package of measures that reduce the impact of such sudden increase in the coastal line. On the other hand that augment in tourism could be an opportunity to improve the standard of life of Cubans. The consideration of different possibilities of such development, the analysis of the damages that each one could cause as well as the measures that could avoid, ameliorate or compensate such effects are the goals that are going to be presented in this paper.

SSP MEETING PRESENTATIONS

P102. INFORMATIONAL SUPPORT FOR COASTAL FORECAST DEVELOPMENT OF RUSSIAN TIDELESS SEAS

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The goal of the accomplished work was provision of information to the project, targeted at study of forming and evolution processes of accumulative shore forms of tideless seas of Russia under the effect of hydro-, litho- and morphodynamic factors. Project is accomplished by a team of specialists from leading Russian research institutions from year 2014 onwards. Main element of saving research results is information-analytical complex, which is found on the Internet at http://cofore.coastdyn.ru/index_eng.html, consists of static and dynamic modules, system of statistical analysis and management and protection of created resources. Information sources for information-analytical complex consists of: existing databases of reference data from Institute of Oceanology, material gathered from long distance and on-site observations over dynamic of coastal waters and sedimentary transportation; material from conferences and open publications. As project develops it is planned to keep developing complex with new research data and relevant publications.

P103. THE CHESTER RIVER WATERSHED OBSERVATORY: A TEST BED FOR WATER QUALITY MONITORING TO TEST LAND USE PRACTICES, MANAGE LAND USE, AND ENLIST CITIZEN INVOLVEMENT

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Good watershed science is founded on good spatial and temporal data. Improved watershed management depends on utilization of data for multiple purposes. Buy-in to the watershed management plan improves with involvement of an educated community. The Chester River, located on the eastern shore of the Chesapeake Bay has been positioned to serve its watershed population and be the best understood river in world. The affiliated education program, Rivers to the Bay, is exportable to any "schoolshed" globally. A "Schoolshed" is defined as the schools within a given watershed.

Managing enclosed coastal seas starts with the expense of monitoring. The Chester River Watershed Observatory, employs an array of Basic Observation Buoys (BOBs) that record water temperature, salinity, dissolved oxygen, turbidity, and pH data. Each buoy costs about $10,000 (US). The DMAC quality data is automatically plotted on www.maracoos.org. The buoy data is augmented by strategically positioned Weather Stations. The Data Portal feeds the watershed website, www.crwo.org. This URL is a universal reference that supports users from educators of all levels, political leaders, policy writers and scientists, from amateur citizen scientists to professionals (including academics).

This site is not geared towards advocacy. It is where users can gather information and data to apply land use practices, techniques, technologies that can be used to measure or improve the water quality in a given watershed.

P104. MONITORING OF COASTAL ECOSYSTEMS BY METHOD OF REMOTE SENSING IN THE SHORT-WAVE RANGE OF RADIO WAVES

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A new method for estimating the parameter noncoherent signal/noise β_K of ionospheric signal is offered. A comparative analysis is carrying out. This new method exceeds an order of magnitude widely used standard one by analytical (relative) accuracy of determining a parameter β_K. It has the same order as the well-known coherent methodology.

P105. THE LANDSCAPE INVESTIGATIONS AS NECESSARY PART OF BIOLOGICAL STUDY IN THE COASTAL ZONE

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Coastal zones have great diversity of resources. The shallow water zones contain the most of plant and benthic communities. A description of relief and type of ground is needed for the rigorous monitoring of biota and environmental condition of coastal zone. Generally, on the basis of these data the investigation methods of the coastal zone are selected. The shallows research strategy has been developed by us for northern part of the Lake Ladoga. If the coastal areas are characterized by great depth and flat topography, then sonar's can be used to describe them and samples of ground can be taken by bottom grabs. In the Lake Ladoga these methods don't operate correctly by reason of the compound bottom relief and the fact that a sizeable part of the bottom is occupied by hard ground. Therefore, our investigations base on the diving transect method of Golikov and Skarlato (1965). A diver moves along transects. He registers the depth, length to coastline, water temperature, relief and ground, edificators and records video. In the laboratory all these data are decoded and used for mapping of bays. Studies of plant communities have been performed and strategy for research of benthic communities in complex relief and hard ground conditions has been developed based on the descriptions of shallow waters. Description of the Malay Nikonovskia Bay bottom has given an opportunity to estimate changes in the bottom of the bay under the influence of the trout farm.

P106. VIEWPOINTS OF THE CHESAPEAKE: INFLUENCING LOCAL AND GLOBAL CITIZENSHIP IN THE FACE OF CLIMATE CHANGE

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Within the Chesapeake Bay region there is a spectrum of perspectives regarding climate change despite the immense and scientifically acknowledged ramifications it holds for the region and its people. Students attending Washington College in Chestertown, Maryland explore these perspectives through a 16-week experiential program each fall, called the "Chesapeake Semester". This immersive program emphasizes interdisciplinary coursework, ethnographic studies, field experiences, and a comparative study in the Caribbean. Through analysis of our interactions and personal experiences from two consecutive Chesapeake Semester programs, we identify key perspectives, discern the implications of diverse stances when preparing for the consequences of climate change, and address how this knowledge influences both local and global citizenship. The authors explore the potential reasons for the incongruous perspectives in the Chesapeake region and Caribbean as well as compare the advantages and obstacles that result. We seek to understand these attitudes for the purpose of preparing for the imminent effects of climate change and conclude that while diverse perspectives often lead to rich cultural heterogeneity, misinformation can stymy necessary social and environmental awareness necessary for effective policy formation.

P107. WORKING COOPERATIVELY WITH SCHOOL SYSTEMS TO INTEGRATE CLIMATE CHANGE EDUCATION WITH A LOCAL CONTEXT INTO SCHOOL SYSTEM CURRICULUM

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In the Chesapeake Bay watershed, Audubon has worked with local school systems to integrate climate science units into upper elementary and middle school curriculum. Pickering Creek Audubon Center worked closely with public schools to implement grade-wide climate programming with students in fifth and sixth grade. Through participation in the Maryland and Delaware Climate Change Education, Assessment, and Research project and the National Oceanic and Atmospheric Association's Climate Stewards Education Project we are sharing these successes with statewide partners and working towards implementing climate change curriculum more broadly across the state. Through academic and teacher professional development programs, Pickering Creek Audubon Center educators train teachers on integrating climate science into their current lessons and review and collaborate on parts of the program teachers will lead in the classroom. Students are connected to climate change through a series of engaging in class and field activities over the course of several weeks. With the term "global climate change" making climate change seem more like a global problem and less like a local problem, Pickering Creek educators use wetlands and birds as examples of local habitats and wildlife impacted by climate change. Through these lessons led by Pickering Creek Audubon Center educators and augmented by material covered by classroom teachers, students get a thorough introduction into the mechanism of climate change, local impacts of climate change on habitats and wildlife, and actions they can take as a community to mitigate the effects of climate change.

P108. FROM AMAGASAKI TO THE SETO INLAND SEA AND THE WORLD: HIGH SCHOOL STUDENT ENVIRONMENT NETWORK

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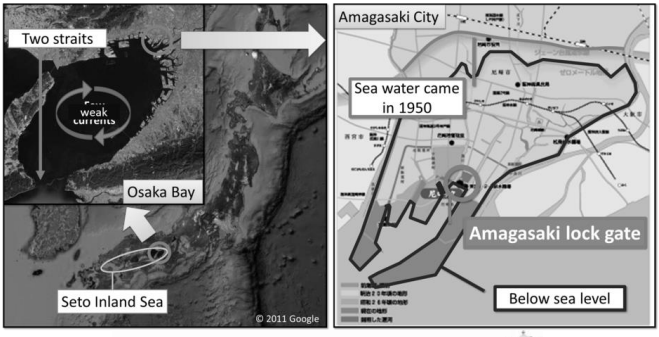
Purpose

The sea around Amagasaki is in the deep part of Osaka Bay and the Seto Inland Sea. The water quality and environment here is especially bad, compared to that of the rest of Japan. We have been researching the water quality and studying ways of water quality improvement to reconstitute the beautiful sea of Amagasaki. However these environmental problems are not only happening in this one place but also in many other seas. So we have to solve the environmental problems of the sea with the cooperation of everyone. Therefore we have built a network of high school students living on the coast of the Seto Inland Sea of Japan. And now we are considering the environment of the local sea and are working actively to help it.

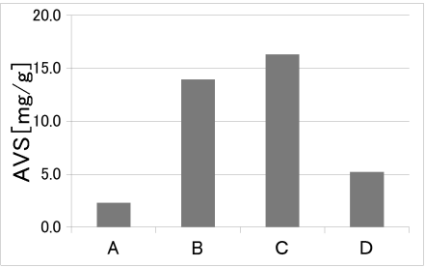


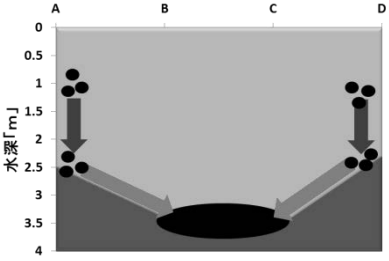
Researching the water quality improvement

The Amagasaki Canal is partitioned off by a lock gate. So its water quality is especially bad compared to that of the rest of the sea around Amagasaki. Creatures are largely damaged by eutrophication in the Amagasaki Canal. Creatures die due to blue tide pollution, and their carcasses become sludge. The sludge makes the water become oxygen deficient. This is a vicious cycle happening in Amagasaki Canal.

We examined the poor oxygenation there to seek a measure for water purification. In particular, we are focusing on the low layer sludge, which causes water problems. We examined the present state, distribution, and the relationship between the sludge and the water. Based on the results, we considered the creation process of the sludge and how to improve the present situation.

We found the causes of biological death by researching the water quality. The case is that oxygen deficient water, which occurs in the low layer during summer, comes up to the surface due to a change in the density current, and then all layers of the Amagasaki Canal become poor in oxygen in the autumn.





The shape of the bottom of the Amagasaki Canal has a central trough. And the amount of sulfide in the center sludge was large. From this fact, we have concluded that dead shellfish at the end of the Amagasaki Canal remain there and become sludge, after that it would collect in the center of the canal.

We found the sulfide of the sludge reached its maximum levels in autumn, and that from summer to autumn the sludge was created, in winter it would settle down again. We examined the relationship between dissolved oxygen and sulfide, whereupon we found a negative correlation (correlation coefficient -0.72). If we can reduce the

amount of sludge, we can also reduce the blue tide. We think dissolved oxygen is the key to the reduction of the sludge.

From Amagasaki to the Seto Inland Sea ~working on a high school student forum~

Environmental problems of the sea are not only local but also global. So cooperation with other areas can help solve this problem. We thought that cooperation with students living in other areas and working together on environmental improvement, such as in the sea around Amagasaki, could extend the approaches of researching the Amagasaki Canal. So we organized the high school student network named "High school Student Forum for the purpose of thinking about the environment of the Seto Inland Sea".

High School Student Forum

We are managing this organization, researching the water quality or living things, and thinking about the environment comprehensively together. Moreover we organized the student executive committee of seven high schools. It made a plan and manages a high school student forum. We'd like to do something for the environment of the Seto Inland Sea together and conduct joint research. In addition we held a study meeting named "science work shop" to promote joint research, and we discussed problems based on the result of our joint research.

Joint research

In the last fiscal year we examined marine litter where we learned about micro-plastic waste. So the theme of this year was "micro-plastic waste". Micro-plastics are the plastics which are weather-eroded to a size of less than 5 millimeters. At first we did not notice them because they are so small. But we have noticed that they have some risks. Micro-plastic waste is likely to become attached to living things. Then, these living things might swallow the micro-plastic by accident.

We found there were lots of them away from the water's edge. This kind of plastic varies according to the area. For example there was a lot of polyethylene or styrofoam and so on. We think they have something to do with location. In our discussion someone said that we should make more people aware of this problem. We'd like to continue researching the micro-plastics and to conduct educational activities.

Fig.4 High school forum activities

Summary

If we can solve environmental problems of the local sea, we may be able to solve environmental problems of the world's seas. We hope that our actions in the sea around Amagasaki will spread as a network of high school students living on the coast of the Seto Inland Sea. Moreover I am eager to develop this network as the world high school students' network, where we can study about closed water areas and to solve environmental problems of the world's seas.

P109. REFRAMING THE CLIMATE CHANGE CONVERSATION: USING VALUES, EXPLANATORY CHAINS AND METAPHOR TO INCREASE PUBLIC UNDERSTANDING OF CLIMATE CHANGE

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Sea level rise caused by climate change is a significant threat to communities in the Chesapeake Bay watershed. Audubon, in conjunction with NNOCCI, has crafted a locally applicable methodology for successfully sharing climate messages with the public.

If enough voices are trained in proven climate communication techniques, the discourse around climate change will change to be productive, creative and solutions focused. Climate communicators and scientists frequently encounter two pitfalls. The first is assuming people have any understanding of climate science. Although studies indicate many feel it is an important issue, many are largely misinformed about the causes and ramifications of climate change. The second is the tendency to talk about climate in the context of unproductive cultural models. A good example of this is graphically highlighting the dire situation that is faced by polar bears, humans or other species, which lead people to quickly disengage from the issue as "too big and scary to deal with."

Through the use of solid explanatory chains, good climate communicators can fill cognitive gaps and avoid unproductive cultural models. Skilled framers direct the conversation towards helpful cultural models and explain climate issues through step-by-step cause and effect and strategically deployed explanatory metaphors. Skilled framers start the conversation with solutions in mind.

P110. GEOECOLOGICAL CHARACTERISTIC OF THE CHEBOKSARY RESERVOIR COAST

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Construction of Cheboksary hydroelectric power station with a reservoir was begun in 1968 and was stopped in 1981. The hydrostation was put into operation when filling a reservoir to a mark of 63,0 m with incomplete construction of protective actions. As a result of rise in level of the Cheboksary reservoir to 68,0 m territories of the Nizhny Novgorod Region, the Republics of Mari El and the Chuvash will be flooded.

Operation of the Cheboksary reservoir within 33 years on a temporary mark of the retaining level of 63,0 m promotes further development of possible negative impacts and deterioration of life of the population in points of accommodation getting to a zone of influence of a reservoir.

In work problems of influence of the Cheboksary reservoir on the nature of adjacent territories are considered. The analysis of influence of natural and technogenic factors on the Cheboksary reservoir is submitted. Comparative research of the territory of a right bank and left bank on studying of hydrological and hydrogeological processes and processing of coast in a zone of influence of a reservoir on key points is conducted. The state is considered recreational development of the territory. Features of a current state of technical objects of the Cheboksary reservoir are defined, the geoecological situation on coast of a reservoir on the studied key sites is revealed. Recommendations about decrease in negative impact of recreational use of coastal zones of a reservoir are developed.

P111. THE INFLUENCE OF SEA ICE ON THE SEA COAST OF SHANTAR ISLANDS

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The Shantar Islands is the group of islands satiated in the Sea of Okhotsk near the exit of Uda Bay, Tugur Bay and Ulban Bay. The islands separated from the mainland and started to exist only 6000 years ago. It happened under the influence of the sea transgression followed by flooding of some parts of the land surface and isolation of the most elevated mountain parts from the mainland.

The climate of The Shantar Island is more severe than the climate in the North part of the Sea of Okhotsk due to its proximity to cold regions of Yakutia, complex system of wind and tidal currents, the duration of the ice period, loads of fog and frequent storm winds. The height of tides on the islands can reach 8 meters, and these tidal currents are considered as one of the fastest tides of the World Ocean.

The ice near the islands appears in the beginning of November and doesn't melt for 8-9 months, usually, till mid-July, but some years - till mid-August. Such severe ice conditions cannot be observed anywhere else in the Sea of Okhotsk.

The variety of forms of the Shantar Islands is a consequence of severe ice conditions, unusual tidal currents and irregularity of the seashore. The most important seashores forming factor is considered to be the activity of sea ice.

P112. ABNORMAL STATE OF THE NORTHERN SEGMENT OF THE VISTULA SPIT

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For a long period of time, the seashore has been eroded and the front dune has been intensely degrading in the area of the Vistula Spit south of the Baltic Strait, connecting the Vistula Lagoon and the Baltic Sea. This leads to the fact that Kosa settlement which is directly behind the front dune gets flooded during the storm events. The settlement was already flooded three times - in December 2011, January 2012 and December 2013. This article aims to provide a substantiation of the critical condition of the northern segment of the Vistula Spit seacoast.

P113. WINTER SEASON BEACH WIDENESS AND SAND GRAIN SIZE VARIABILITY ON THE WESTERN COAST SITE OF KALININGRAD REGION (SOUTH-EASTERN PART OF THE BALTIC SEA)

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It is important to monitor beach changes to answer the questions: does the beach is eroded or not; does it need protection or not.
Our observations were carried out on the western shore of the Sambian Peninsula near Donskoe village in winter of 2014. The beach width was measured and the sand samples were taken once a week for 8 weeks (from January to March). Grain-size of the sand was determined by special sieves with a certain mesh size (2.0, 1.0, 0.5, 0.2 and 0.1 mm.)
The research made clear, that the beach width and sand particles size near the shoreline changes. Firstly, the beach width grows; after that it began to decrease gradually. The waving during the observations was weak, so waving is not a cause for changes. Probably, the main reason for beach growth was aufeis bar, which was protecting the beach from wave erosion. Later, air temperature increase caused the aufeis melting, so the beach width began to narrow slowly.
First samplings in January showed medium and fine sand predomination. This is because the aufeis bar protection role. When the aufeis bar was melting, fine and medium sand was washed out, and began to dominate large particles.
Our measurements showed that the beach is very variable in the winter, and its status should be monitored not 1-2 times a year, but more often.
The research was done with the help of scientists from the Atlantic Branch of Shirshov Institute of Oceanology of Russian Academy of Sciences.

P114. CHARACTERISTICS OF THE CLIFF PLANT COMMUNITIES OF THE TUAPKHAT MASSIF

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Preservation of biological diversity is necessary for sustainable development and rational use of coastal resources. In this paper structure of the cliff plant communities of the massif Tuapkhat (the Black Sea coast, Russia) are characterized. Flora of this coastal zone combines features of Mediterranean and middle European Russia types. Herbaceous and shrub life-forms and xeromorphous and petrophilous plant associations dominate at the studied area. The main factor determining the species composition of the examined communities is substrate character.

P115. "TSUNAGARUKA" PROJECT, CONNECTION AMONG FORESTS, RIVERS AND THE SEA FOR THE SOLUTION OF SEAFLOOR LITTER PROBLEM

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The problem of pollution on the seafloor of the Seto Inland Sea has not improved due to the fact that few people are aware of the problem, the invisibility of the litter, and shortage of garbage collectors. People don't take it as their own problem because they don't know that 70%of the litter on the seafloor contains plastic garbage, to larger items like bicycles, engines, and discarded every day appliances like washing machines and refrigerators which shows that the problem is closely related to our lives. As the enclosed coastal sea is greatly affected by its surroundings, it is critical that people who may affect it should correctly understand the current conditions in the sea and take proper actions.

To grasp the level of understanding of the litter problem, we asked residents along the Takahashi River, a major river flowing into the Seto Inland Sea, and those living in the coastal areas to answer questionnaires about the seafloor litter problem. The result I found was that the further from the sea residents lived, the less knowledge about the problem they had. I noticed that the towns far from the sea rarely had events to learn about seafloor litter as it was not important enough to them to be considered, while the coastal areas did have such events more often.

I also studied the characteristics of the seafloor litter more closely to identify where each piece of litter came from. I did research in the upper river basin and the coastal areas. Naturally, I found much litter from the coastal areas, but I also found quite a lot of litter broken into small pieces from the upper-river basin that flowed into the sea. It was confirmed that reduction of litter in the rivers is one of the key factors for the solution of the seafloor litter problem.

Explaining at the museum

Therefore I moved on to the next phase of our activity called *Tsunagaruka*, which literally means 'connection' in Japanese. Our activities include a simultaneous litter reduction challenge targeting the upper river towns and the coastal regions to raise awareness that forest, rivers and the inland sea are interconnected. I had campaigns for people in the different regions to share the information at grass-roots levels so that the entire region became interconnected to solve the problem together. I conducted educational presentations in the forest and river areas and the coastal areas, collected seafloor litter together with people from
various towns, exhibited posters in museums even on the opposite shore island of Shikoku.

I am confident that our activities strongly connected the residents in broader areas than before, and people's attitudes towards the environment of the Seto Inland Sea changed positively no matter where they lived.

Our activity which started from a small area has spread and is becoming more influential. Our idea is becoming a movement. Communities are coming together to solve the seafloor problem hand in hand. I hope that our efforts around the Seto Inland Sea can be mirrored by communities around the world.

P116. THE ANTHROPOGENIC IMPACT ON THE COAST OF THE KALININGRAD REGION

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The degradation of the coast Sambian demi-island is a natural process. The first attempts to delay the movement of sand by means of bank protection works were undertaken in the first half of the 20th century. This accelerated the process of flushing the sand, and the destruction of the original coast. None of the ensuing construction did not benefit, only worsened the situation. New technological solutions embodied in the Kaliningrad coast in the last 5 years, followed by the ideology of "confrontation" natural processes and produce, to date, the opposite effect. The situation with the destruction of the coastal zone is compounded every day. The only possible solution to the problem of formation of a sustainable coastal zone - a combination of modern technology with the coastal dynamics.

TO THE QUESTION OF THE IMPACT OF CLIMATE CHANGE ON THE ECOLOGICAL STATE OF ARTIFICIAL PLANTATIONS OF PITSUNDSKAYA PINE IN THE SEASIDE AREA OF GELENDZHIK

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Gelendzhik is the resort town, there aren't a lot of industrial enterprises here. The main pollutant is transport. The work purpose is the assessment of a condition of the artificial landings of a pine located along the Federal highway "Don" and landings, which is nearly the sea coast. Researches were conducted to a standard technique of the General vital state (A. S. Bogolyubov). The assessment of a condition of pines was carried out during 6 years: from 2010 to 2015. For carrying out research we used 6 experimental grounds on the Markotkhsky spine and 2 control grounds within the town. We investigated 24 trees on each platform, middle age of the trees were 30 - 40 years. Results. 1. The condition of trees in the pine forests located in immediate proximity with the Federal highway "Don" (No. 1, 2, 3) is unsatisfactory. As even weak influences of the majority of atmospheric gaseous pollutants (sulphurous gas, nitrogen oxides, etc.) give effect of a necrosis and hloroz of pine needles, the condition of pines is connected with technogenic pollution. So near the Federal highway "Don" the air environment is strongly polluted by exhaust gases. Information of 2012 confirm that negative influence of the route on Markotkh's vegetation decreases at reduction of load of the route. 2. On the sites located above on a slope (No. 4,5,6) thanks to remoteness and the wind mode intensity of influence of pollutants is lower and a condition of pines the quite satisfactory. 3. Trees on the sites located near the sea (No. 7,8) are in a good shape. Small deterioration of a state is noted in very droughty years. Conclusion. Results of six years' research show that the condition of the plantings which are in close proximity with the road worsens. It is explained by increase in intensity of the movement on the road, especially during a resort season. Gelendzhik is the city with a good ecological shape, but the damage to environment is already caused. If

not to take measures, we can lose a unique part of the nature in the future, recreate it will be impossible. Measures of reduction of negative impact of exhaust gases were offered. Results of researches are transferred to ecological department of the City administration of Gelendzhik.

RECREATION RESOURCES OF COASTAL ZONE OF RUSSKY ISLAND

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Russky Island is located in the Peter the Great Gulf near the Vladivostok, Russia. It has 18 km at length and 13 km in width. Areal size of Russky Island is about 102 square kilometers. There are 859 plant species you can see here. Also we have a great opportunity in development of eco-tourism at the Russky Island. The most interesting recreational resource is beaches. There are 136 beaches in the island. Total length of those beaches is about 101 km. We can separate it to the 3 category: the most valuable (25.2 km); valuable (38.6 km); relatively valuable (36 km). There are a lot of fortifications of Vladivostok - defense area at this island. Underwater landscapes creates conditions for diving`s development.

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