December 2018

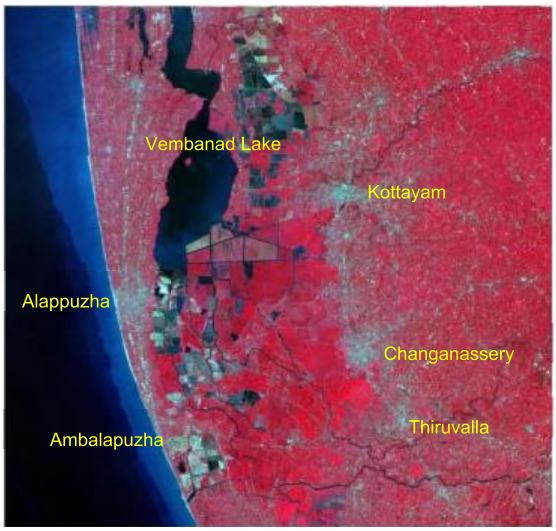
IEEE Gujarat Section
Geoscience and Remote Sensing Society
Chapter Newsletter

ISSUE
I

VOLUME 6

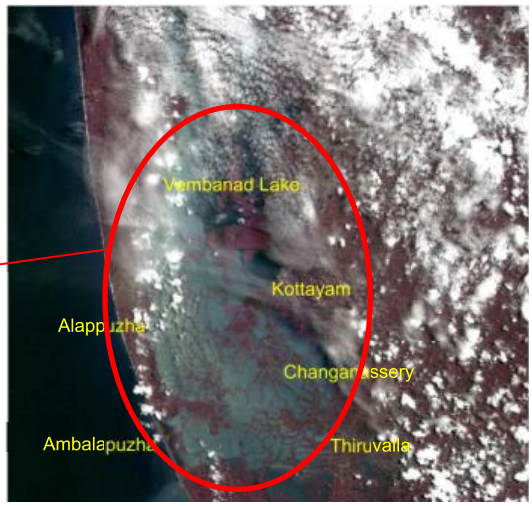
Residents in India's state of Kerala faced a "once-in-a-century" flood that displaced nearly a million people, caused hundreds of fatalities, and washed away homes. The region started receiving heavy rain on August 8, 2018.
Several rivers throughout the region spilled over their banks. Water from the Karuvannur River ran through 40 villages, and washed away a 2.2 kilometer (1.4 mile) stretch of land connecting two national highways. Elevated water levels along the Periyar River displaced thousands of people.
The Operational Land Imager (OLI) on the Landsat 8 satellite acquired the right image (bands 5-4-3) on February 6, 2018, before the flood. The Multispectral Instrument on the European Space Agency's Sentinel-2 satellite acquired the left image (bands 5-4-3) on August 22, 2018, after flood water had inundated the area. The images are false-color, which makes flood water appear blue. Vegetation is bright red.

Using modified Copernicus Sentinel data (2018) processed by the European Space Agency (https://scihub.copernicus.eu/dhus/#/home) and Landsat data from the U.S. Geological Survey. (https://earthexplorer.usgs.gov/)



February 06, 2018 (Before flood)

Flood affected areas in blue tone



August 22, 2018 (After Flood)

Inside this ISSUE

IEEE-Gujarat Section GRSS Chapter Member Bindi Dave participated in IGARSS 2018 held at Valencia, Spain in July 2018 !!

Executive Committee

Editor's Pen

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My sincere gratitude and appreciation to the beloved readers of IEEE Gujarat Section Geoscience and Remote Sensing Society Chapter e-newsletter! The heart rejoice and feel motivated when "the reader's" hopes are fulfilled!
We feel proud to share that our chapter has touched great heights in a span of 7 years. In the current year we have gone across various activities nationally and internationally.
In the present issue we are bringing the concise and interesting interview of ***Dr. Simon Yueh, IEEE TGRS Editor in Chief,*** *where by his views on technicality in upcoming SAR systems, stokes parameter usage and interagency association at large is discussed.*
It is our pleasure, to share that this year IEEE Gujarat Section GRSS Chapter has organized maximum number of events in comparison to past years.

The year begin with the training program, followed by international interaction with respect to various activities pertaining to IEEE at large. This year we had 2 Distinguished Lecture Programmes, 2 workshops and one National Seminar. Behind all these activities, the society intends to support the academicians , students and teachers by enriching the profundity of Geoscience and Remote Sensing field through domain experts. This year we have also reached to the International support and have joint activities with Japan and Indonesia.
Members are the pillars in any society, The chapter feels proud to share the awards and professional upliftment as well as the motivation from the new members who recently joined the chapter. The society welcomes the excited and passionate student members who joined in mass this year, and are the future of the society and will take IEEE to a greater heights and provide innovative expansion of the society.

I acknowledge the support of each and every member involved in the formation of this issue of e-newsletter. I extend my thanks to Shri Ashish for his efforts towards this e-newsletter

Enjoy happy hours with this issue of e-newsletter!!

Editorial Committee

IEEE-GRSS Discussion Meeting

IEEE-GRSS- Gujarat Chapter meets under the Chairmanship of Dr. ShivMohan, Member discussed about Student members Woman in Engineering and other initiatives, goals in near future

Message from the Chairman's Desk

IEEE GRSS Gujarat chapter has shown tremendous growth in its activities during the current year. Chapter has organized activities at Gujarat level and also supported activities at National Level and international level. Thus, chapter has established its presence at National and International level which has built a confidence not only to our members but also brought up laurel from International and National professionals. During this year society has organized maximum number of events in the area of remote sensing and applications by organizing training programs ,workshop, Seminar at national and International level. Participation of members in International IGARSS conference and invited lectures at International conference was another highlight. DLP activities were as exciting as other events during this year. Chapter is also provide support to program related to increased activity of Society including support in establishing new chapters. I welcome new members of the society including student members who are enthusiastic in bringing out role of society at higher level. I express my gratitude to our members for the professionalism with which activities were organized and brought out activities in the form of Newsletter. Finally, let me take this opportunity to wish a healthy, happy and prosperous new year.

Dr. Shiv Mohan
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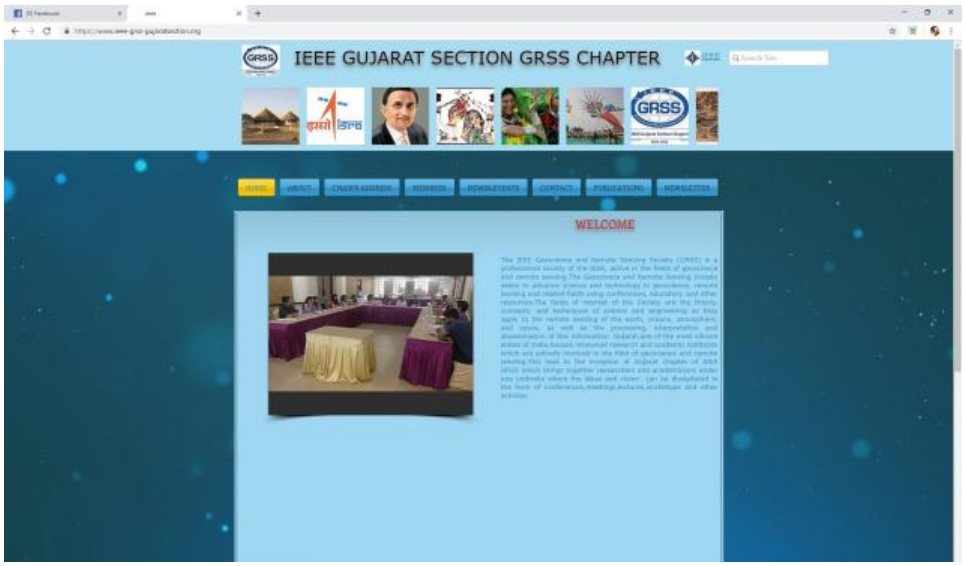
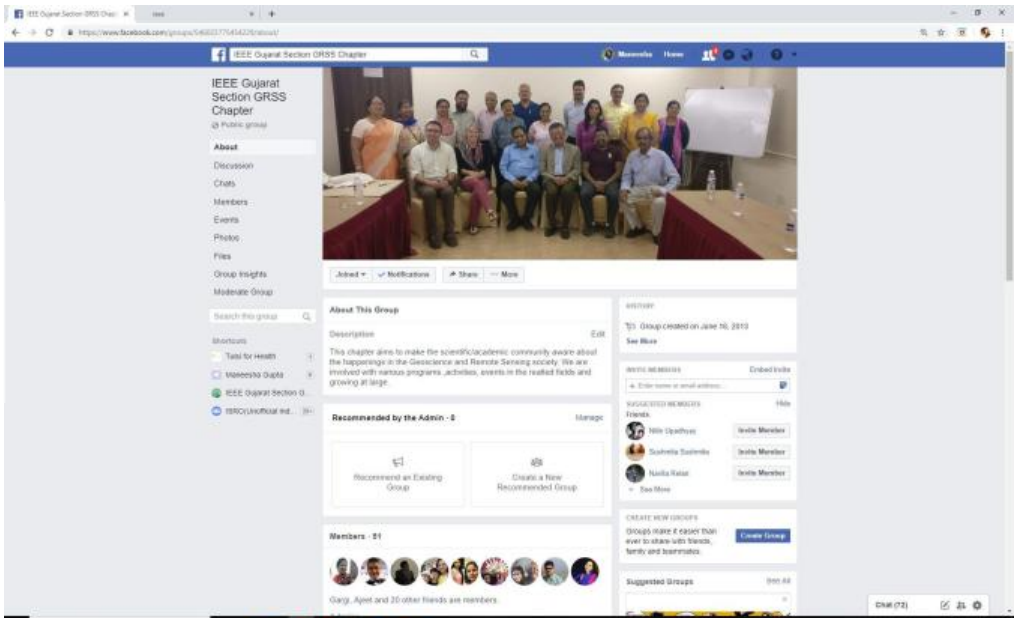


IEEE-GRSS-Gujarat Chapter Web Page

https://www.ieee-grss-gujaratsection.org/



https://www.facebook.com/groups/546023775454229/about/

Event Reports

1.Training program on Soil Moisture and Agricultural Monitoring using Microwave Remote Sensing

IEEE Geoscience and Remote Sensing Society (GRSS) along with the NASA SMAP Project and Space Applications Centre (SAC), arranged a 3-day tutorial in SAC, Ahmedabad, India entitled *Soil Moisture and Agricultural Monitoring using Microwave Remote Sensing.* The goals of the tutorial were international cooperation, networking, and lasting scientific connections. A measure of success was to have 20-30% of the participants engaged in serious post-tutorial research in microwave remote sensing.

Tutorial speakers and participants, 7 Feb 2018

The training was attended by 50 professors, scholars, scientists, managers, and students including IEEE members from locations across India. All participants were working actively in remote sensing. About half of them were familiar with microwave remote sensing, and of those, about 6 were working to retrieve soil moisture from microwave measurements. Experts from NASA-JPL Dr. Simon Yueh and Dr. Narendra N. Das, Univ. of Massachusetts Prof. Paul Siqueira, US Dept. of Agriculture Dr. Mary Susan Moran, Massachusetts Institute of Technology Prof. Dara Entekhabi and Space Applications Centre Shri. Deepak Putrevu, Shri. Dharmendra Kumar Pandey, Shri. C. Patnaik, Dr. Dipanwita Haldar, Shri. M. Ramanujam, Dr. Anup Das and Dr. Sanid C. delivered lecture notes and hands on lessons on various applications of active and passive radar to the participants. The tutorial witnessed high interest among the participants in sharing data, algorithms, and software in a collaborative, multi-mission manner. Specifically, participants discussed algorithm development for NISAR, research collaboration with the Indian Airborne L&S band system, and fusion of SMAP and RISAT. By the end of the tutorial, there were multiple ideas for international collaborative research. There was interest in funding scholarly exchanges to leverage the interest and excitement expressed in the tutorial.

2.IEEE-GRSS Gujarat Members' Interactions with NASA SMAP team

IEEE-GRSS Gujarat invited the NASA-SMAP team to the training program for members' interactions over dinner on 08 February 2018 at Hotel Planet landmark, Ahmedabad. The US delegates Dr. Simon Yueh, Dr. Narendra N. Das, Prof. Paul Siqueira and Dr. Mary Susan Moran interacted with the members of IEEE-GRSS Gujarat and shared their valuable experiences on various activities pertaining to IEEE.

3.IEEE Distinguished Lecture Program(DLP): Statistics & Information Theory in Remote Sensing with SAR-Dr. Alejandro. C. Frery

As a part of Distinguished Lecture Program, IEEE-GRSS (Gujarat chapter) and Faculty of Technology, CEPT university, an expert lecture on "Statistics and Information Theory in Remote Sensing with SAR" was organized on 15th February, 2018. The Lecture was delivered by Dr. Alejandro. C. Frery (LaCCAN, Brazil). He is currently the leader of LaCCAN - Laboratório de Computação Científica e Análise Numérica, Universidade Federal de Alagoas, Maceió, Brazil. His research interests are statistical computing and stochastic modeling, with emphasis in SAR image processing and analysis.

In the talk, he presented a unified framework for a diversity of problems involving SAR imagery (despeckling filters, classification, segmentation, change detection and edge identification). Using Information-Theoretic tools within a Statistical framework, he showed that all these seemingly different problems can be posed and solved as a single one: testing the hypothesis that two or more samples are outcomes of the same distribution. Although the examples are instantiated for SAR, the framework is general enough to encompass a large variety of problems, including other models and types of data.

Along with senior scientists from SAC-ISRO, a large no. of students and faculty members (60 nos.) from CEPT university, Gujarat university, M.G. Science, Nirma university, etc attended the enlightening lecture, followed by interaction with each other.

4.IEEE Distinguished Lecture Program (DLP): Microwave Sensing Through the Subsurface for Addressing the Water Puzzle, by Dr. Mahta Moghaddam

As a part of Distinguished Lecture Program , IEEE-GRSS (Gujarat chapter) and AP/MTT joint chapter organized an expert lecture on "Microwave Sensing Through the Subsurface for Addressing the Water Puzzle" on 1st October, 2018 at Faculty of Technology, CEPT University. The Lecture was delivered by Dr. Mahta Moghaddam (MiXIL, University of Southern California). She is currently a Professor at the University of Southern California (USC), Ming Hsieh department of electrical engineering. During the past ~25 years of active involvement in environmental remote sensing Dr. Moghaddam has introduced new approaches for quantitative interpretation of synthetic aperture radar imagery.

Her most recent contributions include the development of new radar measurement technologies for subsurface and subcanopy characterization, development of forward and inverse scattering techniques for layered random media with rough interfaces, developing sensor web technologies for in-situ environmental sensing, and transforming concepts of radar remote sensing to high-resolution medical imaging. She is a member of the NASA Soil Moisture Active and Passive (SMAP) mission Science Team, member of the Arctic-Boreal Vulnerability Experiment (ABoVE) Science Team, and was the PI for AirMOSS NASA Earth Ventures Suborbital 1 Mission. She is a Fellow of IEEE, Editor-in-Chief of the IEEE Antennas and Propagation Magazine, and a 2016 recipient of the NASA Outstanding Public Leadership Medal for "Outstanding Leadership in Advancement of Microwave Remote Sensing."

In her current talk, she presented a brief description of some of the critical problems in the remote sensing of water resources today, and discussed how her research addresses several components of these problems by developing new low-frequency (e.g., P-band) spaceborne and airborne radar sensor technologies, electromagnetic scattering and inverse scattering models, and in-situ sensor networks. The emerging research on subsurface characterization was discussed, which aimed to map the profiles of soil water content from surface to the root zone, variations in permafrost properties, and ground water.

Along with senior scientists from SAC-ISRO, students and faculty members and researchers (60 nos.) from CEPT university, Gujarat university, DAICT, Nirma university, etc attended the enlightening lecture, followed by interaction with each other.

5.Members' Meet

IEEE-GRSS Gujarat Chapter members' meet was organized on 21 October 2018 at Hotel Planet Landmark, Iskon – Ambli Road, Ahmedabad to discuss forthcoming events and activities of the chapter. The meeting was convened by Dr. Shiv Mohan, Chair of the chapter and was attended by 20 members from IEEE-GRSS Gujarat. It was brought to the notice that the chapter has already added 12 student members and that fulfills the eligibility criteria to form GRSS students wing of Gujarat. GRSS members from various institutions in Gujarat proposed future workshops and training events in their respective institutions and detailed discussion were taken place to support those events both financially and technically.

Interaction among the members during Members' Meet in Ahmedabad

6. National Workshop on "Biodiversity & Remote Sensing"

National workshop was on Biodiversity and Remote sensing was organized on 6th October, 2018 at Maharaja Sayajirao University of Baroda, Vadodara on 6th October 2018. Five eminent speakers from ISRO, C-DAC and MS University were invited to talk on various facet of biodiversity using remote sensing technology. There were about 90 participants from country representing academic institutes and government department. Prof Sandhya Kiran organized the workshop.

Workshop Inauguration

Dr C S Jha spoke on biodiversity and remote sensing whereas Dr Shiv Mohan talked about assessment of biodiversity using microwave data. Other topics concern to Assessment of biodiversity and use of logistic Markov model for Forecasting, medical plants diversity and IT applications in this field of research.
Participants appreciated lectures on advanced remote sensing technique for biodiversity analysis. They suggested such workshop should be organized for long period of time along with hands on.

Speakers in the Workshop: a) Dr Shiv Mohan b) Dr C S Jha and c) Dr M P Kale

7.National Workshop on Advanced Remote Sensing

National workshop on "Advanced Remote Sensing" at Department of Earth Science, Gujarat University, Ahmedabad on 11-12 December 2018. The workshop was focused on capacity building of Geography teachers and research scholars. There were 28 participants mostly from Geography background with few of them were from Geology, botany and engineering background. Workshop was organized by Prof Shital Shukla.

Dignitaries during inauguration of workshop on 1th Dec 208 along with Prof Himanshu Pandya, Vice chancellor of Gujarat University

First day sessions were associated with Hyper Spectral Remote Sensing. First session was conducted on "Hyper Spectral Remote Sensing Concept and Data Sources" by Dr. Praveen Gupta, SAC-ISRO. The session included basic concepts, elements and processes in Hyper Spectral Remote Sensing, comparison of airborne hyper spectral imagers. He had also shown present status, gap areas and future satellite requirements in the field of Hyper Spectral Remote Sensing. Second session was conducted by Dr.Anand SS, Scientist, SAC-ISRO on "Applications of Hyper Spectral Remote Sensing".,

The session included basic information of hyper spectral remote sensing, application of spectral indices, hyper spectral data providers, spectral data processing algorithms, algorithm taxonomy, etc. Post lunch session was Hands on Practices that was conducted by Mr. Ayan Das, SAC-ISRO. It included presentation including concepts of hyper spectral data and different classifications followed by analysis of open source hyper spectral data of JaspaRidge and Cuprite using ENVI 5.5. The session included utilization of supervised and unsupervised classification tools like Principal Component Analysis, Spectral Angle Mapper (SAM), Iso data Clustering and Spectral Feature Fitting.

Second day sessions were associated to Microwave Remote Sensing. Session one conducted by Dr. Shiv Mohan, Chairman, IEEE, GRSS – Gujarat Chapter on "Microwave Remote Sensing Concepts and Data Sources". Session one included concepts of microwave data, types of microwave remote sensing
concepts of microwave data, types of microwave remote sensing, history of microwave remote sensing and different SAR missions in India and worldwide. Lecture also included concepts of polarimetry and interferometry. Session two was also conducted by Dr. Shiv Mohan on "Applications of Microwave Remote Sensing". It included concepts of Synthetic Aperture Radar (SAR) and scattering property. It also included different applications of SAR like irrigation management, flood management, wind energy, biomass, watershed boundary, land use change, wetland mapping, urban dynamics, hydrology and canal water management. Post lunch Hands on Practice session was conducted by Dr. Bindi Dave, CEPT University, Ahmedabad that covered visualization and step by step processing of microwave data of Radarsat 2 satellite by using SNAP Software. Hands on Practice sessions were immensely useful. The session was followed by valedictory function. Chief Guest of the valedictory programme was Dr.Ajai, Emeritus Scientist, SAC-ISRO and Dr. Kaushik Rawal, Director, School of Law, Gujarat University, Ahmedabad.

Group Photo of Participants and Speakers along with Prof Himanshu Pandya Vice-chancellor of Gujarat University and other dignitaries

8.National Symposium of Industry-Academia Collaboration

A National Symposium of Industry-Academia Collaboration-2018 was organized on 14-15 December , 2018 in collaboration with CEPT University, Industry and academia are two pillars in shaping the nation's economy. However, the gap between what academics emphasize and what the industry demands exists. IEEE GRSS in collaboration with CEPT University is attempting to bring the stakeholders under a single umbrella.

Inauguration of the symposium

The symposium was inaugurated by Dr. Paresh Shah (Dean, Faculty of Technology, CEPT University), Dr. Tao Guo (Vice President, PIESAT, China, Guest of honor), Dr. Shiv Mohan (Chairman – IEEE GRSS, Gujarat Chapter), Dr. Anjana Vyas (Executive Director, Center for Applied Geometrics, Adjunct Professor, Faculty of Technology, CEPT University, Ahmedabad) and Dr. Bindi Dave (Program Chair – M. Tech Geomatics program and Assistant Professor – Faculty of Technology.

Invited experts from academia, industry and the government discussed the emerging trends, issues, challenges and opportunities in the geospatial industry. The symposium has discussed the vision on GIS industries and trends, the roadmaps and ways of having better output in working together of the geospatial technology's stakeholders: industry, academia and government. There were fifty participants, of which 16 represented geospatial industry, 20 academia and 14 from the government. The symposium was concluded by Dr Shiv Mohan with a note on the base work for initiating a consortium of experts from all stakeholders which could make a start point for joint activities.

Participants

Concluding session in progress

9. IEEE GRSS – Gujarat Chapter presence other than Gujarat: Joint activities with Japan and Indonesia Chapter:

9.1 Short course on microwave remote sensing Jakarta , Indonesia, 17 Sept 2018 Indonesia:

A short course on microwave remote sensing was organized by with faculty drawing from Gujarat, Japan and Indonesia chapter. Dr Shiv Mohan from IEEE GRSS Gujarat presented tutorial on basics and applications of microwave remote sensing whereas Prof Hiroyoshi Yamada and Prof Akira Hirose covered topics on SAR polarimetry, Big SAR data processing. Dr Arifin Nugroh from Indonesia Chapter talked about Stochastic Optimal Control and its Applications. About thirty participants from different institutes of Indonesia. Training program was well received with emphasis on more such courses of longer duration.

Participants and Faculty of Microwave remote Sensing training program

Dr Shiv Mohan delivering talk on Basics and applications of microwave remote sensing

(http://www.eis.t.u-tokyo.ac.jp/news/20180917AGERS/)

9.2 Asia-Pacific Conference on Geoscience, Electronics and Remote sensing technology, Jakarta, 18-19 September 2018

IEEE GRSS Indonesia in collaboration with IEEE GRSS Gujarat and Japan invited speakers on state of art paper in microwave remote sensing. Dr Shiv Mohan presented a paper on Multi-frequency SAR applications. Prof Akira Hirose and Prof H. Yamada presented lead papers on polarimetry and Big SAR data analysis. About 55 students and professionals participated in the conference and presented their work in the conference

Participants of Asia-Pacific Conference on Geoscience, Electronics and Remote sensing technology, Jakarta, 18-19 September 2018

http://ptpsw.bppt.go.id/sinas2018/

9.3 IEEE International Conference on Aerospace Electronics and Remote Sensing Technology, Bali, Indonesia, 2017

IEEE GRSS Indonesia in collaboration with IEEE GRSS Gujarat and Japan, invited keynote speakers for state of art paper in respective discipline. In addition to local experts, many current topics were discussed by eminent keynote speakers Prof. Akira Hirose (Tokyo University) described the neural network-based Big SAR data processing.

Dr Shiv Mohan presenting state of art paper on Multi-frequency SAR applications

Prof. Hiroyoshi Hamada (All Japan GRSS, Niigata University) presented the SAR polarimetry for the classification of land cover and Dr. Shiv MOHAN (Gujarat GRSS, ISRO) describes multi-frequency SAR Applications.

https://www.lapan.go.id/index.php/subblog/read/2018/5136/LAPAN-Paparkan-Pengembangan-Teknologi-Satelit-dalam-Forum-ICARES-2018/berita

Participants and speakers in the conference

10. Support to National Activities:

Towards extending the support for GRSS activities in India, Chapter contributed towards formally meeting Chapter chairs on 9th June, 2018. One of the agenda related to future directions for activities which could be done jointly. Subsequent meeting were held t Mumbai on 13th Nov 2018. For the purpose of establishing chapters, meeting was also held at Dehradun on 21st November 2018.

Chapter chairs meeting at Bangalore on 9th June 2018

IEEE GRSS discussion meeting at Dehradun on 21Nov. 2018

Interview Dr. Simon Yueh, IEEE TGRS Editor in Chief

Q1. Missions with combined Passive-Active instruments can provide attractive new generation solutions in Remote Sensing. Please throw lights on the advantages & limitations of such designs.

A1. The data from passive and active instruments typically carry complementary information about the constituents in the environment of Earth, including soil moisture, vegetation, rain, clouds, water vapor, snow and ice.

When the passive and active data are used together, spatial and temporal changes of earth environmental element can be more accurately delineated and hence estimated. Passive instruments detect the natural radiation from earth, which is related to the dielectric constant of the objects under investigation although the size and shape (geometry) of the objects also play a role. Active instruments transmit a signal and record scattered signals from the objects; active signals are also influenced by the dielectric properties, but are much more sensitive to the geometry of objects. The dielectric property of objects is the common driver of the active and passive signals. However their differing response to the geometry of objects allows more accurate estimation of dielectric properties and geometry when the data are used together rather than separately.

Because varying water content will have significant influence on the dielectric characteristics of soil, vegetation, snow, and so on. Through the estimation of dielectric properties, passive and active remote sensing technologies can provide knowledge about the amount of water in our environment, which is crucial to our society.

The advantage of passive instruments is their weaker response to geometry than active instruments, and hence can frequently allow accurate estimation of dielectric properties even with limited knowledge of geometry, such as roughness of land and water surfaces. In contrast, signals from active instruments require much more precise information of geometry for retrieval of dielectric properties, hence for water content estimation. For example, the passive data from the National Aeronautics and Space Administration (NASA) Soil Moisture Active Passive (SMAP) mission have been used to produce volumetric soil moisture content with an accuracy of about 4%, while the active data alone produced an accuracy of about 6%.

The data from NASA-ISRO SAR (NISAR) mission is expected to lead to soil moisture products at a spatial resolution of about 100 meters, which is not obtainable from a spaceborne passive-only instrument.

sensitivity to geometry enables the coherent processing of data into high spatial horizontal resolution, which is the basis of synthetic aperture radar (SAR) concept. The state-of-the-art spaceborne SAR design has been producing radar data at meter-scale resolution. The data from NASA-ISRO SAR (NISAR) mission is expected to lead to soil moisture products at a spatial resolution of about 100 meters, which is not obtainable from a spaceborne passive-only instrument.

Dr. Simon Yueh
IEEE TGRS : Editor in Chief

Simon H. Yueh received the Ph.D. degree in Electrical Engineering in January 1991 from the Massachusetts Institute of Technology. He was a postdoctoral research associate at the Massachusetts Institute of Technology from February to August 1991. In September 1991, he joined the Radar Science and Engineering Section at the Jet Propulsion Laboratory (JPL). He was the supervisor of radar system engineering and algorithm development group from 2002-2007. He was the deputy manager of Climate, Oceans and Solid Earth section from 2007 to 2009, and the section manager from 2009 to 2013. He served as the Project Scientist of the National Aeronautics and Space Administration (NASA) Aquarius mission from January 2012 to September 2013, the Deputy Project Scientist of NASA Soil Moisture Active Passive Mission from Jan 2013 to September 2013, and the SMAP Project Scientist since October 2013.

He has been the Principal/Co-Investigator of numerous NASA and DOD research projects on remote sensing of soil moisture, terrestrial snow, ocean salinity and ocean wind. He has authored four book chapters and published more than 150 publications and presentations. He received the IEEE GRSS Transaction Prize Paper award in 1995, 2002, 2010 and 2014. He also received the 2000 Best Paper Award in the IEEE International Geoscience and Remote Symposium. He received the JPL Lew Allen Award in 1998 and Ed Stone Award in 2003. He receives the NASA Exceptional Technology Achievement Medal in 2014. He is an associate editor of IEEE Transactions on Geoscience and Remote Sensing and is the Fellow of IEEE.

Leveraging the relative strength of passive and active data, the SMAP mission was designed to produce an accurate (better than 4%) medium resolution (3 to 9 km) soil moisture products. It is conceivable that the combined use of SMAP radiometer and NISAR radar data can produce accurate soil moisture products at a spatial resolution of 1-3 km.

Q2. Request your comments on the issue of definitions of systems with L-band or even lower frequencies, such as P-band in future missions. Now with SMAP nearly four years old, an aging SMOS & non-availability of Aquarius, what are NASA's specific plans?

A1. SMAP mission is relatively young among the NASA satellite fleets for earth remote sensing. We can expect that it can continue to operate for more than a decade given the past records of spaceborne conical scanning radiometers. The clear data gap resulting from the loss of the SMAP radar is the high resolution aspect of the mission. I believe that the use of data from SMAP and NISAR as well as European's Copernicus Sentinel-1 C-band SAR data together can meet a big part of the SMAP science mission goals. The part that is difficult to recover is the temporal coverage. The SMAP data can provide a global coverage in about one and half days, while NISAR or Sentinel can produce about a revisit of about 6 days. Perhaps combining SMAP/NISAR/Sentinel-1 can lead to 3 to 4 day revisit globally. This is an area requiring further exploration.

NASA is a technology agency. It is expected that many new active and passive remote sensing technologies will be developed in the coming decade. Some members in the science community have been pushing for P-band technologies, which have a much better penetration through vegetation and soil. In the 2017 Earth Science Decadal Survey report, soil moisture and ocean salinity are recognized as critical parameters, but are considered to be difficult to implement for new missions given the current budget environment. Development of new technologies to lower the cost for space missions is something to consider. I think this will be a common goal all space agencies, more than just NASA.

NASA has also been developing a new kind of technologies, called Signals of Opportunity (SoOp), which leverages the transmit signals from many existing communication satellites. The reflected signals (SoOp) from earth surface contain the information about the ocean surface wind speed, soil moisture, land cover freeze/thaw transition, and wetlands. The satellites based on the SoOp technologies include receivers that can detect time delay and Doppler shift of the reflected signals.

Because the SoOp satellites do not have its own transmitters, they will be easier and cheaper to build and launch. The Cyclone Global Navigation Satellite System (CYGNSS) mission is an example indicating NASA's interests in the SoOp technologies.

The key limitations of the SoOp satellite technologies for earth remote sensing are its inability to provide a contiguous spatial coverage over a large area, that can be obtained by SMAP and NISAR. We can envision that SoOp technologies for small missions along with the passive and active instruments on flagship missions with a wide swath coverage will be highly complementary.

3. Analysis of Stokes parameters, measured by microwave sensors has yielded encouraging results in Vector Winds over oceans. How do you assess the prospect of this concept in sensing other terrestrial parameters?

SY: A complete characterization of natural radiation requires four Stokes parameters. The first two correspond to the power in the vertical or horizontal polarizations, while the third and fourth Stokes represent the orientation and ellipticity of radiation. Fully use of four Stokes is not new for radio astronomy community (back to 1950s or earlier), and has received more attention for Earth remote sensing only in the past two decades. The Navy WindSAT and earlier airborne flight campaigns clearly demonstrate how well the vector information of ocean surface winds can be recovered from Stokes parameters.

The origin of third and fourth Stokes parameters is due to media with preferred orientation in the sensing footprint. For ocean surfaces, the direction of wind is the key driver of directional surface features. Over land, there are often heterogeneous land covers in the passive radiometer footprint of about 10 to 50 km in spatial resolution, hence leading to significantly reduced directional features due to spatial averaging. However, the WindSAT data over Greenland clearly shows that there are constituents in the ice sheet with preferred orientation over a large spatial scale. As the spatial resolution of passive instruments continues to improve in the future, the significance of third and fourth Stokes may continue to grow for land observations.

The origin of third and fourth Stokes parameters is due to media with preferred orientation in the sensing footprint.

C ly drawn a lot of attention of scientists in Space Departments. Please throw light on new space-based systems which are expected to address this critical issue more effectively.

A4 As we all know, hurricanes or in more general terms, tropical cyclones, can create huge damage through flooding or wind damage to buildings and power grids for coastal communities.

There have been advancements in space technologies to monitor many aspects of tropical cyclones, including microwave and millimetre wave sounders for temperature and humidity profiles, scatterometers and radiometers for surface winds. There has been increasing demand in high spatial resolution imaging of surface wind and sea surface temperature and also 3-dimensional profiling of winds. Improving the knowledge of the temperature, moisture content and wind in the tropical cyclones is crucial for positioning and intensity forecasting. SMAP L-band radiometers have shown excellent ability to sensing of extreme high winds, but still be at coarse resolution (~50 km). I can expect that NISAR's dual-frequency (L-/S-band) will provide exceptional high spatial resolution (~1 km) for monitoring of tropical cyclones.

Q5. Several International Space agencies are carrying out exemplary work on outreach programmes, especially on educational modules. Perhaps there is need for inter-agency coordination in this area, so that systematic learning can be enhanced. Your comments on this will benefit the readers of our Newsletter.

A5. The collaboration of international space agencies is clearly necessary and has been advancing well in order to deploy a more complete suite of remote sensing satellites for environmental monitoring. Although each agency may have its own specific regional interests or focus, it has been well recognized by the science community that the monitoring of Earth has to be treated like a system.

Coordinated inter-agency effort for education outreach by sharing the information and knowledge is definitely the way to go.

The origin of damaging weather systems frequently can be traced to somewhere a long distance away. From the satellite data collected in the past few decades, we have been gaining a better picture of global water cycle. The water evaporated over the Arabian Sea can be transported by atmosphere wind to produce significant rainfall over India, which subsequently becomes runoff back to ocean and then finds its way back to the Indian Ocean and Arabian Sea. Similar water cycles can now be found in many other parts of the world due to the availability of satellite data. We can no longer look at our own backyard only. Coordinated inter-agency effort for education outreach by sharing the information and knowledge is definitely the way to go.

IN MEMORIAM Prof. Wolfgang-Martin Boerner (1937- 2018)

Dear Readers,

Prof. Wolfgang-Martin Boerner, a Distinguished Senior Professor Emeritus of the University of Illinois, Chicago, an IEEE Life Fellow and a most esteemed member of the Geoscience and Remote Sensing (GRS) society, passed away on May 25th, 2018 . On behalf of the IEEE-Gujarat Section GRS society, I would like to share our deepest condolence to his family, and at the same time we pay our sincere gratitude and appreciation for Professor Boerner's outstanding achievements and extraordinary contributions to radar remote sensing. He was a most distinguished personality, a citizen of the world, and a figure who has supported the international radar remote sensing community in all ways. He influenced more than three generations of students and scientists all over the world and motivated us towards new challenges and to "never ever give up".

"Vision of enhancing the footprint of GRSS in India" – Dr. Shiv Mohan Chairman IEEE-Gujarat Section GRSS

I met Prof. Boerner in 2008 at an International workshop on microwave remote sensing in Jodhpur where I was giving a presentation on India's first radar imaging satellite (RISAT-1). I invited him to ISRO for a talk during 2009, which was attended by many of the geosciences experts of ISRO. Following that, I invited him to a two-day workshop on basics and applications of SAR polarimetry, where he was accompanied by Prof. W. M. Moon, University of Manitoba, for lectures. At this workshop, he also presented IEEE GRSS, making this a small step towards introducing GRSS among the ISRO and other geoscience and remote sensing communities. For the Indian geoscience community, he acted as a mentor and trusted advisor who was guiding many of us in our professional development.

Interaction with the Indian scientific community: Establishment of Jodhpur/Delhi Chapter in India

For the Indian geoscience community, he acted as a mentor and trusted advisor who was guiding many of us in our professional development.

He strengthened GRSS in India by exposing the research contributions of the Indian scientific community to the global community through many IEEE GRSS activities.

He invited some of India's leaders to the international polarimetry workshop at Niigata, the APSAR conference at Japan and Korea, the Mini-SAR Workshop at Taiwan, etc. With his extraordinary commitment during the pre-GRSS establishment phase in India and his ability to identify leaders paired with his academic commitment he was able to connect with Indian leaders who helped in establishing chapters at Delhi/Jodhpur, Ahmedabad, Kolkata and Bangalore during 2012 -2013. During this period, he established groundwork for the chapters at Hyderabad, Bombay, Chennai, Roorkee-Dehradun and Kerala. Among these, the Hyderabad and Bombay chapters are functional and others are in the process of being established. His vision for creating more chapters all over India is being followed by most of us as is his vision for full polarimetry for future radar missions. He will always be remembered for his technical leadership and for creating a strong footprint of GRSS and polarimetry in India.

"A Great Mentor & Legend in the field of SAR Polarimetry" – Dr. Maneesha Gupta

My interaction with prof. Berner was always a fascinating and learning experience. I met Prof. Boerner in 2010 in Space Applications Centre, Ahmedabad at RISAT-1 Utilization Program followed by International workshop on microwave remote sensing in Jodhpur where I was presenting my work on India's first spaceborne SAR RISAT-1. Following that in 2013, I interacted him during the International Expert Meet on Microwave remote Sensing. During all these interactions he shared his views on radar remote sensing, Importance of Electromagnetic Wave Theory and Mathematics in understanding the concepts of SAR imaging.

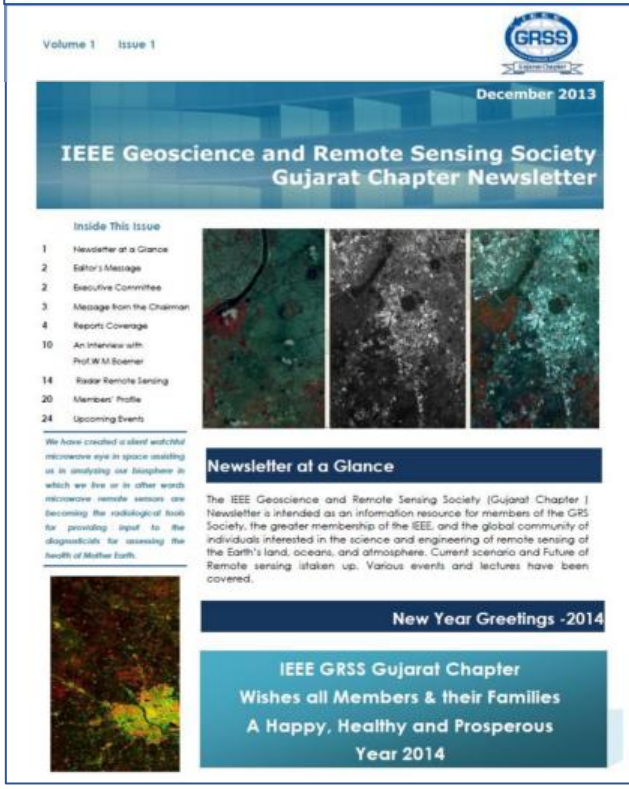
Apart from remote sensing science, he was a good friend with a joyful personality. He was fond of nature, and love to travel. He used to share his affection with India.

In 2012-13 our chapter got an opportunity to kickoff our first newsletter and I am happy to share our fortune that Prof. Boerner agreed for the interview[snap shot shown below]. He shared his experience in Radar remote sensing, upcoming microwave SAR sensors.

Prof. Boerner in International Experts Meet on Microwave Remote Sensing 16-17th December 2013 Ahmedabad

I pay my heartfelt gratitude and indebtedness to the great Mentor and legend of Microwave Remote Sensing.

Prof. Boerner love with birds



Volume 1 Issue 1

December 2013

IEEE Geoscience and Remote Sensing Society Gujarat Chapter Newsletter

Inside This Issue

We have created a silent watchful microwave eye in space assisting us in analysing our biosphere in which we live or in other words microwave remote sensors are becoming the radiological tools for providing input to the diagnosticists for assessing the health of Mother Earth.

Newsletter at a Glance

The IEEE Geoscience and Remote Sensing Society (Gujarat Chapter) Newsletter is intended as an information resource for members of the GRS Society, the greater membership of the IEEE, and the global community of individuals interested in the science and engineering of remote sensing of the Earth's land, oceans, and atmosphere. Current scenario and Future of Remote sensing istaken up. Various events and lectures have been covered.

New Year Greetings -2014

IEEE GRSS Gujarat Chapter Wishes all Members & their Families A Happy, Healthy and Prosperous Year 2014

PAGE 1 IEEE GEOSCIENCE & REMOTE SENSING SOCIETY- GUJARAT CHAPTER NEWSLETTER

INTERVIEW SECTION

An Interview with Prof. W.M. Boerner

We were very fortunate to have Prof Wolfgang-Martin Boerner at Microwave Experts' Meet of GRSS during December 2013 at Ahmedabad amidst us. Prof Boerner is a renowned scientist, familiar to the entire Microwave Remote Sensing fraternity. Dr. Boerner is presently at the University of Illinois at Chicago, Department of Electrical Engineering and Computer Science, as Professor and Director of its Communications, Sensing & Imaging and Navigation Laboratory, where he serves now as Professor Emeritus and Distinguished Research Scientist. He is currently involved actively in international outreach programs in Europe, Oceania and Pacific Asia.

We had extremely interesting discussions on various aspects of Remote Sensing interspersed with his views on society and life in general during the IEEE GRSS Meet here in Ahmedabad. The Editor had difficulty in composing and copy-editing the text of the discussions. Prof Boerner came to our rescue by mailing us elaborate responses to our questions. We wish to reproduce them in our Newsletter in parts. The present issue carries the first part.

Q: 1 Microwave Sensors are seen to be increasingly used in Remote Sensing in research mode. Please throw some light on new microwave sensors in this and the coming decade.

A: 1 With the un-abating global population increase our natural resources are stressed as never before, and the global day/night monitoring of the terrestrial covers from the mesosphere to the lithosphere becomes all the more urgent. Microwave radar sensors are ideally suited for space imaging because those are almost weather independent, and microwaves propagate through the atmosphere with little deteriorating effects due to clouds, storms, rain, fog and haze. Globally humidity, haze, and cloudiness are increasing at a rather rapid pace, whereas only 20 years ago all of those covered only 48% of the globe, today those have increased to about 62% and within another 20 years may exceed 80% for irreversible reasons; thus optical remote sensing from space especially in the tropical and sub-tropical vegetated belts including India will become rather ineffective, and microwave remote sensing technology must now be advanced strongly and most rapidly because operationally it is more rapidly available especially for disaster mitigation assistance.

The basic radar technologies to do the job are the multimodal SAR sensors, first developed for air-borne sensing implemented as for example in 1978 with the first space-borne digital SeaSat SAR which enjoyed great popularity and implementation until these days. However, the NASA SeaSat L-Band SAR had severe limitations in that it was of fixed wide swath-width at a single arbitrary polarization (HH) and of rather poor 25m resolution. SeaSat SAR was followed by several non-polarimetric space SAR sensors such as the ESA ERS-1 (C-Band, 1991–2000), NASDA JERS-1 (L-Band, 1992–1998, CSA RadarSAT-1 (C-Band, 1995–ongoing), ESA ERS-2 (C-Band, 1995–ongoing) and the polarimetrically limited Dual-Pol ESA ENVISAT/ASAR (C-Band, 2002, Ongoing).

In the meantime, fully polarimetric multi-modal high resolution SAR systems at multiple frequencies were introduced first with the multi-band AIRSAR of NASA-JPL culminating in the once-only pair of SIR-C/X-SAR shuttle missions of 1994 April and October, which laid the ground work for true day/night space remote sensing of the terrestrial barren and vegetated land and ocean covers using multi-band polarimetric SAR. Thereafter, NASA suspended further development of the basic need for further advancing airborne and space-borne multi-modal SAR imaging techniques except for the SRTM shuttle mission of 2000 February; swiftly the Canadian CCRS, the Danish EMI, the German DLR, the French ONERA and the Japanese NASDA & CRL (now JAXA & NICT) took over introducing and steadily advancing the Convair-580, the EMI-SAR, the E-SAR, the RAMSES and the Pi-SAR airborne highly advanced fully polarimetric sensors platforms, respectively.

Article Corner

Assessment of Biodiversity using Remote sensing data: An overview

Prof. G. Sandhya Kiran, Head and Professor, Department of Botany, The Maharaja Sayajirao University of Baroda

Biodiversity is a complex concept which is based on various factors like, genes, species, ecosystems, composition, structure and function. Importance of biodiversity has been understood globally by both scientific and social communities and attempts are being made for its conservation, sustainable use, and benefit sharing. Monitoring biodiversity will help meet conservation goals and targets, yet observations collected in-situ are limited in space and time, which may bias interpretations and hinder conservation (Thompson, 2015). Remote sensing is an excellent alternative tool which provides complete and repeatable spatial information for monitoring biodiversity at very low cost and helps in filling up the gaps in biodiversity data.

In contrast to field based data collection remote sensing provides a synoptic view of an area with a high temporal resolution which is apt for estimating environmental heterogeneity and species diversity. With the help of Remote sensing it is possible to derive complete spatial coverage of environmental information for large areas in a consistent manner that may be updated regularly (Muldavin et al. 2001; Duro et al. 2007; Loarie et al. 2007). The information on biodiversity provided by remote sensing includes various spatial scales from landscape, regional, continental to global level (Nagendra 2001; Willis and Whittaker 2002; Turner et al. 2003). Satellite data provided by remote sensing are appropriate for biodiversity monitoring because of its capability of providing repetitive and systematic information of global coverage. (Buchanan et al. 2009; Duro et al. 2007). With the exception of genetic biodiversity, remote sensing can characterize multiple attributes of biodiversity over multiple geographic extents, spatial resolutions, and temporal resolutions (Gillespie et al. 2008; Nagendra 2001; Turner et al. 2003). The type of information that can be derived from a remote sensing image is a function of the sensor's temporal, spectral, and spatial resolution.

Recent advancement in Remote Sensing technologies has increased its applicability in capturing/ measurement of biodiversity on earth. It has exhibited its potential in detection of species and patterns of species richness. Datasets having high spatial resolution like 10 m or less like, IKONOS, QuickBird, OrbView-3 and SPOT-5 (Satellite Pour l' Observation de la Terre-5) has completely revolutionized the Biodiversity research. The benefit of high spatial resolution imagery is that it greatly increases the accuracy of identification and characterization of species at spatial scales which were previously only available from airborne platforms. The air borne platforms have already proved their potentials in identifying sites of low and high diversity (Wang et al.) (Fig. 1) IKONOS imagery provides essential baseline information for biodiversity monitoring and management by enabling the researchers to quantify and evaluate the spatial structure of critical habitats and how it affects endemic species. Landsat series of NASA is increasingly used for biodiversity studies due to the easy and free availability long time series (Fig.7, Fig.8). These sensors also provide data on temperature, precipitation and fire that can be integrated into biodiversity studies (Gillespie et al. 2008). Characterization of biodiversity has greatly been enhanced by the use of LIDAR imagery as it provides information on vertical stratification by giving the information of stand height and structural characteristics of vegetation (Dees et al. 2012). Light Detection and Ranging (LiDAR) and Synthetic Aperture Radar (SAR) data have in recent years demonstrated capabilities for mapping detailed forest structure and estimating biomass (Calders, 2015). Phased Array type L-band SAR (PALSAR) and RADARSAT-2 data have also provided high potential in Land use classification and forest characterization, used either individually.

High-resolution data are also being increasingly used for ex situ biodiversity conservation; for example, scientists at the Royal Botanical Garden, Kew, used very high resolution (VHR) imagery from Google Earth for identifying some previously unknown species in a remote highland forest in Mozambique (Timberlake et al. 2007).

High-resolution images are being keyed to tabular data for providing additional dimensions of access to specimens (Bisby 2000; Edwards et al. 2000; Oliver et al. 2000), and these data sets are being made available through the Internet.

Moderate Resolution Imaging Spectroradiometer (MODIS) derived biophysical indices, i.e., Normalized Difference Vegetation Index (NDVI), Enhanced Vegetation Index (EVI), Fraction of absorbed Photosynthetically Active Radiation (fPAR), Leaf Area Index (LAI), and surface reflectance (SR-645 nm and SR-858 nm) was utilized to analyse the distribution of plant species richness (Mahanand and Behera (2017). However, they obtained weak positive correlation between biophysical indices (Lin et al., 2015) (Fig.3, Fig.9) and species richness and thus concluding that fine resolution spatio-temporal data can be utilized in long-term biodiversity monitoring, species diversity mapping (Tarin Paz-Kagan et al., 2017) (Fig.4, Fig.5) and to measure alpha beta diversity accurately (Rocchini et al., 2016) (Fig.6). Thus to the existing biodiversity (systems remote sensing based biodiversity monitoring has provided an opportunity of extended spatial and temporal assessment. This approach not only has the potential to map indirect indicators such as human induced habitat disturbances (Newbold, 2014; Mildrexler ,2007) and forest cover changes (Butchart ,200;Hansen, 2013)] but also measures direct physical parameters, such as individual trees (Schäfer, 2016) and large mammals (Koh, 2012).

The Convention on Biological Diversity (CBD) has recently established new targets towards 2020 for recognizing the imperative need for biodiversity protection. Remote sensing (RS) data, with its ability for a synoptic view and repetitive coverage can play an important role in achieving theses targets by focussing on widely adopted CBD biodiversity indicators and through systematic operational use of remote sensing data by the experts.

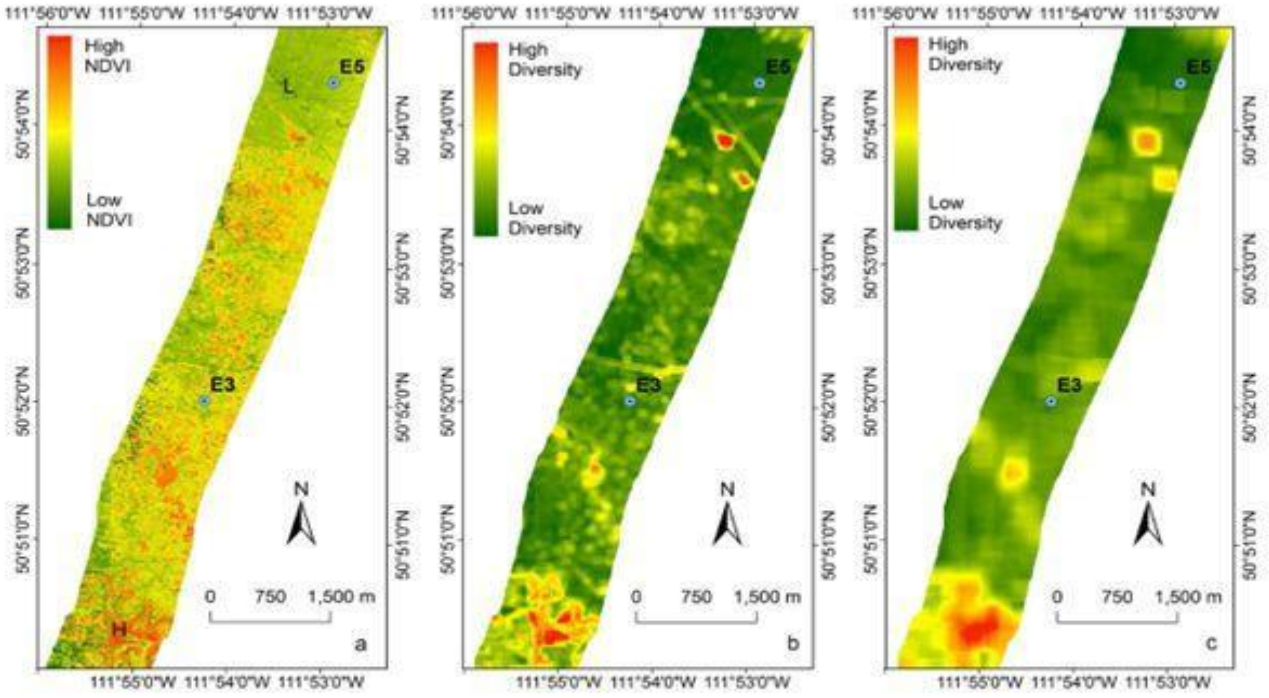


Figure 1: Airborne image of NDVI (a) and optical diversity (b and c) along the flight line. The letters “H” and “L” in the flight line (a) indicate the position of high and low diversity sites. Calibration sites E3 and E5 are also shown (a, b and c), (Ran Wang et al., 2016)

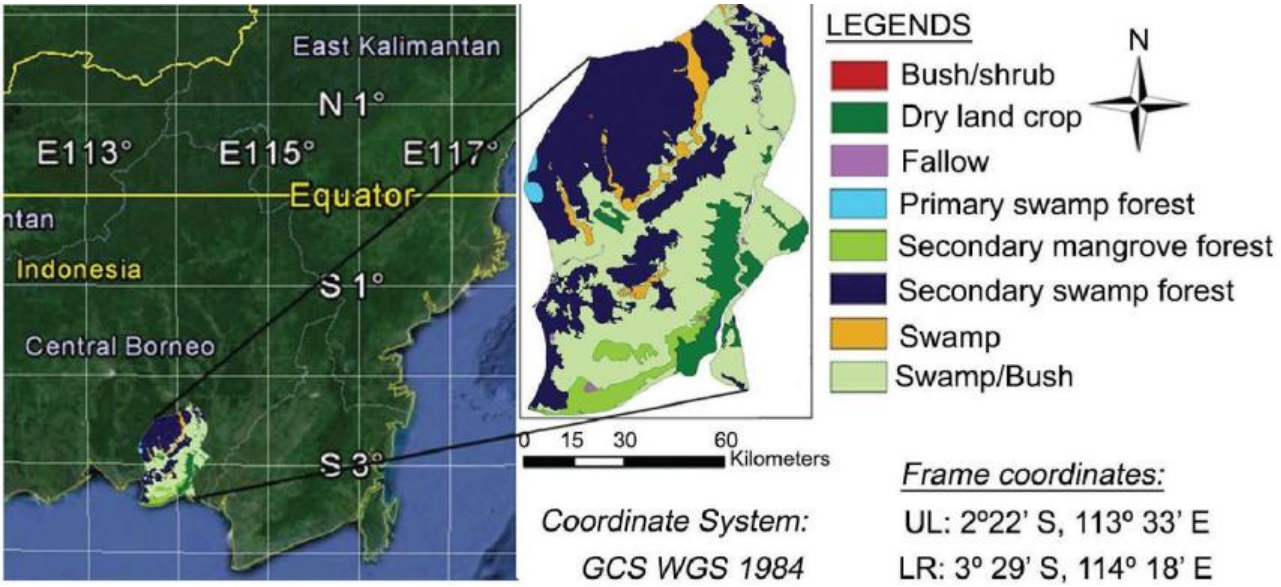


Figure 2: A bitmap showing location and landuse of the study site. (Chinsu Lin et al., 2015)

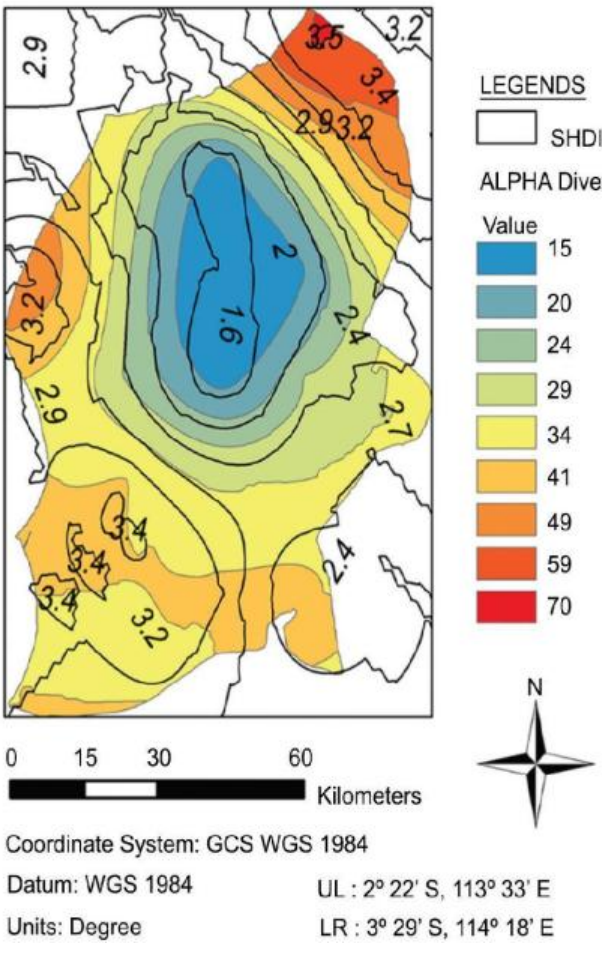


Figure 3: A comparison of the geospatial pattern of alpha diversity and SHDI (Shannon's diversity) in the study site (Chinsu Lin et al., 2015)

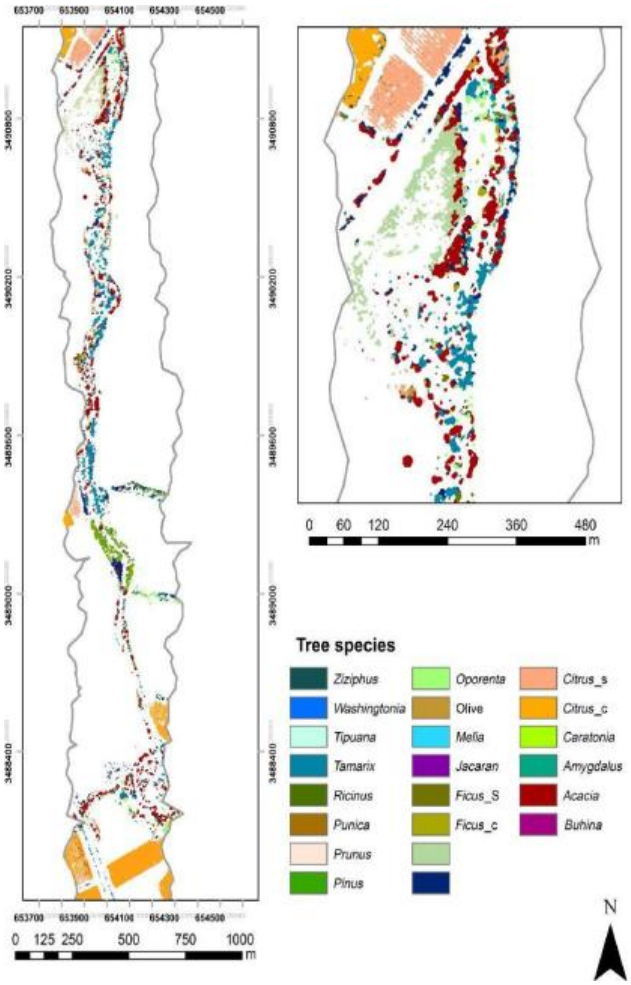


Figure 4: The results of species diversity mapping (SD) in the Dorot site: (a) species diversity map and (b) zoom-in to a selected area within the site, (Tarin Paz-Kagan et al., 2017)

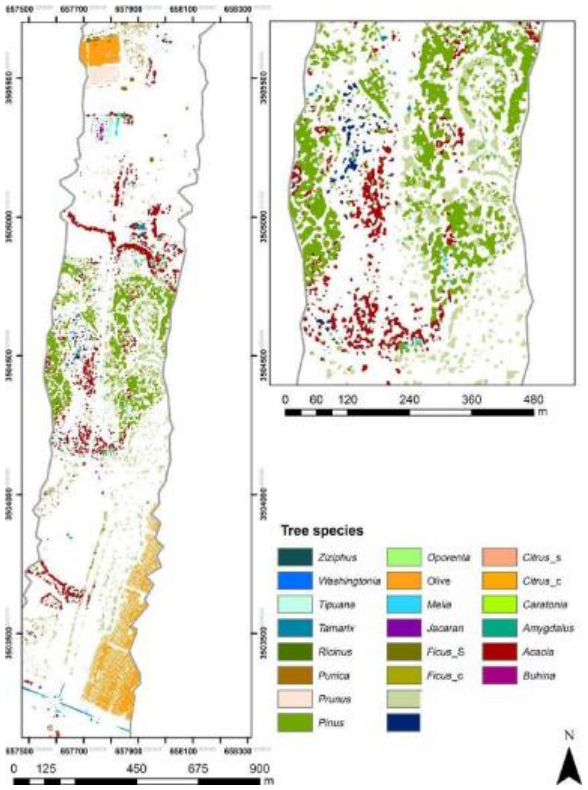
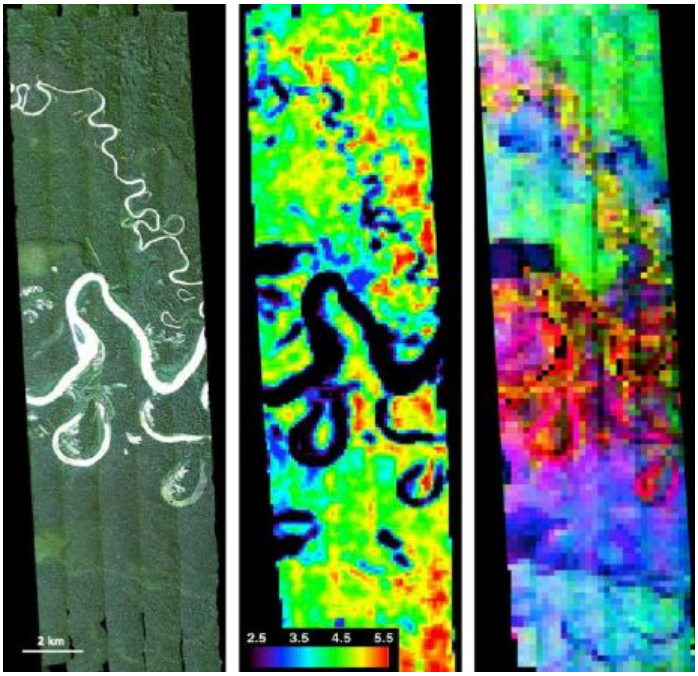


Figure 5: The results of species diversity mapping in the Negba site: (a) species diversity map and (b) zoom-in to a selected area within the site. The classes are related to the different species; their full names are specified, (Tarin Paz-Kagan et al., 2017)



(a) (b) (c)

Figure 6: A lowland Amazonian area shown using: (a) a natural color composite image from the Carnegie Airborne Observatory (CAO) visible-toshortwave infrared (VSWIR) imaging spectrometer; (b) alpha-diversity (Shannon index); and (c) beta-diversity based on Bray–Curtis dissimilarity. A larger Bray–Curtis dissimilarity between two plots corresponds to larger differences in color in the RGB space between the two corresponding pixels). Reproduced from F_eret and Asner (2014a) with kind permission from the Ecological Society of America (D. Rocchini et al., 2016).

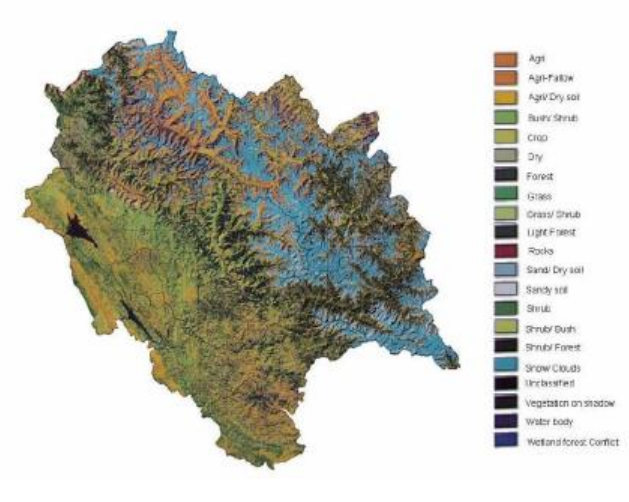


Figure 7: ISODATA Clustering of Geo Cover LandSat TM (Bands 4,7, 2) Himachal Pradesh, India (sood et al.)

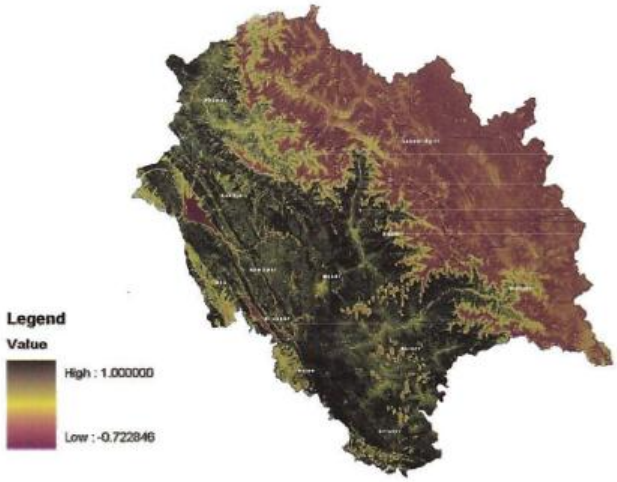


Figure 8: Vegetation derived from Geo Coded IRS 1D LISS III image of Himachal Pradesh (Sood et al.)

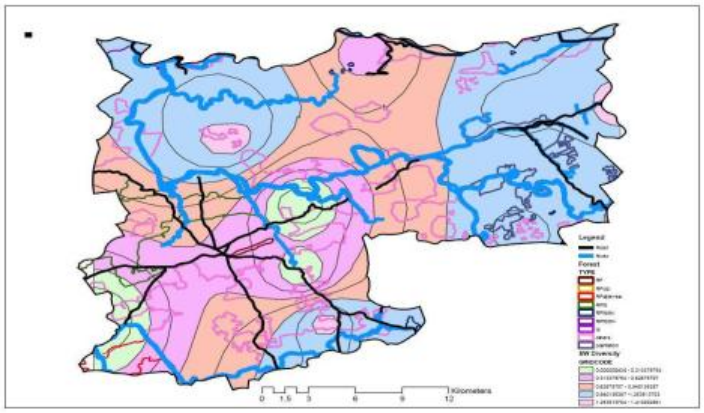


Figure-9: Showing the different Forest Type along with Shannon diversity Map (G. Sandhya Kiran and Mudaliar., 2012)

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Member's Update

IEEE-Gujarat Section GRSS Chapter member **Anup Das**, Ph.D. was elevated to IEEE Senior Member in April 2018. Anup Das is a scientist working with the Space Applications Centre, ISRO and is IEEE-GRSS member since 2012. Currently, he is acting as treasurer of IEEE-Gujarat Section GRSS Chapter. His research interests include applications of SAR polarimetry and interferometry techniques for vegetation and land parameter retrieval, and radar observations of Planetary objects such as Moon, Mars and Venus.

Award Ceremony- 13th March 2019- Dr. Maneesha Gupta receiving Young Scientist ISRO Merit Award-2017 from Dr. K. Sivan (Chairman ISRO) along with Ex-chairman-ISRO Dr. K. Kasturirangan

IEEE-GRSS-Gujarat member **Dr. Maneesha Gupta** received ***Young Scientist ISRO Merit Award*** for the Year 2017 from Chairman-ISRO Dr. K. Sivan and Ex-Chairman ISRO Dr. K. Kasturirangan in Bengaluru on 13th March 2019 in recognition to her innovative contributions to the Indian Space Programme.

She has also been awarded the prestigious ***"Best Publication Award"*** for the year 2017 from Journal of Indian Society of Remote Sensing (JISRS) from Prof. Kale (Ex-Director SAC) and Shri Tapan Mishra (Ex-Director SAC) during National Symposium and Annual convention of ISG and ISRS socities on December 5-7, 2018, at Ahmedabad for her research work entitled "Evaluation of RISAT-1 SAR Radiometric Calibration using Extended Amazon Rainforest" published in) for the year 2017. The award .

Dr. Maneesha Gupta is associated with IEEE-GRSS since beginning. She is Associate Editor of this e-newsletter and Website Manager [https://www.ieee-grss-gujaratsection.org/. Her research interest is associated with international quality microwave remote sensing products from high resolution SAR to medium resolution SAR as well as Scatterometer products. Calibration & Validation of Remote sensing data.

IEEE-Gujarat Section GRSS Chapter Member **Bindi Dave,** Ph.D. was awarded travel grant of USD 1985 to attend IGARSS 2018 held at Valencia, Spain in July 2018. She made oral presentation of a paper titled "*Study of polarimetric decomposition techniques for monitoring temporal growth of major kharif crops and surrounding land use in India"*, co-authored by Dr. Shiv Mohan. Dr. Bindi Dave is an assistant professor in the Faculty of Technology, CEPT University, Ahmedabad. The research work was a part of her doctoral thesis co-guided by Dr. Shiv Mohan, Scientist, PLANEX, PRL and focused on the applications of advanced microwave remote sensing techniques in monitoring temporal and spatial changes in land use and agricultural crop growth.

She along with two other students represented the participation of CEPT University at the IEEE-GRSS forum for the first time, as an active Women in Engineering (WIE) and Young Professional member of this scientific community. She also represented the IEEE-GRSS Gujarat chapter at the Global chapter heads meeting during the symposium. (ieee.org/chapter-chairs-presentation-july-24-2018/)

IEEE-Gujarat Section GRSS Chapter Members **Dr. Bindi Dave,** Ph.D. and **Sabyasachi Purkayastha** attended IGARSS 2018 held at Valencia, Spain and co-authored a paper titled "*Using Image Classification with Space Syntax Model to* Predict Pedestrian Volumes and Vehicular Trip Lengths", presented in the symposium as a poster by the lead author Vidit Kundu. Vidit Kundu is a 2nd year M.Tech student of MURP and Sabyasachi Purkayastha is a 2nd year M.Tech student of Geomatics in the CEPT University, Ahmedabad.

The premise of the paper was acclaimed for being pragmatic and for addressing very real issues pertaining to cities. The disaggregation of population, as what came out through discussions, has proven to be a difficult task to tackle. Uneven population distribution in the cities has made it difficult to use height of built structures from satellite imagery as a proxy for population distribution in an area. The research work, though not entirely solving the problem pertaining to disaggregation of population within organic settlements, was seen as a step towards it. The use of disaggregated population to further augment accessibility models was seen to be an extremely original use case for where satellite imagery could fill in the gaps of limited availability of data. Machine learning experts lauded the effort to bridge the two seemingly disparate fields of remote sensing and urban accessibility.

IEEE-Gujarat Section GRSS Chapter member **Shaily Gandhi** was awarded Ph.D. degree from the CEPT University, Ahmedabad in October 2018. Her Ph.D. thesis titled *"Critical success and failure factors for Pharmaceutical Drugs Monitoring and Management using Geospatial Technology"*. She completed Data Carpentry instructor training in March 2018 and became one of the very few data carpentry instructors in India. Currently she is visiting faculty in CEPT University, NIRMA University and ANANT University in Ahmedabad, Gujarat.

IEEE-Gujarat Section GRSS Chapter member (2014) **Suchit Purohit** was awarded Ph.D. degree from the Gujarat University, Ahmedabad in December 2018. Her Ph.D. thesis titled "Automatic crater detection and classification utilising Chandrayan-1 data". Her areas of interest are image processing, artificial intelligence and machine learning with impac6t craters as subject, Lunar surface morphology and morphometery and impact cratering.

New Members

Dr. Arvind Kumar Singh

Dr. Arvind K Singh joined Space Applications Centre (ISRO), Ahmedabad in January 2001 after completing his M.Sc. and Ph.D. from Roorkee University (now IIT Roorkee) in Physics and Earth Sciences respectively. His working field is Signal and Image Processing towards satellite data processing, including various categories of satellites like Earth observation, Planetary and Astronomical.

He successfully completed his responsibilities like project managers of Moon Impact Probe/Chandraayan-1 and Methane Sensor for Mars/MOM and Deputy Project Director for India's First Astronomical Satellite i.e. Astrosat.

Dr. Singh also got ISRO Team Excellence Award for Chandrayaan-1. He has got various publications including International/National Journals – 15, Conferences – 25, ISRO Internal Studies/Reports – 60

He is also Life Member of Indian National Cartographic Association (INCA), Indian Meteorological Society (IMS) and Indian Society of Geomatics (ISG). He is actively involved in societal activities of these societies. Dr. Arvind K Singh is an Enthusiastic Photographer and Traveler.

Dhwanilnath Gharekhan received his B.E. degree (Electronics and Communications) in 2015 from Silver Oak college of Engineering and Technology, Ahmedabad, India and His M. Tech degree (Geomatics) in 2017 from CEPT University, Ahmedabad, India. For a year he was associated as a Researcher at Xavier's College, Ahmedabad in a RESPOND project focusing in Aerosol Radiative Forcing and while being a visiting Faculty in M.Sc. Geoinformatics programme at Dept. of Geography, Gujarat University. He has recently joined as a Full Time Ph.D. Student at NIRMA University with a focus on Thermal Remote Sensing and Atmospheric Radiative Forcing.

Shaily Gandhi received her graduation in Bachelor of Computer Applications from Gujarat University in 2010, Master's degree in Geoinformics from Symbiosis International University, Pune in 2012 and Ph.D. degree from CEPT University, Ahmedabad in October 2018. She is expert in Geoinformatics, Data Wrangling and Visualization. She has undergone Data Carpentry instructor training in March 2018 and she is one amongst the few data carpentry instructors in India. She is associated with CEPT, NIRMA, and ANANT University as a visiting faculty. She is an alumnus of the CODATA-RDA Research Data Science Summer School at The Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy 2017.

Pooja Bhavesh Shah received her B.E. degree (Civil Engineering) in 2016 from Birla Vishwakarma Mahavidhyala, Vidhyanagar, Gujarat and her M.Tech degree (Geomatics) in 2018 From CEPT University, Ahmedabad. She did her Master's thesis from North Eastern Space Application Centre, Meghalaya on the topic "Measuring Building Vulnerability using Geospatial Techniques: A Case Study of Shillong City". She has been working as Junior Research Fellow in ISRO sponsored Project titled "Identification of Material and Distress for Road Network of Ahmedabad city using L and S band Airborne SAR Data" at Nirma University, Ahmedabad, Gujarat Since June 2018.

Indrani Choudhury Singh received the B.Sc. degree in Agricultural Science and the M.Sc. degree in Agricultural Statistics in 1996 and 1999 respectively, from Assam Agricultural University, Jorhat, Assam. She received Ph.D degree in 2005 on the topic "Environmental Status Evaluation of Agroecosystem of South 24 Paraganas District, West Bengal Using Remote Sensing and GIS Techniques" from Kalyani University, West Bengal in association with Space Applications Centre, ISRO, Ahmadabad. She was with Space Applications Centre, ISRO, Ahmedabad from 1999-2007, as a Research Fellow and worked on "Applications of Microwave Remote Sensing for Agriculture and Rice crop growth monitoring and characterization".

She has more than 18 years of Research and Academic experiences in Agricultural Sciences, Environmental Sciences, Climate Change Studies and application of Geo-informatics in environmental monitoring and earth resources studies. During this tenure, she has extended her capability from research to academics and was involved with many esteemed and prestigious institutions since 1999 including SAC, ISRO, CEPT University, BISAG, Gandhinagar, CRIDA, ICAR, Hyderabad and DA-IICT, Gandhinagar. She has awarded Women Scientist Fellowship as a Principal Investigator from Department of Science and Technology, New Delhi under WOS-A scheme from 2012 onwards. She has successfully completed her first project (April 2012 to March 2015) on the topic entitled "Evaluation of spatiotemporal dynamics of land surface evapotranspiration and monsoon rainfall coupling over Indian region for climate change studies" with DA-IICT, as host institute. Currently she is working on her second project (May 2016-continue) as DST Women Scientist and PI, on the topic "Modelling Agricultural Water Productivity using Earth observation Technique over Indian Region", with SAC, ISRO, Ahmedabad as host institute. She has many international and national publications in various reputed journals.

Samarpita Sarkar received her B.Sc. (Hons.) degree in Geology in 2013 from the Presidency College, University of Calcutta, India and her M.Sc. degree in Applied Geology in 2015 from the IIT Bombay, Mumbai, India. For about a year she worked as a Project Associate in the Physical Research Laboratory, Ahmedabad in a PLANEX project focusing on planetary geology of Mars using high resolution optical & hyperspectral data and also thermal imageries from different Mars missions. She joined Space Application Centre ISRO, Ahmedabad in 2017 and presently focuses on hyperspectral remote sensing for mineral exploration and synthetic aperture radar data for geo-archeology.

Ashish Upadhyay received his B.Com degree in 1995 from Gujarat University and his M.Sc degree in Geomatics in 2012 from CEPT University, Ahmedabad, India. He also holds a certificate course on Remote Sensing Technology and its Applications from National Remote Sensing Agency (NRSA), Hyderabad, July to September 2002. He is currently PhD. Research Scholar at Calorx Teachers' University, Ahmedabad and working as Academic Associate in Faculty of Technology, CEPT University, Ahmedabad, India.

Sabyasachi Purkayastha received his B.Arch degree from School of Architecture Planning and Landscape Design in Jammu(SMVD University) in 2016. He is currently pursuing his masters in Geoinformatics from the Center of Environmental Planning and Technology, Ahmedabad. He became a member of IEEE and GRSS society in the month of May 2018. His area of interest includes the use of Geographical Information Systems and Remote Sensing for Urban applications, specifically, urban planning, Real Estate, public health, retail location analytics, etc.

Readers' View

Paolo Gamba
Department of Electrical, Computer and Biomedical Engineering
University of Pavia, Italy

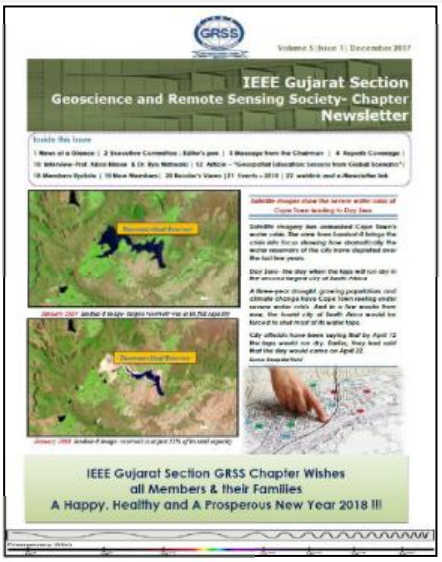
"…keep up with the good work!"

Dr Paul Rosen
JPL/NASA

"…it is excellent and exemplary!"

Dr Akira Hirose
University of Tokyo, Japan

"…happily surprised to see the high activity of Gujarat!"



Prof. Yoshio Yamaguchi
Dept. of Information Engineering
Niigata University, Japan

"Very excellent! It shows all kinds of information in Gujarat Chapter."

David M. Le Vine
NASA Goddard Space Flight Center

I am impressed with all the good work!

Farid Melgani
University of Trento, Italy

"Excellent work and very useful for the community!"

Alejandro C. Frery
Universidade Federal de Alagoas, Brazil
Editor-in-Chief, Geoscience and Remote Sensing Letters

"… it provides a good reading with a good balance of technical information, news and interviews. It is just excellent!"

George Percivall
CTO, Chief Engineer
Open Geospatial Consortium, MA, USA

"…a high quality survey of GRSS-related activities. This newsletter will promote the sharing and application of remote sensing."

Dr Ridha Touzi
Canada Center for Remote Sensing
Ottawa, Canada

"A wonderful newsletter!"

Prof. Paul Siqueira
Microwave Remote Sensing Laboratory
University of Massachusetts, Amherst

"…chapter is very busy and productive!"

Lori Mann Bruce
Associate Vice President and Dean of the Graduate School
Mississippi State University

"The article sounds great!"

Prof. Tanish Zaveri
Nirma University, Ahmedabad

"It looks very professional and informative "

Jocelyn Chanussot
GIPSA Lab, France

...congratulations on all your activities!

Peter Baumann
Jacobs University, Bremen, Germany

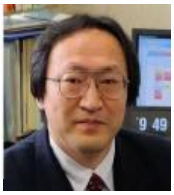
"...valuable information!"

Prof Yasushi Yamaguchi
Nagoya University, Japan

"…wide variety of activities!"

Prof Hiroyoshi Yamada
Niigata University, Japan

"Your chapter is very active!"



Dr Siri Jodha Khalsa
University of Colorado, *Boulder, USA*

"It is very attractive and informative! "

Prof. Dr.-Ing. Dr. h.c. Dr.-Ing. E.h. mult. Werner Wiesbeck
Inst. Hochfrequenztechnik und Elektronik Karlsruhe Institute of Technology, Germany

"*I like this Newsletter. It includes excellent information from education to space."*

Prof. J K Garg
Indraprasth University, New Delhi

"Newsletter has come out well!"

Capt (Dr) Chaitanya S. Sanghvi
Professor, Applied Mechanics Department
L D College of Engineering, Ahmedabad

"Congratulation for such a nice effort!"

Dr. Arvind K. Singh
Scientist/Engineer,Space Application centre Ahmedabad

"Congratulations! Good Work!"

Achievements of ISRO in 2018 – Highlights

Dr. M R Sivaraman

1. GAGANYAN Mission: ISRO is getting ready to send three Astronauts to Space by 2022. A Prototype Space Suit along with Crew Capsule and a Crew Escape Model has been already developed by ISRO. Watch this Video https://www.indiatoday.in/india/video/isro-develops-new-suit-for-2022-space-mission-1333950-2018-09-06. On 5th July this year, ISRO tested its first Crew Escape Model at Sriharokota. ISRO continues to conduct more tests in development of GSLV Mk III, which will be used in GAGANYAN Mission.

2. CHANDRAYAN-2 Mission: (1) The flight Acceptance Test of CE-20, the Cryogenic Engine, earmarked for GSLV Mk III M1-Chandrayan 2 Mission completed on 11th October. (2) Chandrayan-2 Lander (Vikram) Actuator Performance Test was successfully conducted to demonstrate re-targeting in a Parabolic Trajectory on 25th October at ISRO Propulsion Complex, Mahendragiri. This test demonstrated the capability of Vikram to meet the mission requirement of safe, soft and precise landing on the Lunar Surface by steering the module horizontally as well as vertically to a pre-defined target.

3. Satellites launched successfully this year by ISRO: (1) Cartosat-2F, along with 30 co-passenger satellites from different countries, launched on 12th January from Sriharikota on PSLV C40. (2) IRNSS-1I, the seventh satellite in IRNSS series to complete the required number of satellites for Navigation, launched successfully on 11th April, on PSLV XL C 41 from Sriharikota. For Technical details of IRNSS-1I see https://www.isro.gov.in/irnss-programme/pslv-c41-irnss-1i-mission-brochure and https://www.isro.gov.in/pslv-c41-irnss-1i/pslv-c41-irnss-1i-mission-curtain-raiser-video-english in Google Search (3) NovaSAR and S1-4 Satellites from Surrey Satellite Technology Ltd. Surrey, launched on PSLV C 42 on 16th September from Sriharikota. This was the first dedicated commercial launch mission of ISRO, to launch customer satellites, under payment and ISRO earned over Rs 200 crores in this Launch. (4) ISRO launched GSAT-29, on GSLV MK III D2 on 14th November. This is the second successful launch of ISRO's most powerful Rocket, with a capacity to launch 4 ton satellites. GSAT-29 has multi-beam and Optical Satellite Communication Payloads that will usher in bridging Digital Divide in Rural Areas. This GSLV Mk III Rockets will be used in future for Chandrayan-2 and Gaganyan missions. Watch these Videos on GSLV Mk III/GSAT-29 Mission. https://youtu.be/IbgOqF_xj7. https://youtu.be/5R8-XIESnNc (5) ISRO's workhorse rocket PSLV-C43 successfully injected into orbit India's earth observation satellite HySIS along with 30 co-passenger satellites from eight countries on 29th November. HySIS is a Hyper Specrtal Imaging Satellite, made by ISRO. Watch this Video on HySIS. https://www.isro.gov.in/pslv-c43-hysis-mission/pslv-c43-hysis-mission-curtain-raiser-video-english, https://www.youtube.com/watch?v=EWpvSKr5Kd0
4. (6) GSAT-11, the heaviest satellite built by ISRO, was launched successfully early on 5th December morning onboard Aeiane-5 VA246 from Kourou, French Guinea. This satellite brings satellite-based broadband a reality in India. Besides, it will also significantly contribute towards bridging the divide between digital urban and rural India and will enable the next generation application such as in-flight connectivity. Currently, India has nearly 450 million internet users. Watch this Video on GSAT-11, A Curtain Raiser by ISRO. https://www.dos.gov.in/gsat-11-mission/gsat-11-curtain-raiser-video-english For details on GSAT-11 see https://www.dos.gov.in/gsat-11-mission/gsat-11-press-kit or https://www.dos.gov.in/gsat-11-mission/gsat-11-mission-brochure (7) GSAT-7A launched successfully on 19th December. See this Video for details on GSAT-7A. https://youtu.be/qZPfZPgJD0k.
5. Indigenous Cryogenic Technology Development: A high Thrust version of the Vikas Engine was successfully tested and qualified through a Ground Test on 15th July by ISRO at Mahendragiri. This engine will improve the Payload capability of PSLV and GSLV Launch vehicles.

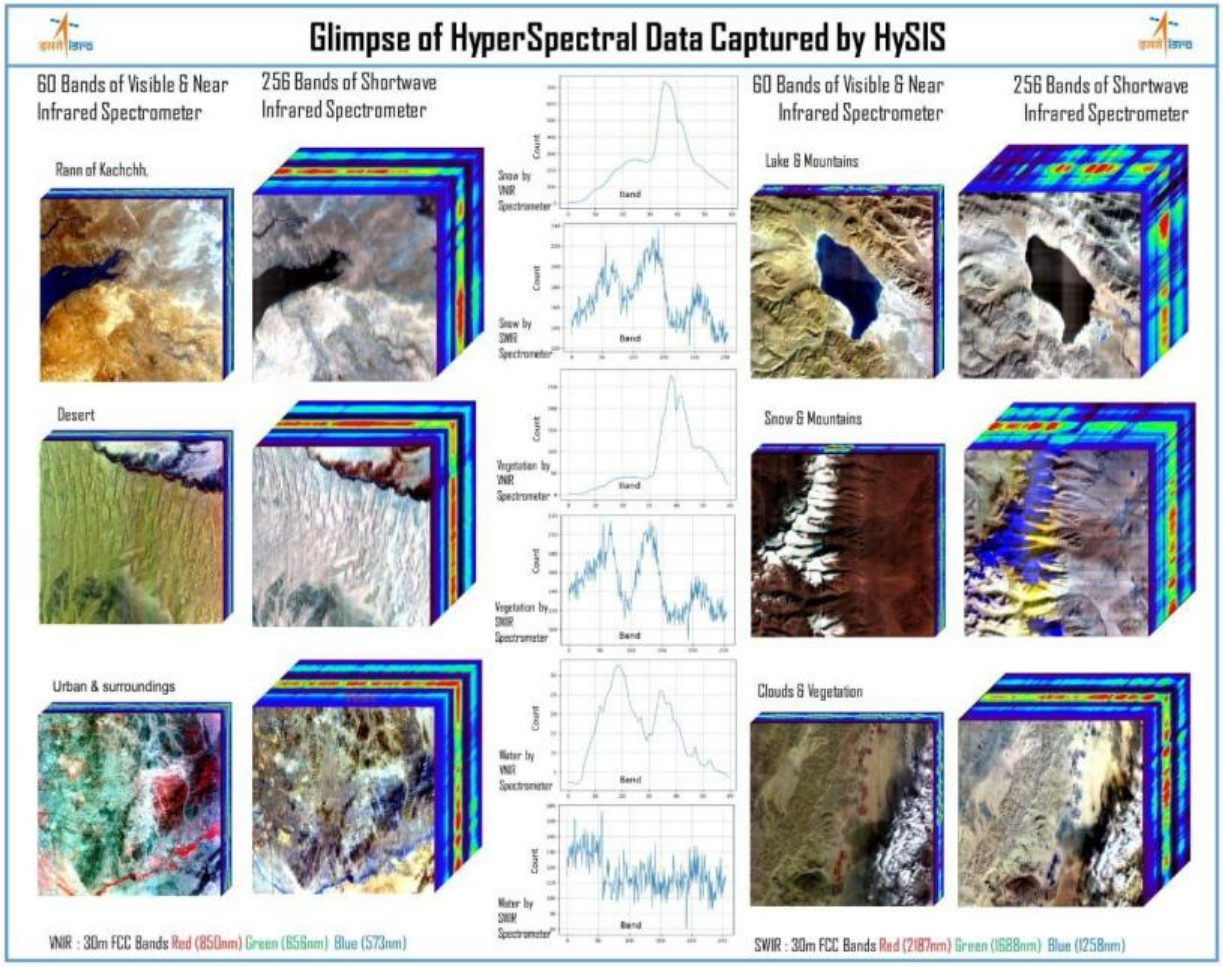
6. IRNSS (India Regional Navigation Satellite System) Mission: (1) With the successful launch of IRNSS-1I, on 11th April this year, the first satellite developed by a Private Firm for ISRO, Alpha Technology, the minimum seven satellite configuration required to provide Satellite Navigation Service, over India and neighboring countries and also 2500 kms into surrounding seas is possible. SAC Engineers in collaboration with Semi Conductor Limited (SCL), Chandigarh, have developed NAVIC Receiver chips. Other Companies too are successful in making NAVIC Receivers in Chip form and soon Mobile phones with GPS/NAVIC Receivers will be available in Indian Market. In May this year, SAC engineers completed development of an Indigenous Atomic Clock. This will be used in future IRNSS satellites, replacing imported ones, after initial testing.

ISRO had a major launch failure too! Launched on 29th March, GSAT-6A had a power problem and contact with the satellite was lost! See for more details http://www.indiandefencereview.com/news/gsat-6a-technical-failure/

7. Discovery of an Exoplanet: Scientists from Physical Research Laboratory, Ahmedabad, have put India in the elite league of countries, who have discovered planets around stars, known as Exoplanets. PRL designed Spectrograph, known as "PARAS" (PRL Advanced Radial-velocity Abu-sky Search), at Guru Shikhar Observatory, Mount Abu, was used. Read in detail from

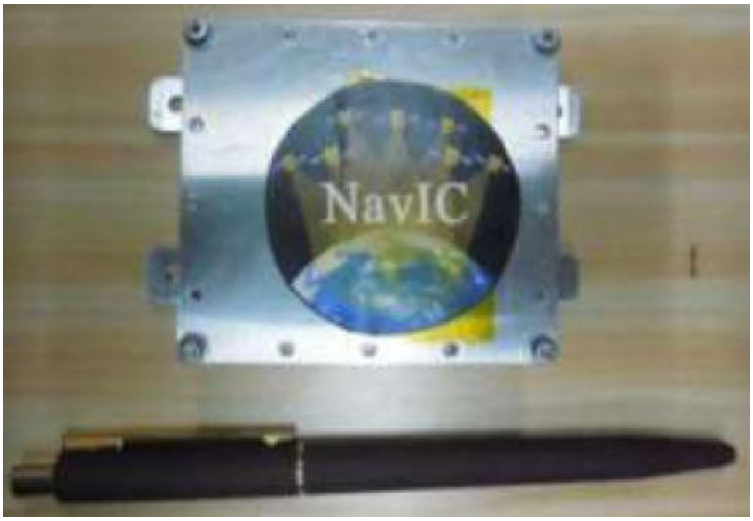
https://www.thehindu.com/sci-tech/science/indian-prl-scientists-discover-an-epic-planet/article24127772.ece
and https://www.isro.gov.in/discovery-of-sub-saturn-exoplanet-around-sun-star

Glimpses of HySIS data



ISRO developed Lunar Lander "Vikram"

SAC developed NAVIC Messaging and Positioning Receiver CHIP



ISRO developed Prototype Space Suit and Crew Module, displayed in an Exhibition in Bangalore

Also watch the Video https://www.youtube.com/watch?v=5LNpD7CXwMY

Events' Calendar – 2019

1. IEEE GRSS Booth (11- 14 March 2019)
2. Distinguished Lecture program by Dr Gustau Camps-Valls, Universitat de València, Spain, Topic:" Machine Learning for Remote Sensing Data Analysis, CEPT University, May 2019
3. Members meeting: May 2019
4. One day workshop on remote sensing for undergraduate students Botany students, July 2019
5. International Training Program on SAR polarimetry, Nov 2019
6. Dr Keely Roth, From US Industry, Keely Roth, Senior Remote Sensing Scientist, The Climate Corp, Topic: Vegetation, Agriculture, Data Fusion, Machine Learning, Nov 2019
7. Workshop on Remote sensing, M S University Baroda, Nov 2019
8. Members meeting: Nov 2019
9. Industry Academia collaboration for Geospatial technologies Symposium, Dec 2019

Contact for Feedback & Queries

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