

**Horizon Europe Programme**

**Specific Application Form (HE CSA)**

**HORIZON-WIDERA-2023-ACCESS-02**

**Project proposal – Technical description (Part B)**

Instructions, please remove

**Version 1.0**

**14 February 2023**

**Structure of the Proposal**

The proposal contains two parts:

• **Part A** of the proposal **is generated by the IT system. It is based on the information entered by the participants through the submission system in the Funding & Tenders Portal.** The participants can update the information in the submission system at any time before final submission.

• **Part B** of the proposal is the narrative part that includes three sections that each correspond to an evaluation criterion. Part B needs to be uploaded as a PDF document following the templates downloaded by the applicants in the submission system for the specific call or topic. The templates for a specific call may slightly differ from the example provided in this document.

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- Step 1: Logging in the Portal

- Step 2: Select the call, topic and type of action in the Portal

- Step 3: Create a draft proposal: Title, acronym, summary, main organisation and contact details

- Step 4: Manage your parties and contact details: add your partner organisations and contact details.

- Step 5: Edit and complete web forms for proposal part A and upload proposal part B

- Step 6: Submit the proposal

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| **HISTORY OF CHANGES** | | |
| **Version** | **Publication date** | **Changes** |
| 1.0 | 14.02.2023 | * Initial version |

**Proposal template Part B: technical description**

**Greek Space Geodesy Excellence Centre (ACRONYM)**

[This document is tagged. Do not delete the tags; they are needed for processing.] #@APP-FORM-HECSA@#

**List of participants**

|  |  |  |
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| **Participant No. \*** | **Participant organisation name** | **Country** |
| 1 (Coordinator) | National Technical University of Athens (NTUA) | Greece |
| 2 | Chalmers Tekniska Hogskola AB (OSO) | Sweden |
| 3 | Collecte Localisation Satellites (CLS) | France |
| 4 | Institut de physique du globe de Paris (IPGP) | France |
| 5 | DeutschesGeoForschungs Zentrum (GFZ) | Germany |

**1. Excellence** #@REL-EVA-RE@#

**1.1 Objectives** #@PRJ-OBJ-PO@#

**1.1 Space Geodesy and Earth Observation**

Since the introduction of Earth orbiting satellites, Space Geodesy has played a crucial role in our understanding of the complex Earth system. An ever increasing number of space-based applications are heavily dependent on results and products derived by methods of Space Geodesy, and hence correlated with advances and progress within this scientific field. Observing the Earth system through space, is in essence an exercise of Space Geodesy.

Space Geodesy is a rapidly evolving multidisciplinary scientific field, playing a crucial role in a series of applications and research areas including Earth monitoring, navigation and positioning, climate studies, earthquake and volcano monitoring, spacecraft navigation, Earth’s interior and geodynamic research, astronomy and fundamental physics. It lays the fundamental groundwork for the exploitation of data collected from Earth orbiting satellites via its unique ability to provide precise modeling of satellite trajectories (i.e. Precise Orbit Determination (POD)), accurate observations and models for the Earth’s rotation and orientation as well as spatial reference frames of the utmost quality. In essence, Space Geodesy provides the fundamental data and measurements that underpin various scientific, environmental, and practical applications essential for our understanding of Earth and space.

The ever-increasing number of earth orbiting satellite missions accompanied with an ever increasing need for improved accuracy demanded by a series of applications (e.g. climate change studies) have in recent years upgraded Space Geodesy’s role, placing it at the core of Geoscienses. In 2020, the geoscience community has fixed an objective of 1mm accuracy and 0.1mm/yr stability for the terrestrial reference frame (TRF) realization, a goal still to be reached. Exciting new missions, such as the ESA GENESIS mission (accepted in November 2022) utilizing multiple space geodetic techniques (“space-ties”), EUMETSAT Sentinel series (Sentinel-3, 4, 5 and 6) and the Surface Water and Ocean Topography (SWOT) mission among others, are evidence of the exciting future and renovated importance and expectations of the field.

ESA’s most ambitious Earth observation program to date, COPERNICUS, headed by the European Commission (EC) in partnership with the European Space Agency (ESA), heavily depends on and contributes to Space Geodesy. The GEO international partnership (<https://www.earthobservations.org/index.php>) and its Global Earth Observation System of Systems (GEOSS) initiative (<https://www.earthobservations.org/geoss.php>) as well as the Global Geodetic Observing System (GGOS) (<https://ggos.org/>), both established in the last two decades, underpin the global interest in a**dvancing our understanding of the dynamic Earth system by quantifying our planet’s changes in space and time.**

**The aforementioned global initiatives and prospects, as well as the growing importance, impact and attention drawn in Space Geodesy, affirm a flourishing research field with a key role in technological and scientific advance.**

**1.2 NTUA and Space Geodesy in Greece**

Space Geodesy can also provide crucial insight on a regional scale. Greece lays on a region of exceptional interest for a series of Geoscience fields, constituting in essence a “physical laboratory”; tectonic crustal deformation is inhomogeneous and among the largest in rate within Europe, seismic events are often and large in magnitude and a series of active volcanoes are spread throughout the country, posing both a public threat as well as unique research opportunities (e.g. inflation of Santorini island due to volcanic activity during 2011-2012). Space Geodesy is the key in understanding such processes, via its unmatched crustal monitoring capabilities and is thus used by a number of Greek institutes involved with such studies, including Universities and public institutions. However, they are merely “consumers” of Space Geodetic products and results (e.g. spatial reference frames, satellite orbits, data analysis software and products, etc), a fact that severely undermines their research initiatives, independence, results and impact. The presence of a dedicated center of excellence for Space Geodesy, disseminating knowledge and expertise, could significantly enhance the capacity of this national ecosystem.

The Project Coordinator (NTUA), via its School of Rural, Surveying and Geoinformatics Engineering, is the oldest and most prestigious institution in Greece providing a curriculum in the field of Geodesy. It has a twofold role in Greece; on the one hand educating and training the next generation of geodesy experts and on the other hand, being involved in relevant research, both to support its academic expertise and also to push scientific frontiers.

In the dawn of the Space Geodesy era, NTUA via its Dionysos Satellite Observatory (DSO) laboratory, had played a significant role in expanding knowledge, involved in a series of novel and invaluable observational techniques, including astrometric data and laser ranging measurements. However, in recent decades, NTUA’s contribution and involvement in the field has lagged behind, while on the same time Space Geodesy has moved forward on a rapid pace. This string of events, have caused NTUA’s research capacity to fall behind currently leading institutes in the field, and its research profile to shrink. In turn, this capacity gap between NTUA and prestigious European institutes in the field, severely undermines its ability to successfully apply for research proposals and secure funding for its research activities and recruitment needs (e.g. PhD students). Unfortunately, NTUA’s international standing has been impaired, and currently does not constitute an appealing destination for young, talented scientists and engineers that want to thrive in the field of Space Geodesy.

This technological and research gap (in the field of Space Geodesy) is evident in all Greek institutions involved in the field. Relevant studies are usually constrained to regional scale, producing scientific results of limited importance and impact. Networking and synergies both between these institutions and their international peers are intermittent, infrequent and often incidental, missing long-term planning and well defined objectives and aims. Research capacity is limited and severely constrained by lack of expertise, well trained and skilled workforce to state-of-the-art methodologies and a low international standing (e.g. involvement in international and European consortia and services).

The lack of a dedicated excellence center in the field of Space Geodesy, is also reflected in the limited involvement of Greece in one of the currently fastest blooming technology markets internationally, that of Space sciences. Lack of expertise and a modern knowledge hub in the field are definitely factors that should be swiftly addressed to reverse the current situation.

**1.3 Center of Excellence for Space Geodesy in Greece**

ACRONYM aims at creating a Center of Excellence for Space Geodesy in Greece, hosted by the Project Coordinator (NTUA), with the crucial contribution of leading experts in the field. Within this framework, NTUA will enhance its research and scientific footprint, increase its technology and research capacity and promote innovation and the involvement of Greece (both of the public and private sector) in Space.

Consortium partners (other than the host), are hand-picked prestigious internationally leading experts in a series of Space Geodetic techniques, collectively constituting the fundamental observational techniques of Space Geodesy. Through the synergy with these institutes, NTUA will be able to:

* Significantly enhance its research capacity, gain knowledge and expertise from world-leading scientists in the field and build its own state-of-the-art software tools that will allow it to establish a key role for the future of Space Geodesy on an international level.
* Mitigate the technological/scientific gap between the host institute and its partners, transforming it to an attractive center of excellence for new scientists, a center of innovation for Greece in the field of space-based geosciences.
* Significantly increase its international standing and visibility in the research community. Create a network of international collaborators, get involved in high-calibre international consortia and establish synergies with distinguished research institutions, severely enhancing its international prestige. Such strategic networking will assist NTUA in maintaining a long-term role as a center of excellence in Space Geodesy, and a long-term involvement in the research frontiers of the field.
* Create a dedicated task force trained in research project claiming, submission and management and boost host’s success rate in research funding bids. Enhance the host's capacity and efficiency in partnership-building, preparation and carrying out of research proposals funded by a series of alternate grant pools. Increase financial support capabilities for its research activities and its ability and capacity to attract and recruit talented young scientists.
* Establish a national (Greek) ecosystem of space related stakeholders, including universities, research institutes and (private) companies; promote innovation, networking and dissemination of scientific expertise and advancements. Boost Greece’s involvement and role in the space and earth observation fields.

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| **Objective** | **Involved WP** | **Target Group** | **Key Performance Indicator** |
| Creation of highly skilled workforce | WP2 and WP3 |  | Number of host institute staff trained |
| Recruit and train new scientists | WP2 and WP3 |  | Number of PhD and PostDoc students trained |
| Research capacity enhancement via in-house software | WP3 |  | In-house software to accommodate:   * DORIS observations * SLR observations * state-of-the-art handling of EOPs   Software validation by expert partners and released online (free and open-source). |
| Involvement of NTUA in the future of Space Geodesy on an international level | WP2, WP3 and WP4 |  | Number of high-caliber geodetic services and consortia in which NTUA will get involved (in various roles). Such are IDS, ILRS, IVS, IAG and GGOS. |
| Mitigation of technological/scientific gap between the host institute and top-tier institutes | WP2,WP3 and WP4 |  |  |
| Attractive center of excellence for new scientists | WP4 |  | * Number of applicants for PhD, PostDoc and (possible) tenure open positions. Expected to take place gradually after the start of ACRONYM. * Number of young scientists (from partners) traveling to NTUA * Number of funding bids submitted for PhD and PostDoc studies (carried out in host institute) * Number of PhD and PostDoc scholarships successfully applied for (from national and/or European funding pools) |
| Establish a national (Greek) ecosystem of space related stakeholders  Center of innovation for Greece in the field of space-based geosciences | WP2 and WP4 |  | * Number of stakeholders present in info-days and seminars. * Number of stakeholders included in research proposals submitted * Number of stakeholders interested in and/or subscribed to the ACRONYM newsletter * Number of stakeholders requesting/accessing online lectures and training videos (via ACRONYM’s website) |
| Increase host’s international standing and visibility | WP4 |  | * Number of conferences/workshops attended * Number of scientific publications in high-impact journals * Impact factor of scientific journals publishing results of ACRONYM * Involvement in International Association of Geodesy (IAG) and GGOS * Release free and open software tools, available on-line * Number of users of software released (measurable via online means, acknowledgments and DOI references) |
| Create a network of international collaborators, get involved in high-calibre international consortia |  |  |  |
| Enhance the host's capacity and efficiency in partnership-building, preparation and carrying out of research proposals funded by a series of alternate grant pools. | WP2 |  | * Number of host institute staff trained * Number of research proposals submitted (within the time span of ACRONYM) * Diversity of funding pools targeted * Success rate of funding bids (research and scholarships) |

#§PRJ-OBJ-PO§#

**1.2 Coordination and/or support measures and methodology** #@CON-MET-CM@# #@COM-PLE-CP@#

**1.2.1 General Concept and Overview**

Building a Center of Excellence for Space Geodesy in Greece is based on three fundamental pillars, which determine the methodology to be followed to achieve the proposal’s objectives. The first pillar is the significant enhancement of the Coordinator’s research capacity via staff training to create a highly skilled work force and in parallel build and/or refine a state-of-the-art software toolset. The latter, accompanied with skilled personnel, constitutes an invaluable asset towards achieving scientific excellence.

A second pillar is the strengthening of research management capacity and administrative skills of the staff working in the host institute. Furthermore, this task aims at significantly broadening possible funding pools (available or targeted by the host institute) and capabilities and increase mobility (inwards and outwards) of qualified scientists.

Finally, a third pillar focuses on networking activities and involvement of the Coordinator in international, high prestige consortia, raising NTUA’s reputation and visibility. Additionally, a Greek Space and Earth Observation ecosystem will be established aiming at promoting relevant technology, innovation and collaboration on a national level.

Dedicated dissemination and communication activities are included aiming at boosting the impact of ACRONYM and the attractiveness of the coordinating institution.

**1.2.1 Enhancing Research Capacity and Achieving Scientific Excellence**

Modern Space Geodesy input is based on four fundamental observational techniques, namely Global Navigation Satellite Systems (GNSS), Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS), Satellite Laser Ranging (SLR) and Very Long Baseline Interferometry (VLBI). These four techniques constitute the pillars of modern Space Geodesy and providing the crucial dataset to study the Earth system and its variations.

The ever growing accuracy demands in the fields of Space Sciences and Geosciences, entail an urge for analysis results of the utmost accuracy. During the last few decades, a long list of modeling improvements have taken place, that allow for sophisticated and robust processing methodologies to yield precision analysis products. Implementing such state-of-the-art methodologies though, requires a deep, comprehensive understanding of both the observational techniques as well as the underlying scientific background. Thus, such software packages are a privilege of a limited number of high-caliber scientific institutions, with significant international standing and highly skilled workforce. An example of such institutions are the internationally-leading partners involved in ACRONYM.

International Services have been established for all the above techniques, namely International DORIS Service (IDS), International Laser Ranging Service (ILRS) and International VLBI Service for Geodesy and Astrometry (IVS), comprised by world leading experts in the respective fields. These consortia play a key role in the shaping, growth and progress of the techniques themselves and are hence of fundamental importance for Space Geodesy, setting quality standards and enabling dissemination of its products in the scientific community. Such products (e.g. precise satellite orbits) constitute nowadays essential, mandatory input for Earth observation and space studies. The twinning partners of ACRONYM, are all members of such top-class International Services.

While NTUA has a well established expertise in the field of GNSS, verifiable by its contribution in international consortia (e.g. EUREF) and its long list of relevant publications in scientific journals, its lacks knowledge, involvement and expertise in the other three techniques that lay at the core of Space Geodesy. This severely weakens both its academic and research capabilities at the field, as well as its ability to drive innovation for the country in a fast growing market related to Space.

Within the framework of ACRONYM, synergies are proposed with leading experts in the techniques of DORIS, SLR and VLBI with the aim of closing the knowledge and technological gap and thus significantly strengthening NTUA's research capacity and potential. A strategic aim of ACRONYM is that by the end of the project’s lifespan, the host institute will have an in-house collection of software tools and a highly-skilled workforce to support high-end research in the field of Space Geodesy and Earth observation.

Each member of the consortium will act as a knowledge transfer node for one of the techniques involved. A dedicated task force will be established in NTUA for each of the three techniques, made up of University personnel (i.e. professors and technical staff), at least one PhD student and one Post-Doc student per technique. This allocation is expected to significantly enhance knowledge assimilation, create highly skilled experts in the involved fields of study, simplify management and logistics and solidify networking between partners. Given that at the time of writing NTUA has no active PhD or Post-Doc students at the aforementioned fields, ACRONYM is expected to significantly increase its manpower and research capacity, alluring young talented scientists to work on the field. In summary, it is expected that at least six new young scientists will be recruited by NTUA (three PhD students and three PostDoc students) to be involved in the project’s activities.

IPGP and CLS will act as the DORIS expertise nodes. Both institutes are leading experts in the field, heavily involved in the technique since its introduction. Their role and contribution is underpinned by their status as Analysis Centers, and involvement in the IDS. The two institutes will take up the task of transferring relevant knowledge to NTUA via interaction with the dedicated task force.

NTUA has, in recent years, started an effort to take up the technique and build a software package to process DORIS data. The assistance of IPGP and CLS will prove to be invaluable for the stepping up of this effort, and the consolidation of NTUA's contribution in the technique. Additionally, the two institutes are long contributors of the IDS and can introduce NTUA in the service, a fact that can lead to a solid, long lasting technical involvement and further networking capacity with high esteem institutions.

Despite SLR's prominent role in Space Geodesy, NTUA's involvement in the technique has been minimum in the last few decades. Besides core geodetic results (e.g. Earth Orientation Parameters (EOP)) SLR provides the most accurate observations for precise orbit determination, a problem inherently coupled with all space geodetic applications. Laser Ranging Reflectors (LRR) are part of the payload of a large number of satellites, especially missions where precise knowledge of the trajectory is required.

GFZ will act as the SLR expertise node, since it has a longstanding contribution in the technique, evident by its involvement in the ILRS as an Analysis Center and a long list of relevant scientific publications.

OSO/Chalmers will act as the VLBI knowledge node. OSO hosts one of the few VLBI sites in Europe and is a prominent member of the IVS. OSO will undertake the task of transferring technique-specific knowledge and expertise to the host institute.

By means of a specialized, technique-based contribution of each member of the consortium to the host (NTUA), knowledge transfer can be better achieved, managed, digested and verified. The host institution will be the sole recipient of this flow of expertise, attributing dedicated personnel to each of the techniques described, thus creating a pool of experts. This highly-skilled work force will in turn disperse the knowledge gained, via NTUA's academic capacity, to the future Space- and Geo-scientists of Greece, significantly boosting innovation and the country's involvement in the growing satellite-based application market.

Achieving scientific excellence within ACRONYM is split into two distinct phases, to allow for a more efficient and robust scheme. During the first phase (WP2), highly skilled scientists from the expert nodes will transfer knowledge and expertise to a dedicated (per technique) task force made up by personnel and young scientists in the Widening institute. The roadmap of the procedure and the scientific syllabus and curriculum will be determined by respective the expert nodes. Focus here will be placed on (a) the internals and details of the techniques themselves, (b) data curation, (c) technique specific error-budget, its treatment and mitigation, (d) application range, instrumentation and technique specific results, and (e) recent trends and research frontiers. Expert nodes will also present their own, home-grown data analysis pipelines to NTUA, identifying best practices, strengths, weaknesses and limitations.

Knowledge transfer will be performed by means of :

* remote (on-line) webinars, virtual trainings and video conferences hosted by the expert nodes and attended by the dedicated task force set-up at the Coordinator institution. Both training/lectures and Q&A sessions will take place during these meets, which will be held approximately twice per month, with a duration of two to four hours.
* remote (on-line) venture labs, where the expert nodes will present and introduce their own analysis pipelines and in-house, state-of-the-art software tools to the dedicated task force set-up at the Coordinator institution. Approximately a series of four venture lab meets will be held (per technique).
* one short-term visit of the dedicated Coordinator task force at the premises of the respective expert node (i.e. visits at IPGP, GFZ and OSO). The visit will have a duration of one to two weeks, and will focus on an integrated presentation and schooling at data collection/acquisition and instrumentation, data curation and analysis procedures followed by the expert nodes. A guided tour at instrumentation sites will also be performed at GFZ and OSO, since these institutes host instrumentation not available in Greece (only few such sites are installed worldwide). These visits will also place focus on solidifing networking activities and allow for further one-on-one communication and intercourse.

At the end of this phase, the dedicated task forces (setup at the Coordinator institute) will have gained a deep understanding of the methodologies involved within each of the Space Geodetic techniques. With the newly found skills and the assistance of the respective partners, this phase will culminate with the compilation of technical documents that describe specifications, models and standards to be used to design a state-of-the-art software toolbox to perform data analysis of DORIS and SLR observations, accompanied with respective validation procedures. These documents will act as roadmap for the next step of research capacity building and achieving scientific excellence.

The next, second phase (WP3) will build on the knowledge gained from the previous phase and will adhere to a more “hands on”, technical approach. The target here will be the severe strengthening of NTUA’s research capacity via the designing and building of a space geodetic software tool-box, to perform robust analysis of satellite data, incorporating state-of-the-art methodologies. Under the (per-technique) guidance of the expert partners and the work-plan established (in WP2), NTUA will undertake the task of gaining knowledge and expertise and in parallel applying lessons learned in its own, in-house software package. This collection of tools will allow the analysis of space geodetic data (both DORIS and SLR) to perform precise orbit determination, positioning, and estimation of a series of geodetic parameters of interest. Note that during the last couple of years, NTUA has already ignited an effort to develop such software tools, a fact that is expected to significantly assist the effort and outcome of ACRONYM.

Software development will adopt the work plan established in Task 2.1, enabling step-by-step validation. Such a process will enable the efficient administration of the capacity building process, monitoring progress through well established, timely milestones, goals and validation tests.

Focus will be placed on (a) problem solving skills, (b) robust algorithmic approaches and best practices, (c) numerical methodologies, (d) program design and implementation strategies and (e) adoption of state-of-the-art models. Knowledge transfer will be performed by means of :

* remote (on-line) webinars hosted by the expert nodes and attended by the dedicated task force set-up at the Coordinator institution, focusing on implementation and validation of specific specific technical issues, i.e. modeling approaches (according to the roadmap laied out in the technical dpocuments of the previous step). These meets will be performed once every two months.
* remote (on-line) one-to-one and one-to-many video conferences hosted by the expert nodes and attended by the dedicated task force set-up at the Coordinator institution. The conferences will be focused on Q&A sessions, problem solving and advisory meetings, targeting specific needs and problems that (may) come up during the implementation phase; they will be requested “on demand” by the task force.
* two short-term visits per technique; the dedicated Coordinator task force will visit the respective expert node (i.e. visits at CLS, GFZ and OSO) and staff of the expert nodes will also make a short term visit to the Coordinator. The visits will have a duration of one to two weeks, and will focus on inspection, evaluation and validation of the software under construction and exchange of best practices. They are also expected to further strengthen twinning synergies and provide a framework for teamwork, enhancing collective problem solving.

**1.2.2 Strengthening research management capacity and administrative skills**

In order to further enhance NTUA’s research capacity and funding capabilities and resources, knowledge and expertise transfer will expand beyond technical matters, to include coaching on research proposal preparation/writing, submission and management (WP2). A dedicated task force will be established at NTUA, that will be targeting funding bids on a national and European level, with the aim of enhancing its ability to claim funding bids. As is the case for technical skills, a twofold approach will also be adopted here. Expert nodes will share their proposal management skills via dedicated online training of their peers in NTUA. The consortium will also prepare and submit two research proposals, building upon ACRONYM, that will be submitted within the duration of the current project, to national or European authorities. This is expected to both strengthen the host’s research project management skills and also to pursue the long-term involvement of NTUA with state-of-the-art challenges in Space Geodesy and related fields.

Through the consortium synergy and in the framework of ACRONYM, at least three papers will be published in high impact, peer-reviewed scientific journals. These publications will target specific issues of the three respective Space Geodetic techniques tackled in ACRONYM. This goal is expected to strengthen the commitment and engagement of the twinning partners. Additionally, it will raise the host institute’s international prestige and its capacity in scientific publishing.

Further strengthening of the host’s networking activities and prominence will be seeked through the consortium’s presence in at least five international conferences, where outcomes of ACRONYM will be presented. If possible, the host will specifically pursue its presence in technique-specific conferences/workshops, organized by the respective international services (i.e. IDS, ILRS and IVS), which will ensure the introduction of the host institute in an ecosystem of top-class, high-prestige experts in the field.

Special care will be taken for efficiently disseminating the results and outcomes of ACRONYM. Besides adhering to an open-science policy (see 1.2.1), the consortium will organize a three-day summer school on Space Geodesy to take place in Greece. The goal here will be to introduce space geodetic techniques as well as recent trends, applications and use cases to the Greek ecosystem of involved in Space studies and Geosciences. This will include public research institutions, universities and private sector organizations/companies. OSO, IPGP and GFZ will all be present and give presentations and/or lectures in their respective areas of expertise. NTUA will present the ongoing effort to establish a center of excellence for Space Geodesy in Greece, ACRONYM results and outcomes (e.g. software tools and products), expected impact and possible synergy opportunities.

Additionally, one info-day/seminar will take place in Greece, organized by NTUA and CLS in an effort to present current products and trends related to Space-based solutions and promote innovation. CLS will address issues of providing high value-added products and services, being a worldwide pioneer provider of monitoring and surveillance solutions for Earth, focusing on Environmental and Climate monitoring, Maritime Surveillance and Infrastructure monitoring. Target audience will include the Greek ecosystem of involved institutes in Space studies and Geosciences, with special focus on companies and stakeholders active in the field. Both the summer schools and the seminar are additionally expected to strengthen ties and networking within the national ecosystem.

**1.2.**3

**1.2.1 Open Science**

ACRONYM will adhere to an open-science policy, a fact reflected through a series of its outcomes. All publications described above, both the ones to be published in peer-reviewed journals and the ones to be presented in international conferences/workshops, will be open-access.

Additionally, the software to be designed and implemented (described above) will be developed using a free and open-source policy, using a license agreement that will adhere to this property (e.g. MIT License). The development phase, will be performed in the public domain, using one or more public repositories (e.g. via the gitlab platform). Hence, the scientific community and any interested parties will be able to browse, download/clone and use the software or specific components of it and even modify, expand and repurpose it to fit their needs.

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**2. Impact**

**2.1 Project’s pathways towards impact**

Through the coarse of ACRONYM, NTUA will be enhancing its strategic networking and by project’s end, it will have established a number of important international synergies with top class institutes in the field of Space Geodesy and be involved in high prestige consortia which shape the field’s future. Building on this new network, NTUA will be able to seek further collaboration and networking possibilities with important international institutes, strengthening its standing, research profile and role within the scientific community.

By the end of ACRONYM, NTUA with the crucial assistance of its project collaborators, will have at its disposal a software toolbox able to perform state-of-the-art analysis of space geodetic data (DORIS and SLR). To place this result into perspective, it is worth noting that for the most recent realization of ITRF, the ILRS contributed data from 7 Analysis Centers (Pavlis et al. 2023) including GFZ, while at the same time the IDS’s contribution was derived from only 4 Analysis Centers (Moreaux et al. 2022) including CLS. The European Space Agency (ESA) was involved in both contributions, and so was NASA’s Goddard Space Flight Center. This shortage of dedicated analysis centers, is indicative of the limited availability of dedicated software solutions designed to handle such data in a precise manner and the challenges such a task poses. Hence, the aforementioned institutions hold a high level of expertise, international prestige and research capacity. The software tools used by these centers however, are neither free nor open-source.

It is thus evident, that the expected software package to be designed and implemented in the framework of ACRONYM will have a sizable impact for the scientific community. Stakeholders include not only the users of the software, but also the international services that will be able to include further contributions (produced via the software) thus strengthening their products. Especially precise satellite orbits and reference frame maintenance (which is based on analysis of the four core Space Geodetic techniques) are nowadays prerequisites for numerous applications and studies extending through the whole Geosciences spectrum.

The consortium will adopt a number of measures to allow for the efficient sharing of the software package to be created with the scientific community. Firstly, the development will be performed using a public repository, meaning that access will be free to any interested party. Both intermediate steps (i.e. beta versions) as well as the final product will be freely accessible and strictly adhering to an open-source policy. Licensing of the software will legally guarantee the “free and open-source” policy both for scientific and commercial usage.

Via the adoption of such a policy, ACRONYM aims at creating a vivid scientific community of software users, ranging from post-graduate students, to highly skilled scientists/researchers and professionals in the Space and Earth Observation industry. With their expertise, specific needs and individual application demands, they will be able to drive the constant development of the package and provide means for continuous validation, creating high-quality new knowledge along the way and fostering its diffusion. Paired with its newly found expertise gained through ACRONYM and thus an enhanced and modernized academic capacity, NTUA will be established as an attractive excellence center for Space Geodesy, strengthening human capital in research and boosting innovation in a rapidly evolving new market.

Additionally, a Digital Object Identifier (DOI) will be attributed to the software enabling its citation and thus allow for proper credit attribution. This is expected to have a measurable and sizable effect in the long term, since relevant citations will enhance NTUA’s international research profile.

Outcomes of ACRONYM will also include the fulfillement of three PhD and one Post-Doctoral dissertations. The specific research targets of these studies will be co-decided among the consortium partners and the supervision will be shared between NTUA and one expert node (per technique). The defending of these Thesis are expected after the end of ACRONYM and will significantly enhance NTUA’s research man power, extending past ACRONYM’s end. Currently, due mainly to limited funding capabilities and expertise/capacity limitations, dissertations in the field of Space Geodesy are scarce (currently only two PhD students and no Post-Doc students).

**2.2 Measures to maximise impact - Dissemination, exploitation and communication** #@COM-DIS-VIS-CDV@#

**todo**

#§COM-DIS-VIS-CDV§#

**2.3 Summary**

**KEY ELEMENT OF THE IMPACT SECTION**

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| **SPECIFIC NEEDS** |
| *What are the specific needs that triggered this project?*  Closing of the scientific gap between top class European institutes and Greece in the field of Space Geodesy.  Enhancement of research capacity of NTUA in terms of technical assets, expertise and qualified staff.  Improve prestige and international standing of the host institute.  Establish a network of top-class collaborators and boost involvement in high-esteem consortia.  Increase funding capabilities and resources for research (project claiming).  Boost Greece’s involvement and innovation in the wider field of Space studies and Geosciences and establish a national ecosystem in the field. |
| **D & E & C MEASURES** |
| What dissemination, exploitation and communication measures will you apply to the results?  **Exploitation:** Release of DORIS analysis software package attributing a citeable and trackable DOI (e.g. via zenodo).  **Exploitation:** Release of SLR analysis software package attributing a citeable and trackable DOI (e.g. via zenodo).  **Exploitation:** Use of capacity built in ACRONYM (software, expertise, network and management skills) to apply for further grants/projects in a national and/or European level.  **Dissemination towards the scientific community**: Scientific publication (both in peer-reviewed journals and in international conference) with results obtained through software usage.  **Dissemination towards the scientific community and Space Industry**: Software release using a public domain software repository/development platform (e.g. gitlab) using MIT license.  **Dissemination towards the academic community in Greece**: Include usage of parts of the software in the graduate-level academic curriculum of the School of Rural Surveying and Geoinformatics Engineering of NTUA (to perform data analysis).  **Communication towards the scientific community and Space Industry:** Use of social media (e.g. LinkedIn) to promote and advertise the software tools built in ACRONYM. Usage and application range will also be presented in a conference/workshop organized by NTUA in Greece. |

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| **EXPECTED RESULTS** |
| What do you expect to generate by the end of the project?  **Software Tools:** Brand new software tools to perform analysis of Space Geodetic data, using state-of-the-art modeling.  **Successful large-scale demonstrator:** Trial with 3 satellite missions of POD and precise positioning using DORIS data.  **Successful large-scale demonstrator:** Trial with 3 satellite missions of POD and precise positioning using SLR data.  **Publications:** Three scientific papers in peer-reviewed journals and five publication in international conferences.  **Expertise:** Three PhD students trained and one Post-Doc trained. NTUA personnel will have gained extended expertise and enhanced its research profile.  **Further Grants and Long Term Plan:** At least two grant proposals submitted to secure further, long term involvement in state-of-the-art Space Geodesy.  **Involvement:** Involvement in international, high-prestige consortia such as IDS and IRLS, which shape the future of Space Geodesy. |

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| **TARGET GROUPS** |
| *Who will use or further up-take the results of the project? Who will benefit from the results of the project?*  **Scientific community** (Space Geodesy and Geosciences).  **Greek ecosystem** of institutions involved in monitoring the region’s unique crust kinematics/behavior (due to tectonics, seismic events, etc).  **End users/industry** related to Space applications (e.g. Space Security and Awareness, etc) and monitoring and surveillance solutions for Earth (e.g. Environmental and Climate monitoring, Maritime Surveillance, Infrastructure monitoring, etc).  **Graduate and PhD students**.  **Young Scientists and Engineers** in the wider field of Geoscienses. |
| **OUTCOMES** |
| *What change do you expect to see after successful dissemination and exploitation of project results to the target group(s)?*  Usage of software tools by the scientific community (measured by their attributed DOIs).  Involvement in high prestige international consortia as Associate Analysis Center (for NTUA).  High use of the scientific papers published (measured with the relative rate of citation index of publications).  Increased visibility and international standing of NTUA in the field of Space Geodesy and Geosciences.  Establishment of a highly experienced and skilled task force in the host institute, with extended networking capabilities and international reach (in a European and international level).  Raise attractiveness of NTUA to young talented scientists along with its ability to provide relevant funding (via successfully claiming research funds). |
| **IMPACTS** |
| *What are the expected wider scientific, economic and societal effects of the project contributing to the expected impacts outlined in the respective destination in the work programme?*  ***S*ocietal:** Quenching of the crowding-out effect of young scientists experienced in Greece.  **Technological:** Creation of a centre of excellence for Space Geodesy in Greece, with elevated international standing.  **Technological:** Boost involvement, innovation and expertise for Space studies in Greece.  **Economic/Scientific:** Boost host institute’s success rate in research funding bids.  **Scientific:** Sustainable synergies with prestigious, top-level institutes and consortia. Establish and secure the host institute’s role as a key player in the field of Space Geodesy in the long run. |

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**3. Quality and efficiency of the implementation** #@QUA-LIT-QL@# #@WRK-PLA-WP@#

**3.1 Work plan and resources**

The work plan for ACRONYM is heavily focused on an seamless, one-way transfer of excellence between the top-class consortium partners and NTUA. Project administration activities are placed in an individual Working Package (WP1) to allow for its efficient management, coordination and progress checking. Capacity building is split into two Working Packages, each with its own focus and goals; WP2 targets the establishment of networking channels, task forces and technique-specific synergies, introductory level coaching on the respective techniques, and the establishment of a detailed work-plan and goal setting for the transfer of excellence and capacity building to follow. WP3 aims at a more hands-on approach, where the top-class partners will assist NTUA in enhancing its research capacity and prestige via the refinement of its scientific arsenal, specifically aimed at implementing state-of-the-art software tools. An additional Working Package (WP4) is aimed at dissemination activities through e.g. the sharing of outcomes and results via open-access scientific publications and promoting innovation, especially in Greece. The work plan is described in detail in the following.

**3.2 Capacity of participants and consortium as a whole** #@CON-SOR-CS@# #@PRJ-MGT-PM@#

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**Tables for section 3.1**

**Table 3.1a: List of work packages**

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| **Work package No** | **Work Package Title** | **Lead Participant No** | **Lead Participant Short Name** | **Person-Months** | **Start Month** | **End month** |
| WP1 | Project Management and Coordination | 1 | NTUA |  | 1 | 36 |
| WP2 | Networking and Transfer of Knowledge | 1 | OSO |  | 1 | 24 |
| WP3 | Building Excellence Capacity | 1 | IPGP |  | 12 | 36 |
| WP4 | Dissemination, Exploitation and Communication Activities | 1 | NTUA |  | 1 | 36 |

**Table 3.1b: Work package description**

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| **Work package number** | WP1 |
| **Work package title** | Project Management & Coordination |

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| **Objectives**  The objective of this WP is to ensure successful implementation of project activities and timely delivery of high-quality results, so that by the end of implementation life the project achieves its overall goal and fulfills all foreseen objectives as given in the Proposal. In more detail, specific aims targeted at this WP are:   * Establish a strong project management scheme * Establish appropriate communication and reporting channels to the European Commission * Ensure successful achievement of the project objectives on time and within budget * Establish an efficient electronic service for communications, and document exchanging * Conduct continuous quality assurance activities for the operation of the project and the production of its results within its lifespan * Ensure continuous monitoring of the project’s progress and timely initiation of corrective actions (if needed) * Coordinate the organization and execution of the various project meetings, and/or participation of the project in various external or self-organized events * Perform risk analysis and ethical and legal framework analysis to ensure successful and continuous compliance with ethical and legal standards concerning the project objectives. |

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| **Description of work**  **Task 1.1: Project Implementation Plan and Project Management Board (M1-M36): Lead NTUA**  A Project Management Board will be decided on and formed at the kick-off meeting (Task 1.x). This board will act as the highest project body in charge for executive decisions and responsible for project activities and results, risks, quality assurance, resources, impact monitoring, meetings preparation, as well as for in-house reports and the reporting towards the European Commission. ACRONYM Management Board will consist of representatives of all partners (one representative per partner).  The Project Management Board will explain project work methodology, confirm objectives, list tasks and the time of their execution, present resources, roles, and responsibilities of ACRONYM partners, give milestones and the paths to the achievement of project results, and elaborate all other aspects important to successful project implementation in accordance with the workplan of this Proposal. The task forces of all active work packages will periodically deliver in-house progress reports to the Project Management Board.  The board will perform on-line meetings every three months, or whenever one of the Quality Management Board, Risk Management Board or Financial Management Board identifies a specific need/subject to be addressed. It will also periodically submit progress reports (every six months).  **Task 1.2: Quality Management and Monitoring (M1-M36): Lead CLS**  The project will establish the Quality Management Board, whose role will be to develop a quality management plan, define and monitor the achievement of high quality project deliverables, conduct quality checks, and organize quality-related project meetings and teleconferences. The board members will be decided on and formed at the kick-off meeting (Task 1.x), made up of personnel from all partners.  At the beginning of project implementation period, the board will prepare, and the Project Management Board will adopt the Quality Plan, a document that prescribes quality assurance mechanisms and metrics, internal and external quality control measures, particular quality-related requirements for scientific project results including gender dimension, and define roles and responsibilities of all participants included in quality procedures. Every 6 months starting from the project beginning, the Quality Management Board will deliver integrated reports to the Project Management Board.  **Task 1.3: Risk Management (M1-M36): Lead GFZ**  The Project Management Board will adopt at the beginning of the project the Risk Management Plan referring to the monitoring of the risks identified at the time of Proposal preparation, and to those risks occurred in the period between Proposal submission and Grant awarding. The Plan will be continuously revised, and it will be the responsibility of all project participants to report promptly about any newly emerged risk that could impact project implementation and cause deviation from the original work plan. For every identified risk, the level of likelihood to occur and the level of severity must be elaborated, and timely prevention and mitigation actions and mechanisms precisely defined. Risk Management will be discussed as a separate session at every gathering of the Project Management Board.  **Task 1.4: Financial Management (M1-M36); Lead NTUA**  One specific support team to the Project Management Board will be the Financial Committee, that will develop the Guidelines for the Use of the Grant, monitor project expenditures, deliver in-house reports to the Management Board every 6 months, and prepare financial reports for the European Commission.  **Task 1.5: Coordination, Communication and Administration (M1-M36); Lead NTUA**  The Coordinator shall form a collective, and each partner shall form its own administrative base of the project. The Coordinator shall issue labelling instructions and store hardcopies of all project documentation. In a separate part of the project web platform (Task 4.1), an electronic project register will be formed. The Coordinator leads day-to-day communication through agreed electronic channels at the level of the Project Management Board, with Leaders of Work Packages, coordinates project activities, distributes documents, news, and achievements, and reports on communication with the European Commission. Mutually, all members of the Project Management Board shall inform each other about the project progress in locale and the potential obstacles and changed conditions for its implementation, so that the difficulties could be dealt with successfully and timely, or the back-up plans prepared.  **Task 1.X Kick-Off Meeting (M1-3); Lead: OSO**  A two-day meeting will be held with the presence of all involved partners, organized by OSO. The focus of the meeting will be the establishment of sound networking and communication between partners, the acquaitance of the different task forces and groups, decisions on on-line communication means (e.g. video conference platforms) and first imminent steps to be performed.  **Task 1.X Wrap-Up, Evaluation and Conclusions Meeting (M32-36); Lead IPGP**  Near the end of ACRONYM, a two-day meeting will be held organized by GFZ with the presence of all partners. The aim of the meeting will be the evaluation of the overall work done during the lifespan of ACRONYM, assessment of initial goals established and the extend they were reached, current status of the Center of Excellence for Space Geodesy research capacity, possible shortcomings and imminent next steps for their overcoming.  Conclusions will be drawn on the success rate of the project, acting as guidelines for the next steps of the consortium and especially the awaited synergies proposed for at Task 2.4. Evaluation and concussions will be drawn both for the research capacity building part of ACRONYM, as well as the administrative and managerial performance. |

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| **Work package number** | WP2 |
| **Work package title** | Transfer of Knowledge |

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| **Objectives**  The objectives of this WP are to:   * transfer knowledge (per technique) from expert nodes to the coordinator * establish technical standards, requirements and specifications for research capacity building (mid-term and long-term) * recruitment of at least three PhD students and three PostDoc students to support research capacity building * establish and train a task force at NTUA aiming at boosting its success rate in research funding bids |

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| **Description of work**  **Task 2.1 Networking and transfer of knowledge for DORIS (M1-M12); Lead IPGP**  The host institute along with IPGP and CLS will establish a task force (with members of all three involved institutes) and the means through which this force will maintain a long-term, sound communication and collaboration.  The expert partners will introduce the DORIS technique to their peers in the host institute via online webinars, virtual training, videos conferences, venture labs and one short term encounter (duration between one and two weeks) of all three involved partners. At this stage, virtual meetings (webinars, training and/or lab sessions) will be held twice per month. Knowledge exchange will include data curation, analysis pipelines, identification of technique specific error-budget and its treatment and mitigation, instrumentation and technique specific results, applications and future prospects. The short term visit will be hosted by IPGP and will include the schooling of the host’s personnel and its training on software tools used by the expert nodes in their respective institutes.  The partners will also decide on a technique-specific PhD thesis and one Post-Doc Thesis, which they will co-supervise, thus strengthening ties and synergies. Both theses will be carried out in NTUA, in close cooperation with the expert nodes, and written/defended in English.  Additionally, exploiting the expertise of the top-class institutes (IPGP and CLS), the partners will draw out a detailed plan on significantly enhancing the host’s research capacity within the time frame of ACRONYM, through designing and implementing a DORIS data analysis toolbox. This plan will include specifications, standards and models as well as hierarchically ordered tasks, eventually leading to reaching state-of-the-art analysis results (i.e. Associate Analysis Center status). The plan will include timely milestones, goals and validation tests.  Furthermore, this three-part consortium will decide on two technique-related subjects to work on, aiming at two scientific publications in high-impact peer-reviewed scientific journals (impact factor > 2.4).  Expert nodes will introduce the host to the IDS consortium, facilitating its further networking with prestigious international top-class institutes.  **Task 2.2 Networking and transfer of knowledge for SLR (M1-M12); Lead GFZ**  GFZ and NTUA will establish a task force (with members of both involved institutes) and the means through which this force will maintain a long-term, solid communication channel.  The expert partner will introduce the SLR technique to its peers in the host institute via online webinars, virtual training, video conferences, venture labs and one short term encounter (duration between one and two weeks), hosted by GFZ. At this stage, virtual meetings (webinars, training and/or lab sessions) will be held twice per month. Knowledge exchange will include data curation, analysis pipelines, identification of technique specific error-budget and its treatment and mitigation, instrumentation and technique specific results, applications and future prospects. During the visit, NTUA personnel will make a guided in-situ visit to the SLR station in Potsdam (operated by GFZ), where they will be introduced to the instrumentation and operational aspects of the site. Additionally, the visit will include the schooling of the host’s personnel in software tools developed and used by the expert node to process SLR data for precise orbit determination and estimation of geodetic parameters.  The partners will also decide on a technique-specific PhD thesis and one PostDoc thesis which they will co-supervise. The theses will be carried out in NTUA, in close cooperation with the expert node, and written/defended in English.  Exploiting the expertise of GFZ, the two partners will lay out a detailed plan on significantly enhancing the host’s research capacity within the time frame of ACRONYM, through designing and implementing an SLR data analysis toolbox. It will include specifications, standards and models as well as hierarchically ordered tasks, eventually leading to reaching state-of-the-art analysis results (i.e. Associate Analysis Center status). The plan will include timely milestones, goals and validation tests.  Furthermore, the two partners will decide on a technique-related subject to work on, aiming at a scientific publication in a peer-reviewed scientific journal (impact factor > 2.4).  GFZ will introduce the host to the ILRS consortium, facilitating its further networking with prestigious international top-class institutes.  **Task 2.3 Networking and preparing research capacity for VLBI (M1-M12); Lead OSO**  OSO and NTUA will establish a task force (with members of both involved institutes) and the means through which this force will maintain a long-term, sound communication channel.  The expert partner will introduce the VLBI technique to its peers in the host institute via online webinars, virtual training, video conferences, venture labs and one short term encounter (duration between one and two weeks), hosted by OSO. At this stage, virtual meetings (webinars, training and/or lab sessions) will be held twice per month. Knowledge exchange will include data curation, analysis pipelines, identification of technique specific error-budget and its treatment and mitigation, instrumentation and technique specific results, applications and future prospects. During the visit, NTUA personnel will make a guided in-situ visit to the VLBI site in Onsala (operated by OSO), where they will be introduced to the instrumentation and operational aspects of the site. Additionally, the visit will include the schooling and training of the host’s personnel in software tools developed and used by the expert node to process VLBI data for the estimation of Earth orientation parameters.  The partners will also decide on a technique-specific PhD thesis and one PostDoc thesis which they will co-supervise. The theses will be carried out in NTUA, in close cooperation with the expert node, and written/defended in English.  Exploiting the expertise of OSO, the partners will lay out a detailed plan on significantly enhancing the host’s research capacity within the time frame of ACRONYM, through designing and implementing a geodetic toolbox, specifically aiming at an efficient and accurate handling of Earth orientation parameters, celestial and terrestrial reference frame transformations and modeling of tidal phenomena. This plan will include state-of-the-art standards and models to be used, as well as testing and validation cases. Tasks will be hierarchically ordered in a precision ordered fashion, eventually leading to achieving utmost quality. The plan will include timely milestones, goals and validation tests.  Furthermore, the two partners will decide on a technique-related subject to work on, aiming at a scientific publication in a peer-reviewed scientific journal (impact factor > 2.4).  OSO will introduce the host to the IVS consortium, facilitating its further networking with prestigious international top-class institutes.  **Task 2.4 Evaluation of currently available software tools (M6-12); Lead GFZ** |

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| **Work package number** | WP3 |
| **Work package title** | Building Excellence Capacity |

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| **Objectives**  The objectives of this WP are to:   * effectively enhance host’s research capacity through expertise, skill building and software implementation * transfer of knowledge and best practices (per technique) using a “hands-on” approach * build a software toolbox to perform state-of-the-art data analysis for observations collected by both DORIS and SLR techniques. Additionally, the package will be able to efficiently incorporate recent advances and high-quality products from VLBI analysis. * enhance NTUA research profile via adherence to a free and open-source policy (software) * create highly skilled personnel at the host institute * establish a long term plan for enhancing the host institute’s research capacity and international standing * accommodate NTUA’s involvement in prestigious international consortia |

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| **Description of work**  **Task 3.1 Building research capacity via DORIS (M12-M36); Lead CLS**  CLS and IPGP will provide assistance to NTUA aiming at the upgrade and refinement of its own DORIS analysis software, to perform precise orbit determination and estimation of geodetic parameters. A working group of at least four members of NTUA, including one PhD and one PostDoc student, will be involved in this task on the host institute’s part.  Both expert nodes will assist NTUA’s personnel via online webinars, one-on-one and one-to-many training, problem solving and advisory meetings, exploiting the networking capacity already established in Task 2.1. Additionally, NTUA’s staff will visit CLS and both CLS and IPGP personnel will make one short visit to NTUA’s facilities, in an effort to further consolidate efficient flow of expertise. The short term visits will have a duration of one to two weeks. Knowledge transfer at this stage will include robust algorithmic and design approaches, best modeling practices, state-of-the-art methodologies and implementation strategies. Regular virtual meetings will be held once per month to monitor progress, while additional meetings will take place on demand, targeting specific issues and/or problems that may come up (problem solving and training sessions).  Software development will adopt the work plan established in Task 2.1, enabling step-by-step validation. Such a process will enable the efficient administration of the capacity building process, monitoring progress through well established, timely milestones, goals and validation tests.  Expert nodes will also introduce aspects of currently active intense research within the DORIS technique as well as IDS specific needs and ongoing and/or future plans, through which the host institute can play a significant role in the field in the long term.  **Task 3.2 Building research capacity via SLR (M12-M36); Lead GFZ**  GFZ will provide assistance to NTUA aiming at the development of its own SLR analysis software, to perform precise orbit determination and estimation of geodetic parameters. A working group of at least four members of NTUA, including one PhD and one PostDoc student, will be involved in this task on the host institute’s part.  The expert node will assist NTUA’s personnel via online webinars, one-on-one and one-to-many training, problem solving and advisory meetings, exploiting the networking capacity already established in Task 2.2. Additionally, NTUA’s staff will visit GFZ and GFZ personnel will make a short visit to NTUA’s facilities, in an effort to further consolidate an efficient flow of expertise. The short term visits will have a duration of one to two weeks. Knowledge transfer at this stage will include robust algorithmic and design approaches, best modeling practices, state-of-the-art methodologies and implementation strategies. Regular virtual meetings will be held once per month to monitor progress, while additional meetings will take place on demand, targeting specific issues and/or problems that may come up (problem solving and training sessions).  Software development will adopt the work plan established in Task 2.2, enabling step-by-step validation. Such a process will enable the efficient administration of the capacity building process, monitoring progress through well established, timely milestones, goals and validation tests.  GFZ will also introduce aspects of currently active intense research within the SLR technique as well as ILRS specific needs and ongoing and/or future plans, through which the host institute can play a significant role in the field in the long term.  **Task 3.3 Building research capacity via VLBI (M12-M36); Lead OSO**  VLBI is known for its importance in the observation of the Earth's orientation parameters and fluctuations in the length of day. Such observations are of immense importance in Space Geodesy, since they enable e.g. the permanent tie between Celestial and Terrestrial Reference Frames.  OSO will assist NTUA in incorporating a state-of-the-art handling of Earth Orientation Parameters and consequently reference frame transformation schema in its own software toolset. The expert node will assist NTUA’s personnel via online webinars, one-on-one and one-to-many schooling, problem solving and advisory meetings, exploiting the networking capacity already established in Task 2.3. A working group of at least four members of NTUA, including one PhD and one PostDoc student, will be involved in this task on the host institute’s part. Regular virtual meetings will be held once per month to monitor progress, while additional meetings will take place on demand, targeting specific issues and/or problems that may come up (problem solving and training sessions).  Knowledge transfer at this stage will include robust algorithmic and design approaches, best modeling practices, state-of-the-art methodologies and implementation strategies. Software development will adopt the work plan established in Task 2.2, enabling step-by-step validation. Such a process will enable the efficient administration of the capacity building process, monitoring progress through well established, timely milestones, goals and validation tests.  Additionally, NTUA’s staff will visit OSO and OSO personnel will make a short visit to NTUA’s facilities, in an effort to further consolidate networking and efficient expertise transfer. The short term visits will have a duration of one to two weeks.  **Task 3.4 Long term plan for centre of excellence (M30-36); Lead NTUA**  The consortium will thoroughly evaluate the progress performed within the framework of ACRONYM in terms of research capacity; it will then accordingly establish a work plan for all remaining steps required for NTUA to reach either an Analysis Center status or an Associate Analysis Center status, for the DORIS and SLR techniques, depending on each international service’s needs (i.e. IDS and ILRS) and prerequisites.  Additionally, the consortium will identify weak points in the research capacity built and propose means to mitigate them. Finally, it will identify and propose a number of study areas that currently lay in research frontiers and attract international research interest. These focus areas will act as pathways for future evolution and growth of the Centre of Excellence. |

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| **Work package number** | WP4 |
| **Work package title** | Strengthening research management, administration and funding capacity |

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| **Objectives**  The objectives of this WP are to:   * Strengthen research management capacities and administrative skills of the staff working in NTUA * Create a dedicated, skilled workforce at NTUA responsible for project claiming and grant applications * Expand and diversify funding pools and capabilities targeted by NTUA * Build expertise at efficient and succeseful research proposal writing * Claim research and scholarhsip funds to enahnce NTUA’s appealingness to young scientits and recruitement opportunities, increase mobility and support and expand research activities (financialy-wise) * Boost success rate of funding bids |

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| **Description of work**  **Task 4.1 Strengthening research management capacity and administrative skills (M1-M18); Lead OSO**  **Task 4.2 Exploring funding pools and opportunities (M12-M18); Lead GFZ**  **Task 4.3 Enhancing Research Funding Capacity (M12-M36); Lead CLS**  The host institute will establish a task force made up of six NTUA employees, which will be trained in project funding seeking, proposal writing and efficient research project management and administration, via remote mentoring and coaching. The consortium partners (CLS, IPGP, GFZ and OSO) will transfer technical knowledge, know-how and best practices to the NTUA task force.  The task force along with the partners will be involved in exploring possibilities and capabilities in:   * research funding possibilities via European research funding pools and consortia (e.g. EU, ESA, etc) * **collaborative funding (contributions from various stakeholders, such as government agencies, private foundations and industry partners)** * **funding via research consortia and networks (e.g. funding claiming via contribution in international services such as the IDS, ILRS and IVS)** * **funding pools and networking specifically targeting young scientists, e.g. MSCA Doctoral Networks** * **public-private partnerships, where partnerships with industry will be seeked for, to support research and development in Space and Earth Observation industry and technology**   in an effort to significantly enhance future NTUA’s successful proposal submission rate, secure financial aid for the host’s research activities in the long-run and boost long-term synergy between the consortium partners.  The task force along with the partners will decide on a strategic plan for two further research proposals to be submitted within the duration of ACRONYM.  **Task 4.4 Attracting new scientists and increasing mobility (M12-M36); Lead IPGP**  **Task 4.5 research management/administration unit** |

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| **Work package number** | WP5 |
| **Work package title** | Networking and Ecosystem Activities |

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| **Objectives**  The objectives of this WP are to:   * establish efficient and seamless communication and knowledge transfer channels * establish efficient and solid networking and collaboration between twinning partners * introduction of NTUA to international consortia and/or services (i.e. IDS, ILRS and IVS) * establishment of a Greek ecosystem of partners involved in space-based geosciences and applications |

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| **Description of work**  **Task 2.1 Establishing ACRONYM seamless communication channels**  **Task 2.2 Introduction to Space Geodetic International Services**  **Task 2.3 Introduction to Internation Geodetic Consortia**  **Task 2.6 Establishing a Greek Ecosystem of Partners in Space-based Geosciences (M6-18); Lead NTUA**  NTUA will take the initiative of bringing together all parties in Greece involved in Space-based geosciences and related applications. This will include possible industry partners (e.g. Libre Space Foundation (<https://libre.space/>), Geosystems Hellas (<https://www.geosystems-hellas.gr/>), Planetek Hellas (<https://www.planetek.gr/>)), governmental agencies and institutions (e.g. National Observatory of Athens, Beyond Centre (<http://beyond-eocenter.eu/>), Hellenic Group on Earth Observations (<https://www.greekgeo.noa.gr/>)) as well as universities (e.g. Aristotle University of Thessaloniki, National and Kapodistrian University of Athens and the University of West Attica).  Two dedicated conferences will be organized by NTUA to take place in Greece, aiming at networking activities and potential collaborations between involved parties. A minimum attendance of 15 individual agencies is expected.  The first conference will focus on presenting ACRONYM’s aims, objectives and anticipated impact, as well as Space-based earth observation research activities currently active at NTUA performed in various laboratories (e.g. remote sensing, positioning and navigation, atmospheric studies, etc).  A second, two-day conference will focus on the introduction of the different ecosystem parties, presenting their fields of expertise, research and industry portfolios, aspirations and future work. |

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| **Work package number** | WP5 |
| **Work package title** | Dissemination, Exploitation and Communication Activities |

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| **Objectives**  The objectives of this WP are to:   * significantly enhance the host institute’s international standing and prestige via dissemination and communication activities * endorse and promote the achievements of ACRONYM and the newly established center of excellence * enhance NTUA’s research profile through scientific papers in top-tier peer reviewed journals, co-authored with the top-class consortium partners (at least three) * enhance NTUA’s visibility, prominence and networking capabilities via consortium presence in at least five international conferences/workshops * strengthen the potential for future collaborations nationally and beyond borders * enhance NTUA’s appeal to young talented scientists * enhance and support the national (Greek) ecosystem of stakeholders related to Space studies and Geosciences; boost innovation and disperse knowledge |

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| **Description of work**  **Task 4.1 Project Website and Social Media Engagement (M6-M36); Lead NTUA**  The host institute will design and implement a dedicated web site for the project, assisting networking capabilities, promotion and communication of activities taking place in the framework of the project and, dissemination of ACRONYM outcomes and results and in general outreach material.  Mandatory sections to be included into the website include general project information (aim, objectives, consortium members), the list of activities and achieved results, news and events, contact information, and login area for ACRONYM beneficiaries. The website will be continuously updated during the whole lifespan of the project.  Promotion, communication and endorsement activities will also be performed via social media (e.g. LinkedIn) on a timely manner, throughout the duration of ACRONYM.  **Task 4.2 Sharing of technical knowledge and know-how (M12-M24); Lead IPGP**  Lectures and presentations prepared by the consortium experts (see WP2) will be made available (on-line, free access) to any interested parties, on demand. Users will be able to browse content and watch video-lectures, shared on the project’s web site (Task 4.1). Such actions are expected to increase visibility of the project and promote awareness in the field, especially targeting Greek institutions (both public and private).  **Task 4.3 Joint Summer School and Seminar (M12-M36); Lead NTUA**  The host institute will organize a three-day Summer School that will take place in Greece, for the endorsement of ACRONYM, dissemination of its scientific output and results and promotion of innovation in the field of Space Geodesy, Orbit Determination, Space Studies and Geosciences in general. IPGP, GFZ and OSO will all be involved, presenting the space geodetic techniques, current and future trends, applications and challenges. The school will especially target the Greek ecosystem of stakeholders that are involved in Space studies and Geosciences. This will include public research institutions, universities and private sector organizations/companies.  The host institute will also organize a one-day seminar (info-day) to take place in Greece, where CLS utilizing its decades old involvement in the field of providing space-based solutions, will address issues of providing high value-added products and services related to monitoring and surveillance solutions for Earth. Focus will be placed on Environmental and Climate monitoring, Maritime Surveillance and Infrastructure monitoring. Target audience will be the Greek ecosystem relevant to the Space studies and Geosciences (public research institutions, universities, private sector and any interested party) in an effort to promote and endorse innovative and trending ideas, products and solutions in the field.  **Task 4.4 Open-Access Publications (M12-M36); Lead NTUA**  Each of the expert partners will collaborate with the host institution in the co-authorship of one scientific paper (in their respective fields of expertise), to be published in peer-reviewed journal (impact factor > 2.4). Hence, by the end of ACRONYM, three high impact factor publications will have been produced, adhering to an open-access policy.  Additionally, members of the consortium will present relevant publications in at least five international conferences. The target here includes technique-related workshops (e.g. Analysis Centre Workshops organized by IDS and/or ILRS) and conferences of significant importance and prominence (e.g. IUGG, EGU and AGU international conferences).  **Task 4.5 Dissemination Activities and Support for the Greek Ecosystem (M12-M36); Lead CLS**  To support the establishment and longlivety of the Greek space-based geoscienences ecosystem (Task 2.5), NTUA and partners will prepare and disseminate a newletter, containing information on: (a) the aims and objectives of ACRONYMS, (b) milestones reached, (c) activities performed within ACRONYM including software design and release, conference attendance and relevant publications, (d) new prospects, missions and trends in pace Geodesy, (e) outreach matterial from all partners of ACRONYM and (f) outreach matterial from ecosystem members.  The first issue of the newsletter will be prepared and published by the 12th month and from then on, a new issue will be released every six months. |

**Table 3.1c: List of Deliverables**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Deliverable (number)** | **Deliverable name** | **Work package number** | **Short name of lead participant** | **Type** | **Dissemination level** | **Delivery date**  **(in months)** |
| D1.1 | Kick-Off Meeting | WP1 | NTUA | R | PU | 3 |
| D1.2 | Project Management Board Meetings | WP1 | NTUA | R | PU | 6,12,18,24,30 |
| D1.4 | Final ACRONYM meeting | WP1 | NTUA |  |  | 36 |
| D2.X | Evaluation and status of NTUA’s in-house software | WP2 | GFZ | R | PU | 12 |
| D2.1 | Standards and specification for DORIS analysis | WP2 | IPGP | R | PU | 12 |
| D2.2 | Standards and specification for SLR analysis | WP2 | GFZ | R | PU | 12 |
| D2.3 | Standards and specification for EOP and tidal analysis | WP2 | OSO | R | PU | 12 |
| D4.X | ACRONYM Newsletter | WP4 | CLS |  |  | 12,18,24,30,36 |
| D2.4 | Submission of two research proposals for funding | WP2 | NTUA | R | PU | 24 |
| D2.5 | Greek ecosystem meeting I | WP2 | NTUA |  |  | 12 |
| D2.6 | Greek ecosystem meeting II | WP2 | NTUA |  |  | 24 |
|  | **research management/administration unit** |  |  |  |  |  |
| D3.1 | Software toolbox for analysis of DORIS observations | WP3 | IPGP | R+O | PU | 36 |
| D3.2 | Software toolbox for analysis of SLR observations | WP3 | SLR | R+O | PU | 36 |
| D3.3 | Validation tests for EOP precise handling | WP3 | OSO | R+O | PU | 36 |
| D3.4 | Long term plan for Center of Excellence | WP3 | NTUA | R | PU | 36 |
| D4.1 | Project Website | WP4 | NTUA | DEC | PU | 12 |
| D4.2 | Lecture notes and Training material | WP4 | NTUA | DEC | PU | 30 |
| D4.3 | Joint Summer School | WP4 | NTUA | DEC | PU | 32 |
| D4.4 | Space Geodesy Solutions Info-day | WP4 | CLS | DEC | PU | 32 |
| D4.5 | Open-Access Publications | WP4 | NTUA | DEC | PU | 36 |
| D1.X | Evaluation and Conclusions | WP1 | GFZ |  |  | 36 |

**Table 3.1d: List of milestones**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Milestone number** | **Milestone name** | **Related work package(s)** | **Due date (in month)** | **Means of verification** |
| MS | Kick-Off Meeting Organized | WP1 | 3 | Organization of an all-partner meeting |
| MS | Agreement on PhD/Post-Doc co-supervision | WP2 | 8 | Official certification by NTUA and the respective partner involved |
| MS | ACRONYM website | WP4 | 8 | ACRONYM website publicly accessible |
| MS | Standards and specifications for software development | WP2 | 12 | Document reports (three individual reports as described in Tasks 2.1, 2.2 and 2.3) |
| MS | Issue of the first volume of the ACRONYM newletter | WP4 | 12 | Delivery by e-mail to all parties involved in the Greek ecosystem |
| MS | Establishment of a Greek ecosystem for space-based Earth observation | WP2 | 12 | Two open meetings of the Greek ecosystem performed. Expected attendance of over 12 different individual institutions |
| MS | Orbit determination via SLR and DORIS | WP3 | 20 | Software tests validated by expert nodes; publicly available via software repository (version 1.0) |
| MS | Precise orbit determination via SLR and DORIS for one satellite | WP3 | 28 | Software tests validated by expert nodes; publicly available via software repository (version 2.0) |
| MS | Estimation of parameters of geodetic interest | WP3 | 34 | Software tests validated by expert nodes; publicly available via software repository (version 3.0) |
| MS | Wrap Up Meeting | WP1 | 36 | All-partner meeting and technical report |

**Table 3.1e: Critical risks for implementation** #@RSK-MGT-RM@#

|  |  |  |
| --- | --- | --- |
| **Description of risk (indicate level of (i) likelihood, and (ii) severity: Low/Medium/High)** | **Work package(s) involved** | **Proposed risk-mitigation measures** |
| Inability to travel e.g. due to pandemic security measures (l:medium,s:low) | WP2 and WP3 | If such a situation shall arise, then the partners will perform the required tasks via online platforms, utilizing experience gained throughout the last few years of security measures. |
| Failure to fully implement the Space Geodesy software (l:low,s:high) | WP3 | Due to the partner's expertise in such tasks, and the availability of a relevant package that can act as a fundamental building block, such a risk is considered extremely small. If however such a situation arises at some minimal extent, then the consortium will limit the number of involved satellites (e.g. from three to two or one).  If the software build does not reach state-of-the-art standards (upon project completion), the host institute will have already gained the knowledge and know-how to further refine it and will have already submitted proposals to extend its funding and support via relevant research projects. The network of collaborators that will have been established, will guarantee its on-going support in technical matters. The Long term plan for centre of excellence (established in Task 3.4) will act as a roadmap for eventually reaching state-of-the-art quality. |
| **One partner resigns from consortium** |  | **Other partners can still support the research component of the project** |
|  |  |  |

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**Table 3.1f: Summary of staff effort**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **WPn** | **WPn+1** | **WPn+2** | **Total Person-**  **Months per Participant** |
| **Participant Number/Short Name** |  |  |  |  |
| **Participant Number/**  **Short Name** |  |  |  |  |
| **Participant Number/**  **Short Name** |  |  |  |  |
| **Total Person Months** |  |  |  |  |

**Table 3.1g: ‘Subcontracting costs’ items**

|  |  |  |
| --- | --- | --- |
| **Participant Number/Short Name** | | |
|  | **Cost (€)** | **Description of tasks and justification** |
| **Subcontracting** |  |  |

**Table 3.1h: ‘Purchase costs’ items (travel and subsistence, equipment and other goods, works and services)**

|  |  |  |
| --- | --- | --- |
| **Participant Number/Short Name** | | |
|  | **Cost (€)** | **Justification** |
| **Travel and subsistence** |  |  |
| **Equipment** |  |  |
| **Other goods, works and services** |  |  |
| **Remaining purchase costs (<15% of pers. Costs)** |  |  |
| **Total** |  |  |

**Table 3.1i: ‘Other costs categories’ items (e.g. internally invoiced goods and services)**

|  |  |  |
| --- | --- | --- |
| **Participant Number/Short Name** | | |
|  | **Cost (€)** | **Justification** |
| **Internally invoiced goods and services** |  |  |
| **…** |  |  |

**Table 3.1j: ‘In-kind contributions’ provided by third parties**

|  |  |  |  |
| --- | --- | --- | --- |
| **Participant Number/Short Name** | | | |
| **Third party name** | **Category** | **Cost (€)** | **Justification** |
|  | **Select between**  Seconded personnel  Travel and subsistence  Equipment  Other goods, works and services  Internally invoiced goods and services |  |  |
|  |  |  |  |

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**Table 3.1k: Research Component**

|  |  |
| --- | --- |
| Have you included a research component in your project? | Yes/No |
| If YES |  |
| Please indicate the WP and/or tasks which will be dedicated to research |  |
| Please confirm that the research component does not exceed 30% of the total Horizon Europe grant amount | Yes/No |
| Please confirm that at least 50% of the research component is allocated to the coordinator | Yes/No |
| Please indicate the total amount of budget allocated to the research activities | EUR |
| Please indicate the amount of the research budget which will go to the coordinator | EUR |
| For each Beneficiary, please indicate the amount of budget allocated to research: |  |
| Beneficiary 1 | EUR |
| Beneficiary 2 | EUR |
| Beneficiary 3 | EUR |
| Beneficiary 4 | EUR |
| Beneficiary 5 | EUR |
| Beneficiary 6 | EUR |
| Beneficiary 7 | EUR |
| … | EUR |