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# EXCELSIOR Project

| H2020-WIDESPREAD-2018-2020 \| Grant Agreement No 857510 | |
|---|---|
| Project full title: | **ERATOSTHENES: Excellence Research Centre for Earth Surveillance and Space-Based Monitoring of the Environment** |
| Project acronym: | **EXCELSIOR** |
| Work Package: | **WP6 Knowledge transfer and capacity building** |
| Deliverable: | **D6.3 Workplan for transfer of knowledge and experience (update 2)** |
| Version: | **Final D6.3** |
| Dissemination level: | **Public** |

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| Project full title: | **ERATOSTHENES: Excellence Research Centre for Earth Surveillance and Space-Based Monitoring of the Environment** |
| Project acronym: | **EXCELSIOR** |
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| Deliverable (D): | **D6.3 Workplan for transfer of knowledge and experience (update 2)** |
| Due date of deliverable: | **31 May 2023**<br>**(Month 44 of the project)** \| Version: **Final D6.3** |
| Author(s): | CUT: **Diofantos HADJIMITSIS**<br>DLR: **Gunter SCHEIRER**, **Thomas KRAUSS**<br>NOA: **Haris KONTOES**, **Maria KASKARA**,<br>TROPOS: **Johannes BÜHL**, **Patric SEIFERT**<br>PMOD/WRC: **Stelios KAZADZIS**<br>ECoE: **Zampela PITTAKI**, **Kyriacos THEMISTOCLEOUS** |
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## Document Sign-off

| Nature | Name | Role | Partner | Date |
|---|---|---|---|---|
| **DRAFT** | Zampela PITTAKI<br>Kyriacos THEMISTOCLEOUS | WP6 Participant<br>Project Technical Manager | ECoE | 10/04/2023 |
| **REVIEWED** | Diofantos HADJIMITSIS | Project Coordinator | CUT | 28/04/2023 |
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| **DRAFT** | Zampela PITTAKI<br>Kyriacos THEMISTOCLEOUS | WP6 Participant<br>Project Technical Manager | ECoE | 26/05/2023 |
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| **APPROVED** | All partners | | | 31/05/2023 |

## Work Package 6: Knowledge Transfer and Capacity Building

### D6.3 Workplan for transfer of knowledge and experience (update 2)

| Sections to be protected | Description | Owner | Access Rights | |
|---|---|---|---|---|
| | | | Period | Type* |
| **None** | | | **-** | **PD** |

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## Executive Summary

Deliverable D.6.3 'Workplan for transfer of knowledge and experience' focuses on the activities carried out for the transfer of knowledge and experience during the Capacity Building Scheme period 'A' (M26 to M44), and the workplan for knowledge transfer and experience during the upcoming Capacity Building Scheme B. Various activities such as workshops, trainings, seminars, and webinars were implemented by the Strategic Partners to facilitate capacity building and knowledge transfer to the ERATOSTHENES CoE researchers. Additionally, an initial plan for Capacity Building Scheme B is provided, which was designed in collaboration with the Strategic Partners of the EXCELSIOR project (TROPOS, DLR, NOA, and PMOD/WRC).

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## Abbreviations

| | |
|---|---|
| CoE | Centre of Excellence |
| CUT | Cyprus University of Technology |
| DEC | Department of Electronic Communications |
| DLR | German Aerospace Centre |
| DMRID | Deputy Ministry of Research, Innovation and Digital Policy |
| ECoE | Eratosthenes Centre of Excellence |
| EO | Earth Observation |
| EXCELSIOR | Eratosthenes: Excellence Research Centre for Earth Surveillance and Space-based Monitoring of the Environment |
| GBS | Ground-based Remote Sensing Station |
| NOA | National Observatory of Athens |
| PMOD/WRC | Physikalisch-Meteorologisches Observatorium Davos / World Radiation Center |
| TROPOS | Leibniz Institute for TROPOSpheric Research |
| TBD | To be determined |

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# 1 Introduction

This document represents the 'Workplan for transfer of knowledge and experience' (deliverable D.6.3) for the EXCELSIOR project. It focuses on the implemented activities that took place during Capacity Building Scheme A of WP6 "Knowledge Transfer and Capacity Building". The main objective of WP6 is to coordinate and manage the knowledge transfer and capacity building that will take place during the EXCELSIOR project with Strategic Partners. The document presents a work plan outlining how knowledge transfer and capacity building were carried out between the Strategic Partners through workshops, seminars, and secondments. This plan heavily relied on the comprehensive work conducted during the project's preparation phase to define the specific seminars, workshops, and secondments that would occur among the Strategic Partners.

This deliverable focuses on the activities carried out for the transfer of knowledge and experience during the Capacity Building Scheme period 'A' (M26 to M44), and the workplan for knowledge transfer and experience during the upcoming Capacity Building Scheme B. Various activities such as workshops, trainings, seminars, and webinars were implemented by the Strategic Partners to facilitate capacity building and knowledge transfer to the ERATOSTHENES CoE researchers. The aim was to enhance the overall capacity of the Centre. This plan was regularly updated based on the evolving needs of the ERATOSTHENES CoE.

For Capacity Building Scheme B, the Strategic Partners of the project (i.e., DLR, NOA, TROPOS and PMOD/WRC) have created a workplan for the transfer of knowledge activities. This workplan is based on the needs of the ERATOSTHENES CoE that were updated according to the identified knowledge gaps of the ERATOSTHENES CoE. An initial plan for Capacity Building Scheme B is provided, which was designed in collaboration with the Strategic Partners (TROPOS, DLR, NOA, and PMOD/WRC).

Descriptions of selected knowledge transfer activities for Capacity Building Scheme B can be found in Appendices A to D.

Chapter 2 provides an overview of the capacity building and knowledge transfer activities conducted during the Capacity Building Scheme A.

Chapter 3 provides the evaluation of the impact and effectiveness of the activities implemented throughout the entire duration of Capacity Building Scheme A.

Chapter 4 provides the description of Demonstration Activities linked with Capacity Building Activities.

Chapter 5 provides the identification of Gaps and additional needs for Capacity Building Scheme B, the initial workplan for the training activities for the Capacity Building - Scheme B, and the expected Impact for Capacity Building - Scheme B.

Chapter 6 is the concluding chapter of the deliverable

Appendix A includes selected trainings by TROPOS scheduled for Capacity Building Scheme B;

Appendix B includes selected trainings by DLR scheduled for Capacity Building Scheme B;

Appendix C includes selected trainings by NOA scheduled for Capacity Building Scheme B and

Appendix D includes selected trainings by PMOD/WRC scheduled for Capacity Building Scheme B.

Appendix E includes the Impacts resulting from the Activities from Capacity Building Scheme A

# 2 Capacity Building Scheme A

A central objective of the EXCELSIOR project is to enhance capacity building and promote knowledge transfer from the Strategic Partners to the ERATOSTHENES CoE. To that end, the Capacity Building Schemes have been designed to provide capacity building and knowledge transfer activities throughout the lifetime of the EXCELSIOR project. This chapter provides an overview of the activities that each Strategic Partner carried out during Capacity Building Scheme A.

## 2.1 Upon the completion of the activities Capacity Building

Capacity-building is defined as the process of developing and strengthening the skills, abilities, processes, and resources that organizations and communities need to thrive. In the EXCELSIOR, capacity building activities include training, learning, knowledge transfer, skill development, coaching, mutual support, and professional development (Figure 1). The EXCELSIOR project has developed a workplan for how the Strategic Partners will provide knowledge transfer and capacity building via workshops, seminars, and trainings.

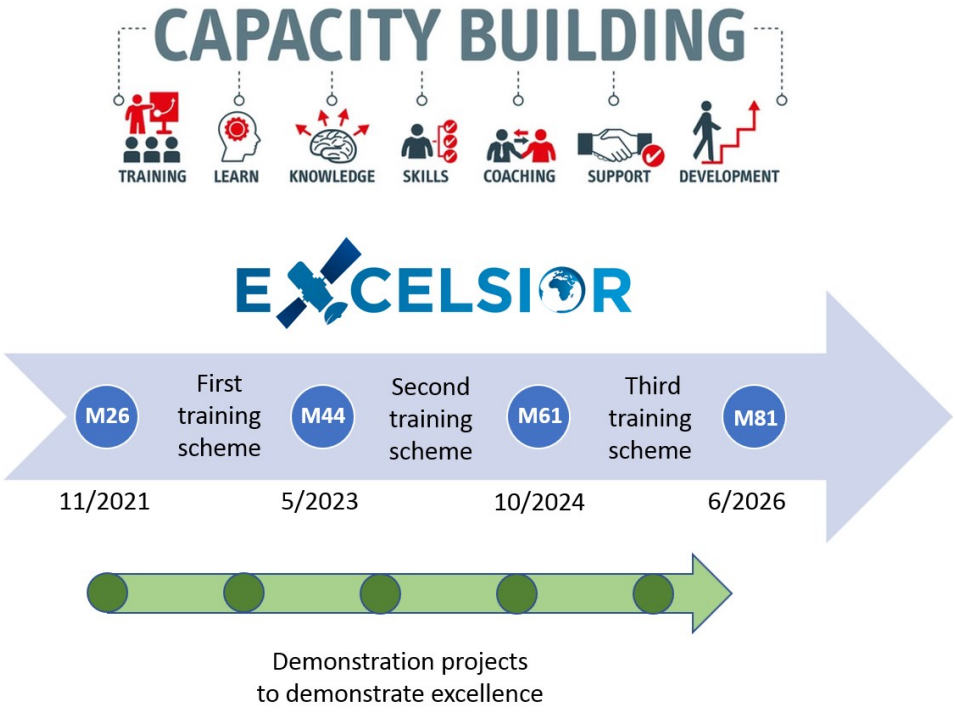


Figure 1. Capacity Building Schemes and Demonstration Projects

The workplan for capacity building with the Strategic Partners is divided into three periods: Capacity Building Scheme A, Capacity Building Scheme B and Capacity Building Scheme C. To maximize the efficiency of capacity building, five demonstration project periods will take place with the Strategic Partners throughout the lifetime of the EXCELSIOR project. In this way, the valuable skills and knowledge gained during the Capacity Building Schemes was/will be applied to the Demonstration Projects.

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Each Strategic Partner has provided the ERATOSTHENES CoE with capacity building and knowledge transfer activities that was/will be done in the clusters of Society Resilience, Environment and Climate, and Big Earth Data Analytics as well as the thematic areas of Atmosphere, Solar Energy, Agriculture, Land, Water, Disaster Risk Reduction Earthquakes/ Landslides, Disasters Risk Reduction Floods, Disasters Risk Reduction /Fire Management, Cultural Heritage, Maritime Safety And Security and Information extraction (Figure 2). The capacity building and knowledge transfer activities was/will be adjusted as new personnel are hired by the Eratosthenes CoE.

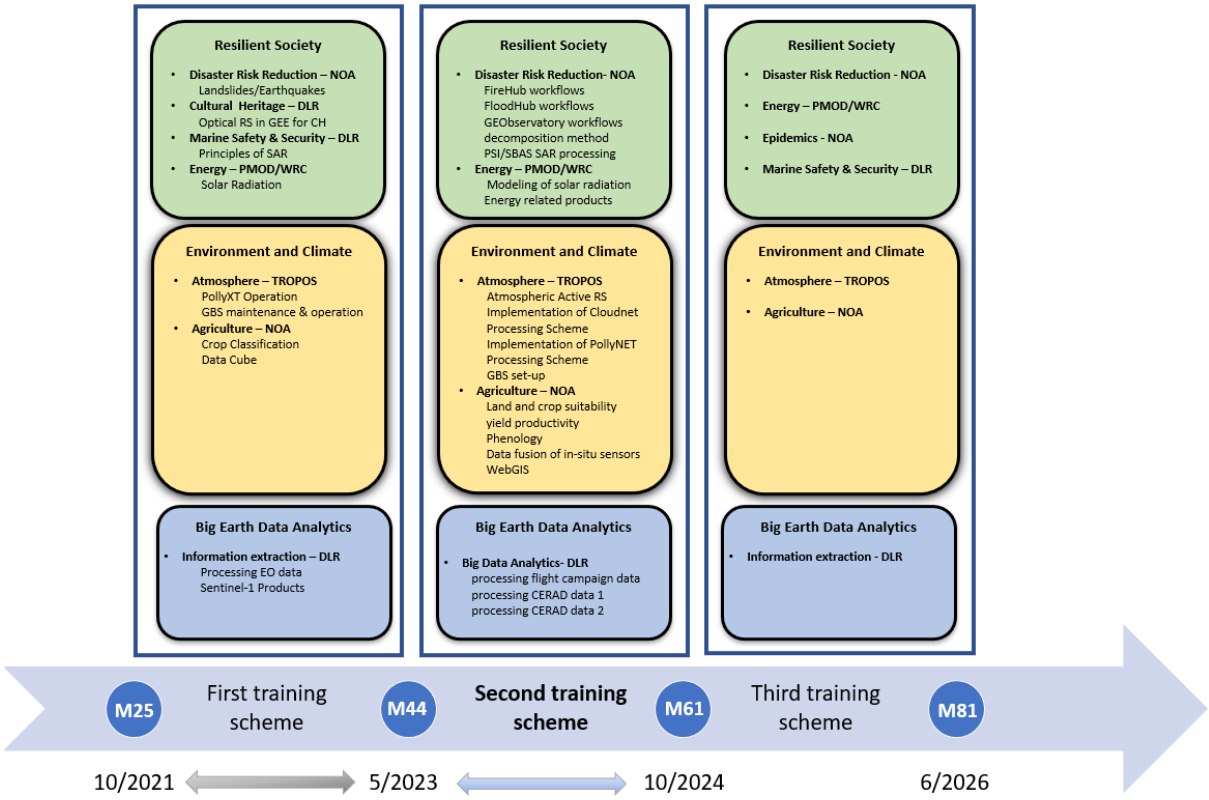


Figure 2. Topics for the first, second and third training scheme.

The trainees consist of former researchers of the Cyprus University of Technology that have been transferred to ERATOSTHENES CoE and new researchers recruited by the CoE. The Strategic Partners provided the initial basic trainings listed in section 2.2 to evaluate the existing capacity and knowledge of the researchers and identify the needs for any additional training and capacity building. The trainings were/will be provided by the Strategic Partners during the capacity building and knowledge transfer activities that were/will be done by each Strategic Partner.

Following the activities that took place during Capacity Building Scheme A, an evaluation of the activities was conducted to identify and evaluate the further capacity needs of the ERATOSTHENES CoE. This interaction will also be further tested in WP7 in the additional demonstration projects, where the interaction and collaboration of Strategic Partners and ERATOSTHENES CoE researchers will continue identifying any gaps or additional capacity building activities. In this way, necessary activities

can be identified, developed and implemented for Capacity Building Scheme B and/or Capacity Building Scheme C.

## 2.2 Conducted Capacity Building and Knowledge Transfer Activities

The activities that were carried out during the Capacity Building Scheme A by the Strategic Partners are shown in Table 1. Table 1 includes a description of the capacity building and knowledge transfer activities conducted by each Strategic Partner, the targeted cluster, type of activity, the month and week that it took place, the number of days that the activity required and the number of participants.

Table 1. Capacity building and knowledge transfer activities by date carried-out.

| Partner / Lecturer | Capacity Building / Knowledge Transfer Activity | Type of Activity | Month, Week | # of days | Thematic Area | # of participants |
|---|---|---|---|---|---|---|
| **NOA** | Seminar on crop classification and crop monitoring for the control of the CAP: the RECAP, Sen2Agri and EOPEN paradigms. Content: DIAS platforms, Acquisition of Satellite Imagery & Data pre-processing, Data fusion S1 & S2 data, Introduction to the DataCube, Crop classification algorithm, Grassland mowing algorithm | Seminar | M26, WK4 (November) | 4 | Agriculture | 27 |
| **NOA** | Earthquakes/Landslides: Basic training on data processing to ERATOSTHENES CoE based on the NOA's workflow for GEObservatory. Content: Acquisition of Satellite Imagery, Processing of Imagery, Theory on Persistent Scatter Interferometry methods for geo-hazards monitoring, Applications including earthquakes, landslides, volcanic activity, construction activity, etc. | Training | M29, WK1 (February) | 3 | Disasters Risk Reduction (All) | 22 |
| **DLR** | Webinar on processing earth observation data in cloud environments. The activity will cover multispectral (Sentinel-2, Landsat, etc.) | Webinar | M36, WK1 (September) | 1 | Big Data | 30 |

| Partner / Lecturer | Capacity Building / Knowledge Transfer Activity | Type of Activity | Month, Week | # of days | Thematic Area | # of participants |
|---|---|---|---|---|---|---|
| | and SAR data (Sentinel-1). The thematic context will cover lakes, wetlands, river basins, coasts, but also agricultural areas and contribute to integrated water management strategies - Cloud infrastructures, GEE; Data storage; Processing and analysis | | | | | |
| **NOA** | **Scalable large-scale agriculture monitoring:** Installation of data cube, processing of Analysis ready S1 & S2 data, Identify APIs for free data, development of yaml files for indexing data in the cube, development of APIs for large scale agricultural monitoring. | Training | M37 – M38 | 2 | Agriculture | 2 |
| **TROPOS** | GBS Maintenance and on-site operation | Training | M31, WK2 (April) | 4 | Atmosphere | 4 |
| **DLR** | Sentinel-1 Products, Data Access and Processing: Introduction on the Copernicus mission Sentinel-1, the data structure, product levels and with Sentinel-1 Instrument Processing Facility (IPF); Processing of Earth observation data in cloud environments; Data handling, implementation of data interfaces e.g. direct downlink or Copernicus Data Hub, following the rules for open data policy; Basics and first automated download from Copernicus since hub. | Seminar | M38, WK2 (November) | 3 | Big Data | 37 |
| **DLR** | Principles of SAR-based maritime information retrieval for maritime safety and security: Basic insight | Seminar | M41, WK2 (February) | 3 | Maritime | 20 |

| Partner / Lecturer | Capacity Building / Knowledge Transfer Activity | Type of Activity | Month, Week | # of days | Thematic Area | # of participants |
|---|---|---|---|---|---|---|
| | into oceanographic processes and anthropogenic structures and their specific representation in SAR images; SAR image signatures used to derive maritime domain information such as sea state and wind properties, ship detection and classification and other. | | | | | |
| **TROPOS** | PollyXT Operation | Training | M36, WK3-4 (September) | 2 | Atmosphere | 4 |
| **PMOD/ WRC** | Training workshop on Solar Radiation/Energy measurements, modeling and applications | Training | M38, WK3 (November) | 2 | Solar Energy | 11 |
| **DLR** | An Introduction to Optical Remote Sensing Data Analysis in Google Earth Engine, with Applications to Cultural Heritage: Hands-on sessions on Google Earth Engine, performing environmental applications at small and large scales, relying on ESA's Sentinel satellites from the Copernicus program, including other data sources; applications to Cultural Heritage risk analysis included. | Training | M42, WK4 (March) | 4 | Cultural Heritage | 27 |
| **TROPOS** | GBS Maintenance and on-site operation | Training | M42, WK1 (March) | 4 | Atmosphere | 4 |

Table 2 features the GANTT chart of the activities conducted as part of Capacity Building Scheme A. The purpose of organizing these activities within the specified timeline was to encourage researchers to take full advantage of the training sessions for knowledge transfer and capacity building. As well, the activities provided the opportunity for researchers to identify any gaps in their knowledge and request additional training to be included in Capacity Building Scheme B and/or Capacity Building Scheme C.

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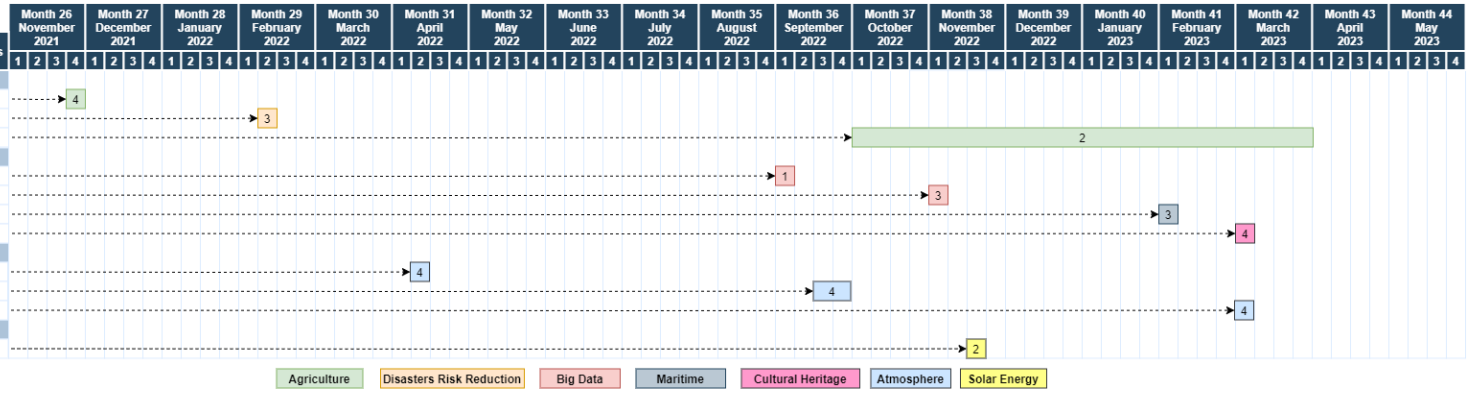
Table 2. GANTT chart for Capacity Building Workplan

| | Activity Name | Type | Participants |
|---|---|---|---|
| | **NOA** | | |
| 1 | Seminar on crop classification and crop monitoring for the control of the CAP | Seminar | 27 |
| 2 | Earthquakes/Landslides | Training | 22 |
| 3 | Scalable large-scale agriculture monitoring | Training | 2 |
| | **DLR** | | |
| 1 | Webinar on processing earth observation data in cloud environments | Webinar | 30 |
| 2 | Sentinel-1 Products, Data Access and Processing | Seminar | 37 |
| 3 | Principles of SAR-based maritime information retrieval for maritime safety | Seminar | 20 |
| 4 | An Introduction to Optical Remote Sensing Data Analysis - Cultural Heritage | Training | 27 |
| | **TROPOS** | | |
| 1 | GBS Maintenance and on-site operation | Training | 4 |
| 2 | PollyXT Operation | Training | 4 |
| 3 | GBS Maintenance and on-site operation | Training | 4 |
| | **PMOD/WRC** | | |
| 1 | Training workshop on Solar Radiation/Energy measurements, modeling | Training | 11 |




*The number in each cell refers to the number of days in the specific week that will be allocated for the training. The duration, date, content and number of trainings was adjusted according to the needs and availability of the trainers and trainees.

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## 2.3 Scheduled activities not implemented

There were several activities that were scheduled to take place which were not implemented, due to various reasons. The following provides an overview of the activity that was scheduled to take place, the type of activity, the month for which it was scheduled to take place and the reason it was not implemented.

### 2.3.1 TROPOS

Regarding the activities for Capacity Building Scheme A not implemented by Strategic Partner **TROPOS**, the activities will take place in 2024 or will take place online.

| Capacity Building / Knowledge Transfer Activity | Type of Activity | Scheduled Month | Rationale |
|---|---|---|---|
| Cloud Radar Operation | Workshop | M33 | No Radar available - **Shift to 2024** |
| Lecture about microwave and radar remote sensing | Lecture | M37-40 | Radar Lecture moved to LIM. During **next semester**, a requirement will be made for **providing this lecture online**. |
| GBS instrument integration at Leipzig | Workshop | M41 | No GBS Container available - **Shift to 2024** |
| GBS Data Evaluation Workshop | Workshop | M42 | No GBS Container available - **Shift to 2024** |
| Lecture about atmospheric remote sensing | Lecture | M42 | Should be conducted **when GBS arrives at Limassol** |
| Training on usage of LARDA[3] remote sensing data cube | Training | M42 | No Server was available - **Shift to 2024** |
| Cloud Radar Operation | Workshop | M44 | No Radar available - **Shift to 2024** |

### 2.3.2 DLR

Regarding the activities for Capacity Building Scheme A not implemented by Strategic Partner **DLR,** the activities were adjusted to the needs of the ERATOSTHENES Centre of Excellence (ERATOSTHENES CoE). Some activities were postponed due to the flight campaign that will take place and/or insufficient infrastructure for the activity to take place.

| Capacity Building / Knowledge Transfer Activity | Type of Activity | Month, Week | Rationale |
|---|---|---|---|
| Remote training of CUT staff in processing of optical sensor data offered from DLR in Oberpfaffenhofen. | Seminar | M32 | **Replaced** by An Introduction to Optical Remote Sensing Data Analysis in Google Earth Engine, with Applications to Cultural Heritage. |
| Theory and applications: Processing System Management (PSM) and Operating Tool (OT) based on operational ground segment components | Seminar | M32 | **Replaced** by Sentinel-1 Products, Data Access and Processing. |

| Capacity Building / Knowledge Transfer Activity | Type of Activity | Month, Week | Rationale |
|---|---|---|---|
| Theory and applications: Teaching of basics for maritime information extraction from Sythetic Apeture Radar SAR and hands-on software training. | Seminar | M33 | **Replaced** by Principles of SAR-based maritime information retrieval for maritime safety and security. Therefore, it was adjusted to ERATOSTHENES CoE needs. |
| Introduction to SAR and InSAR | Training | M41 | **Replaced** by Webinar on processing earth observation data in cloud environments. Therefore, it was adjusted to ERATOSTHENES CoE needs. |
| Basic training on optical data processing to ERATOSTHENES CoE based e.g. on the DLR processing chain CATENA. | Training | M38 | **Replaced** by the joined flight campaign CERAD in Cyprus. The flight campaign will be a new Research-Capacity-Demonstrator which also includes the processing of the data including the specialized training and will replace these CATENA-activities. Additionally, **sufficient infrastructure was not available**. |
| First Special-Topic training on optical data processing to ERATOSTHENES CoE based on the DLR processing chain CATENA. | Training | M39 | |
| Second Special-Topic training on optical data processing to ERATOSTHENES CoE based on the DLR processing chain CATENA. | Training | M40 | |
| Third Special-Topic training on deployment of the DLR processing chain CATENA using Docker-Containers. | Training | M41 | |

### 2.3.3 NOA

Regarding the activities for Capacity Building Scheme A not implemented by Strategic Partner **NOA**, the majority of the activities were postponed so they could be in line with the Training Schedule A Demonstration Project that focused on Agriculture and Disasters.

| Capacity Building / Knowledge Transfer Activity | Type of Activity | Month | Rationale |
|---|---|---|---|
| Floods: Overview of using data and state-of-the-art technologies, models and scientific approaches wrt: Diachronic Sentinel-based | Training | M28 | **Postponed**. Training schedule A focused on Agriculture and Disasters, in line with demonstration projects (WP7). |

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| Capacity Building / Knowledge Transfer Activity | Type of Activity | Month | Rationale |
|---|---|---|---|
| flood extent mapping, & NWP forecasting system for early warning and hydrologic and hydraulic models for real time monitoring | | | |
| Disaster Risk Reduction: Remote training of CUT staff in the disaster management sector offered from NOA in Athens. | Training | M28 | It has been determined that the topics covered in the seminar are **no longer necessary for the current needs of ERATOSTHENES CoE**. |
| Floods: Overview of assimilation techniques with the integration of Sentinel-based flood extent mapping with other data sources. Ingestion of crowdsourced and EO data for real time monitoring and Flood frequency analysis | Training | M29 | **Postponed**. Training schedule A focused on Agriculture and Disasters, in line with demonstration projects (WP7). |
| Fires: Overview of using multisource EO/in-situ/sensor data and state-of-the-art technologies, models and scientific approaches to support fire fighting in all phases of crisis management (preparedness, during crisis, post crisis) wrt: Dynamic fire risk; Damage assessment (post crisis); Early detection; Fire monitoring | Training | M30 | **Postponed.** Training schedule A focused on Agriculture and Disasters, in line with demonstration projects (WP7). |
| Set-up of network of in-situ sensors and training on the fusion modeling /assimilating satellite and in-situ/sensor data | Workshop | M43 | This workshop will be **postponed** to Training Schedule B to become more specific for the ERATOSTHENES CoE needs. |

# 3 Evaluation of the Impact and Effectiveness of Conducted Activities

Following the implementation of the activities within Capacity Building Scheme A, an evaluation was conducted by both the trainees and trainers to assess the effectiveness of each activity. The evaluation aimed to determine the extent to which knowledge gaps were addressed and filled and identify any areas that may require additional training in specific subjects. The outcomes of these evaluations are presented in the subsequent sections. For this reason, three CB forms for each capacity building activities were completed.

- The CB1 form was completed by Trainer prior to the activity to define the structure, the presenter, the targeted participants, the dates and duration, the type and location, the training skills required and equipment, the objective and the outcome to be specified.
- The CB2 form was completed by a trainer to define the actions, the deliverables and the evaluation resulting from the training as well as recommendations to be provided after the completion of the activity.
- The CB3 form was completed by each trainee to evaluate the capacity building activity, the actions resulting from the training, to identify whether future trainings are required, and to provide recommendations.

For Lectures, CB forms were not required to be completed. As well, CB forms were not required for trainings given by TROPOS since these activities were carried out during the installation of Doppler Lidar at Limassol and during the regular maintenance of PollyXT.

## 3.1 Evaluation of Training

This subsection provides the objectives of the activity obtained from CB1 forms, the evaluation of the trainers from CB2 and the evaluation from the trainees from CB3 and is organized based on the activity carried out from each partner.

### 3.1.1 NOA

#### *3.1.1.1 Crop classification and crop monitoring for the control of the CAP*

This 4-days virtual training workshop was carried out by Dr. Sitokonstantinou, Mr. Drivas, Mr. Koukos and Mr. Tsardanidis from NOA. This activity aimed to benefit ERATOSTHENES CoE members to enhance their knowledge on artificial intelligence (AI) for Earth observation (EO) regarding the agricultural applications as well as to offer the background, context and motivation behind the aforementioned domain, but also the technologies and models used (state-of-the–art, the beyond state-of-the-art). Finally, it aimed to highlight the research capabilities of ERATOSTHENES CoE, assist in the demonstration scenarios and promote ideas for creation, sharing, evaluation and dissemination.

The seminar was virtual (due to COVID19 restrictions) and, although the trainers did not have face-to-face interaction with the trainees, they attempted to make the seminar as interactive as possible, encouraging the trainees to participate with their cameras on and ask questions. As a general comment, the trainees appeared to follow the theoretical and the hands-on parts of the seminar. After

every theory session the trainers provided a kahoot game based on what was taught. The kahoot games were used both for evaluation of the understanding of the trainees as well as a fun activity for the group. The seminar was attended by a large number of people with different research backgrounds. The capacity building skills that were included in this activity were (a) Artificial Intelligence: Machine-Learning data-driven modelling of EO/in-situ/meteorological data. Data/Image processing/analysis, (b) Automated big data pre-processing, curation & management: Databases including EO/in-situ/meteorological data, etc, and (c) Server management & administration: Big EO data management. A very high percentage of participants (>90%) indicated that the knowledge transfer was effective and 77% stated that this activity will contribute to developing excellence in ERATOSTHENES CoE research capacity.

#### *3.1.1.2 Earthquakes/Landslides: Training on data processing to ERATOSTHENES CoE based on the NOA's workflow for GEObservatory*

This virtual training workshop was carried out by NOA and specifically from Dr. Alatza, Mr. Apostolakis, Prof. Loupasakis and Dr. Kontoes and the objective was to provide basic experience in SAR interferometry processing methods and time-series analysis. The main aim of the activity was for ERATOSTHENES CoE researchers to increase efficiency and productivity in the disaster risk sector and to highlight the research capabilities of the ERATOSTHENES CoE, assisting in the demonstration projects, promoting ideas creation, sharing, evaluation and dissemination. The actions yielded from the training were the development of practical skills, the understanding of NOA's expertise in the field, the evaluation of trainers and trainees, the lessons learned from training effectiveness, the increased engagement and the increased teams' motivation. The capacity building skills that were included in this activity were:

a) Persistent Scatterer Interferometry (PSI),
b) Small Baseline Interferometric SAR (SBAS),
c) training on Ground-based SAR and relative applications,
d) processing chains for the exploitation of magnetometer data (satellite and ground-based) and the use of relevant software,
e) ground/geology/geomorphology explanation of SAR results,
f) Integration of crowdsourcing techniques,
g) Use of Big Earth Data in the monitoring of earthquakes and landslides, and
h) machine learning / AI and automation of processes (e.g. Google Earth Engine, scripts, etc.).

The seminar was attended by a large number of people with different research backgrounds. The seminar was virtual, and the hands-on training was conducted through the remote connection to NOA servers. However, trainers indicated that all the technical problems faced during the three-day course were successfully resolved. It was recommended that the training be repeated at the ERATOSTHENES CoE site using the Centre's servers and provide the opportunity to set up the same configuration and processing chain to the ERATOSTHENES CoE. This would also encourage the development of stronger collaborations between NOA and ERATOSTHENES CoE staff. An overwhelming number of trainees (80%) indicated that they acquired new set of skills during the training.

### 3.1.2 DLR

#### *3.1.2.1 Processing of Earth observation data in cloud environments*

This 1-day virtual training workshop was carried out by Dr. Bachofer and Dr. Ottinger at DLR. The objective was to provide the participants with a basic understanding of EO cloud processing and through the hands-on session, for the trainees to learn about the basic functionalities of the GEE platform and to develop their own code and applications with the platform. The aim of the activity was to provide an introduction on the processing of EO data in cloud environments, an overview on cloud processing platforms (GEE, AWS, MS Planetary, DIAS, TEPs, etc.) and the basic principles of cloud processing emphasizing in Google Earth Engine. This activity covered multispectral (Sentinel-2, Landsat, etc.) and SAR data (Sentinel-1) processing. The thematic context covered water body monitoring and vegetation dynamics with a spatial focus on Cyprus. The capacity needs that were identified included the basic and intermediate knowledge on data processing and cloud platforms, EO and data processing and introduction in Programming with GEE. The actions yielded from this training were further exchange on GEE and the use of cloud-based processing for EO applications at ERATOSTHENES CoE.

Trainers rated this webinar as being highly successful, as it enabled everyone to engage in the hands-on session. This capacity building could lead into a Research Capacity Demonstrator, which would demonstrate the capacity gained from this training. Finally, it was recommended that an advanced course on EO big data and cloud processing would be advantageous for ERATOSTHENES CoE staff. An overwhelming number of trainees (>85%) indicated that they learned new skills and over 90% of the trainees found the type of activity to be satisfactory, and regarding the training materials, 81% found them to be satisfactory, while 12.5% indicated that additional material would be more beneficial. This training was anticipated to help over 85% of the trainees advance their research areas, and the acquired skills were expected to assist over 80% of the trainees in writing more effective research proposals. Based on the feedback from all trainees, this activity was seen as aiding in the development of excellence in ERATOSTHENES CoE research capacity. Future trainings on the specific subject were deemed necessary by the majority (>85%) of the trainees. The trainers received praise from the participants for their exceptional expertise and effective training approach.

#### *3.1.2.2 Sentinel-1 Products, Data Access and Processing*

This 3-days virtual training workshop was carried out by DLR-DFD and specifically from Mr. Detmar Krause. The primary objective of the workshop was to equip participants with a fundamental comprehension of Sentinel-1 products, including data availability and processing levels. The workshop included practical sessions that allowed attendees to explore the essential functionalities of the Processing System Management PSM and Workflow Management Platform WMP processing frameworks. The aim was to enable participants to utilize the applications in an upcoming demonstration project and develop their own thematic algorithm and applications using the framework. By the end of the training, the trainees gained the necessary knowledge and skills to effectively utilize the PSM and WMP frameworks for data processing and application development. The actions yielded from this training were that the practical skills developed will be transferred to the

ERATOSTHENES CoE during the upcoming Capacity Demonstration in 2023. The trainer stated that the existing skills of the participants facilitated their ability to follow the content and scripting of the practical session. Considering the nature of the online event, the trainer rates the webinar as a successful. This capacity building could lead into a Research Capacity Demonstrator, which would demonstrate the capacity gained from this training. Additionally, an advanced course on thematic SAR data processing has already been scheduled for 2023.

#### *3.1.2.3 Principles of SAR-based maritime information retrieval for maritime safety and security*

This 3-days virtual training workshop was carried out by DLR-IMF and specifically from Dr. Sven Jacobsen and Mr. Bjoern Tings. The objective of this training was to provide trainees with a basic understanding of oceanographic processes, anthropogenic structures, and natural phenomena as they are represented in SAR images. Through examples, trainees learned how to derive information regarding the maritime domain from SAR images, including wind and wave information, detection and distinction of oil spills from look-alikes, coastal morphodynamic change detection, the use of AI and machine learning for generating maritime information products, direct and indirect detection of maritime objects, and ship classification and parameter estimation. The training aimed to equip participants with the necessary knowledge and skills to effectively analyze SAR images and extract meaningful maritime information. The actions yielded from this activity were for trainees to perform self-studies of background knowledge on SAR-based vessel recognition. The training provided the foundation for understanding and configuring the respective software. The intention of the training was providing background knowledge on SAR-based maritime information retrieval software as knowledge of physical and methodical background is required to understand capabilities and control the parameters of the software. According to the trainer, the trainees demonstrated high levels of motivation, as evidenced by their active participation and the quality of their questions, which indicated a solid understanding of the training content. An additional session using SAR-based maritime processing and information retrieval before proceeding to a hands-on training session using the software developed by DLR for operational use will be beneficial. The trainer recommended that an onsite hand-on training be conducted when the operational service chain is up and running. The participants found the training highly interesting and the majority (>65%) of the participants stated that future trainings on the specific subject were deemed necessary. Overall, the participants strongly advocated for on-site training that offers a focused, efficient, and interactive learning experience, allowing for better comprehension and application of the training content.

#### *3.1.2.4 An Introduction to Optical Remote Sensing Data Analysis in Google Earth Engine, with Applications to Cultural Heritage*

This 4-days virtual training workshop was carried out by Dr. Daniele Cerra from DLR. The objective of the hands-on sessions was to familiarize trainees with the utilization of GEE, for downloading, processing, and visualizing vast amounts of harmonized geospatial data. The main aim of the activity was to enable participants to perform environmental applications at both small and large scales, leveraging data from ESA's Sentinel satellites within the Copernicus program, as well as other relevant data sources. Additionally, the training included applications related to Cultural Heritage risk analysis, allowing trainees to explore the potential of geospatial data in assessing and managing risks to cultural

heritage sites. By the end of the sessions, the trainees had gained practical experience in utilizing GEE and applying it to environmental and Cultural Heritage risk analysis applications, expanding their capabilities in geospatial data analysis and decision-making processes. The actions yielded from this activity were the trainees to be able to carry out geospatial analysis autonomously and specifically:

(a) selecting, loading, filtering Copernicus data spatially, temporally, and qualitatively;
(b) comparing and combining spectral information in different bands;
(c) Multitemporal analysis before and after specific events in sensitive areas;
(d) examples of applications to CH risk monitoring and damage estimation.

According to the trainer, the majority of the trainees were able to follow the complete workshop and carried out most of the processing steps and applications described. A majority of the participants (69%) indicated that they learned new skills during the training and a high percentage of participants (>76%) stated that the trainers were able to provide effective knowledge transfer.

### 3.1.3 PMOD/WRC

#### *3.1.3.1 Solar Radiation/Energy measurements, modeling and applications*

This 2-days on-site training workshop was carried out by Dr. Stelios Kazadzis of PMOD/WRC at the World Radiation Center, Davos, Switzerland. The objective was to transfer knowledge on both instrumentation and modeling related basics and applications as well as a demonstration and use of hardware (calibration) and software (modeling codes/tools). The main aim of the workshop was to provide theoretical knowledge on solar applications, practical experience and demonstration on solar measurements, calibration and quality control aspects and hands on experience and software related transfer concerning radiative transfer modeling applications. The actions yielded from this training were:

- the transfer of knowledge on modeling related technical aspects (installing and running the model) and also basics and applications;
- the demonstration of hardware (calibration) and software (modeling codes/tools) for measurement sensors;
- the demonstration and use of satellite and model data to be used as inputs for radiative transfer modelling.

Furthermore, discussions on possible conference publications have been performed. 4 conference publications were carried out related with the workshop from November 2022 till April 2023. The training highlighted modeling aspects crucial for the success of the solar energy group within ERATOSTHENES CoE, as evidenced by their presentations at international conferences and an upcoming publication. Several discussions on infrastructure needs provided valuable insights aligned with the goals outlined in the EXCELSIOR proposal. Sharing modeling inputs and potential satellite data sources furthered the strategic objectives of the EXCELSIOR project in solar radiation/energy and solar UV. Synergistic goals and ideas emerged among the solar and atmospheric groups of ERATOSTHENES CoE and strategic partners PMOD/WRC and NOA. The trainer recommends a follow-up short training on assessing the progress of the transferred knowledge and to include new scientists that will join the

ERATOSTHENES CoE (planned for June, 2023). In addition, a further discussion on existing publications that can be directly applied with ERATOSTHENES CoE data and for the Cyprus area is also recommended. The majority of the trainees (75%) indicated that they learned new skills and 75% of the trainees found the type of training to be satisfactory. All trainees acknowledged that the trainer was able to provide effective knowledge transfer.

## 3.2 Impact of Capacity Building Activities

The Capacity Building activities have made a significant impact to the scientific publications and research proposals that were submitted by the ERATOSTHENES CoE. A more detailed descriptions of the impact of each activity can be found in Appendix E. Each capacity building / knowledge transfer activity had an impact on a number of publications and proposals, as an outcome of every activity.

### 3.2.1 Proposals

During the first Capacity Training Scheme, 46 research proposals were submitted based on the topics within the capacity building activities.

The total proposals by thematic area are shown below:

- Environment and Climate: 22
- Resilient Society: 19
- Big Earth Data Analytics: 5

For Environment and Climate, from the 21 proposals submitted, 9 proposals were in the topic of agriculture, 3 proposals were in the topic of land and 10 proposals were in other related topics.

For Resilient society, from the 19 proposals submitted, 3 proposals were in the topic of cultural heritage, 2 proposals were in the topic of disaster risk reduction and 14 proposals were in other related topics.

For Big Earth Data Analytics, from the 5 proposals submitted, 1 proposal was in the topic of geoinformatics, 2 proposals were in the topic of extraction and 2 proposals were in other related topics.

Eight research proposals were successful and many of them are still pending results. This shows the significant effect of the capacity training activities.

### 3.2.2 Publications

In terms of publications, 60 publications were published from 1 January 2022 to present. In total, 39 abstracts, 10 conference papers, 9 journal articles, 1 book chapter and 1 poster were published.

The total publication by thematic area are shown below:

- Environment and Climate: 37
- Resilient Society: 23
- Big Earth Data Analytics: 0

For Environment and Climate, from the 37 publications published, 2 papers were in the topic of agriculture, 8 papers were in the topic of atmosphere, 5 papers were in the topic of land, 5 papers were in the topic of water and 17 papers were in other related topics.

For Resilient Society, from the 23 publications published, 7 papers were in the topic of cultural heritage, 2 papers were in the topic of disaster risk reduction, 4 papers were in the topic of energy, 7 papers were in the topic of marine safety and security and 3 papers were in other related topics.

For Big Earth Data Analytics, no papers were published during this time frame.

In addition, there are several publications that have been submitted to conferences and journals, which are still awaiting acceptance.

The ERATOSTHENES CoE, in order to disseminate the results of the capacity building activities in terms of scientific knowledge and network with other institutions, scientists, stakeholders, etc., organized the Ninth International Conference on Remote Sensing and Geo-information (RSCy2023) that took place from 3-5 April 2023 in Ayia Napa, Cyprus. During the conference, the researchers had the opportunity to present the results of their capacity building activities and demonstration projects, together with the Strategic Partners, and network with other EO researchers, organizations and stakeholders. This event had significant impact in networking internationally by providing activities associated with the capacity building of the Centre.

# 4 Description of Demonstration Activities linked with Capacity Building Activities

## 4.1 Agriculture – Demonstration (NOA)

During the Demonstration "Agriculture Monitoring" a Capacity Building Activity entitled "Scalable preparation and processing of large-scale Earth observation data: Installation of data cube, S1 & S2 pre-processing, preparation of an example notebook for estimating NDWI over Asprokremmos Reservoir using Analysis ready S2 data seasonal composites, identification CREODIAS APIs for free data and the development of yaml files for indexing data in the cube, was carried out. Mr. Athanasios Drivas (trainer) from NOA conducted the capacity building session, providing valuable guidance to Mr. Stelios Neophytides (trainee) from ERATOSTHENES CoE. The training included the provision of scripts that could be tailored to the Data Cube of ERATOSTHENES CoE, enabling a seamless workflow. Assistance was also provided in debugging the python environment. Based on the trainee's feedback, it is recommended to extend this capacity building as a Part 2 session, with the trainer physically present at the premises of ERATOSTHENES CoE. This would allow for more personalized and interactive training, fostering a deeper understanding of the subject matter and providing hands-on support. By expanding and enhancing this capacity building initiative, ERATOSTHENES CoE can further strengthen its expertise in the field.

## 4.2 Water – Demonstration (DLR)

The Capacity Building Activity has not yet taken place through the Demonstration "Assessment of Vegetation Dynamics and Drivers of Drought for the Republic of Cyprus". However, the current demonstration project is still ongoing.

## 4.3 Disaster Risk Reduction – Demonstration (NOA)

The Capacity Building Activity has not yet taken place through the Demonstration "Cyprus GeoHazards". This demonstration carried out as ERATOSTHENES CoE and NOA teams to separately work on various topics and methos and the outcomes will be integrated for scientific products.

## 4.4 Solar Energy – Demonstration (NOA and PMOD/WRC)

Through this demonstration project, Capacity Building Activities regarding the setup of the RT model for climatological analysis, and the setup and initialization of the forecasting system was carried out. These CBs have been carried out by Dr. Ilias Fountoulakis and Dr. Kazadzis (trainers) to Dr. Kostas Fragkos and Dr. Argyro Nisantzi (trainee). In addition, discussions on links of the solar radiation and the atmospheric group has been conducted on possible collaborations both on climate and solar energy aspects.

# 5 Capacity Building Scheme B

Table 3 provides an overview of the activities planned for Capacity Building Scheme B by the Strategic Partners. The selection of these presented activities includes the postponed activities from Capacity Building Scheme A, as well as the updated requirements of the ERATOSTHENES CoE. The table includes a description of the capacity building and knowledge transfer activities to be conducted by each Strategic Partner, the specific cluster targeted, the type of activity, and the scheduled month and week for implementation. The information in the Table highlights the comprehensive plan for capacity building and knowledge transfer. Table 4 provides a GANTT chart for the activities for Capacity Building Scheme B. Detailed information on the selected activities can be found in the Appendices.

Table 3. Capacity building and knowledge transfer activities for Capacity Building Scheme B.

| Partner | Capacity Building / Knowledge Transfer Activity (Thematic Area) | Type of Activity | Month, Week | # of days |
|---|---|---|---|---|
| **NOA** | Land and crop suitability analysis: This training will include causality and Machine Learning techniques, as well as jupyter notebook for practical applications. (Agriculture) | One-to-one Training | M45 (June 2023) | 1 |
| **NOA** | Estimation of yield productivity: This session could cover the theory and practical applications of various techniques for estimating crop yields, uncertainty analysis, and validation of results, with opportunities for participants to ask questions. Hands-on exercises to be decided depending on the infrastructure provision of ERATOSTHENES CoE. (Agriculture) | Seminar | M50 (November 2023) | 1 |
| **NOA** | Phenology monitoring using Earth Observation: This session could include: applications of different methods for phenology prediction using multiple heterogenous data sources (e.g., EO, satellite, meteorological); analyzing temporal patterns in remote sensing data; in-situ campaign protocol; interpretation of results. (Agriculture) | Seminar | M52 (January 2024) | 1 |
| **NOA** | Data fusion of in-situ IoT sensors data and satellite data: This session could include the different techniques for integrating at least two types of data sources to equip participants with the skills and knowledge needed to effectively fuse in-situ IoT sensors data | Workshop | M54 (March 2024) | 1 |

| Partner | Capacity Building / Knowledge Transfer Activity (Thematic Area) | Type of Activity | Month, Week | # of days |
|---|---|---|---|---|
| | (e.g., meteorological data or street-level images) and satellite data for various applications. (Agriculture) | | | |
| **NOA** | WebGIS for agricultural applications: This activity is designed to provide participants with an introduction to the tools and techniques for visualizing and publishing geospatial data via web apps. The activity will guide participants through the process of creating a web-based map using popular geospatial software tools and will cover topics such as importing data, sharing data, configuring the map layout, customizing the appearance of the map and handlings users requests. Topics like experimenting with different features and creating a web app or/and API on the top of repository hosting geospatial data may be covered. (Agriculture) | Workshop | M57 (June 2024) | 1 |
| **NOA** | Overview of FloodHub workflows: This session could include an overview of using data and state-of-the-art technologies, models and scientific approaches with regard to: Real-time & near real-time disaster flood monitoring. (Disasters Risk Reduction) | Training | M55 (April 2024) | 2 |
| **NOA** | Overview of FireHub workflows: This session could include an overview of using multisource EO/in-situ/sensor data and state-of-the-art technologies, models and scientific approaches to support firefighting in all phases of crisis management (preparedness, during crisis, post crisis) with regards to: Dynamic fire risk; Damage assessment (post crisis); Early detection; Fire monitoring. (Disasters Risk Reduction) | Training | M57 (June 2024) | 2 |
| **NOA** | Overview of GEObservatory workflow: This session could cover the basic features and functionalities of the GEObservatory workflow and include examples of how the workflow has been used in NOA's projects, in order to | Training | M62 (November 2024) | 1 |

| Partner | Capacity Building / Knowledge Transfer Activity (Thematic Area) | Type of Activity | Month, Week | # of days |
|---|---|---|---|---|
| | illustrate its potential applications and benefits. (Disasters Risk Reduction) | | | |
| **NOA** | Decomposition of ascending and descending velocities: This session could involve delivering a presentation or workshop that covers the theory and practical applications of this technique. It covers the mathematical basis of the decomposition method, as well as the data requirements and processing steps involved. Additionally, the workshop could include hands-on exercises that allow participants to apply the decomposition method to datasets, with guidance and feedback provided by the trainer. (Disasters Risk Reduction) | One-to-one Training | M50 (November 2023) | 1 |
| **NOA** | Comprehensive training on PSI/SBAS and other advanced SAR processing techniques: This session could cover the theory, data processing steps, and practical applications of these techniques. The workshop could include lectures on the underlying principles of SAR interferometry, processing and analyze real SAR data using PSI/SBAS and other advanced techniques. Additionally, the workshop could cover topics such as data quality control, error analysis, and interpretation of results, with opportunities for participants to ask questions and receive feedback from the trainer. (Disasters Risk Reduction) | Training | M60 (September 2024) | 1 |
| **NOA and PMODWRC** | Set-up of network of in-situ sensors and training on the fusion modeling /assimilating satellite and in-situ/sensor data | Training | Month 50, (November 2023) | 2 |
| **DLR** | Training on processing data derived from flight campaign CERAD in Cyprus. The flight campaign will be a new Research-Capacity-Demonstrator also including the processing of the data. (Big Data) | Training | M49 (October 2023) | 1 |

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 857510.

This project has received funding from the Government of the Republic of Cyprus through the Directorate General for the European Programmes, Coordination and Development as well as the Cyprus University of Technology.

| Partner | Capacity Building / Knowledge Transfer Activity (Thematic Area) | Type of Activity | Month, Week | # of days |
|---|---|---|---|---|
| **TROPOS** | Atmospheric Active Remote Sensing* | Workshop | M49-51 (October – December 2023) | 1 |
| **TROPOS** | Implementation of Cloudnet Processing Scheme* | secondment at TROPOS | 2024 | 6 |
| **TROPOS** | Implementation of PollyNET Processing Scheme* | secondment at TROPOS | 2024 | 11 |
| **TROPOS** | GBS set-up at TROPOS* | secondment at TROPOS | 2024 | Minimum 10 days |
| **PMOD/WRC and NOA** | Modeling of solar radiation, part 2: is a continuation of the one that took place in November 2022 at Davos, Switzerland. It is needed in order to enhance the knowledge on modelling aspects and related applications. Trainees will have a closer look at atmospheric aspects and also published results using such tools. Knowledge transferred will be both technical but also seminar based, sharing ideas for possible scientific research outcomes by ERATOSTHENES CoE scientists. (Solar Energy) | Training | M45 (June 2023) | 2 |
| **PMOD/ WRC** | Energy related products (Solar Energy) | Seminar | M53 (February 2024) | 2 |
| **PMOD/WRC** | Solar energy scientist visiting Davos, Switzerland (Solar Energy) | Secondment One to one training | between months M54 to M60, March to September 2024 | 60-90 |

*TROPOS will proceed with 4 workshops during Training Scheme B. Additional information can be found in Appendix A.

(1) Atmospheric Active Remote Sensing: (M49-51). This will be a (virtual) one-day workshop with some lectures about atmospheric remote sensing as a kickoff for the RCDs. Included in this workshop is an implementation session that will discuss how to implement the contents at the Eratosthenes CoE (RCDs, Projects, Papers). The topics of the workshop include lectures in Atmospheric active remote sensing, Optical remote sensing lidar, Microwave and radar remote sensing, Spaceborne remote sensing and Remote Sensing of Wind as well as a workshop for the Wrap-up and implementation session.

(2) Implementation of Cloudnet Processing Scheme: Individual hands-on training will be provided in the form of secondments at TROPOS in 2024. These trainings will be concluded by an open workshop event for summarizing the results and discussing how Eratosthenes CoE wants to make use of Cloudnet. The training will include the setup of Cloudnet software on the Eratosthenes CoE virtual server and implementation on the ACTRIS-CLOUDNET Processing Chain and database.

(3) Implementation of PollyNET Processing Scheme Individual hands-on training will be provided in the form of secondments at TROPOS in 2024. These trainings will be concluded by an open workshop event for summarizing the results and discussing how Eratosthenes CoE wants to make use of PollyNET. The training will include the setup of the PollyNet Processing chain on the Eratosthenes CoE virtual server, the Manual and automated Raman lidar evaluation as well as the implementation of the ACTRIS-EARLINET Processing Chain and database.

(4) The GBS setup is the major event for 2024. All components will have been delivered by beginning of 2024. By this time, a team of Eratosthenes CoE / CARO is trained at TROPOS in setting up the container and making it ready for shipping to Cyprus. For this event a minimum of 10 days are mentioned in the table, but 3 weeks is more is realistic. This training can only be done at TROPOS. The training will include hands on training in the following:

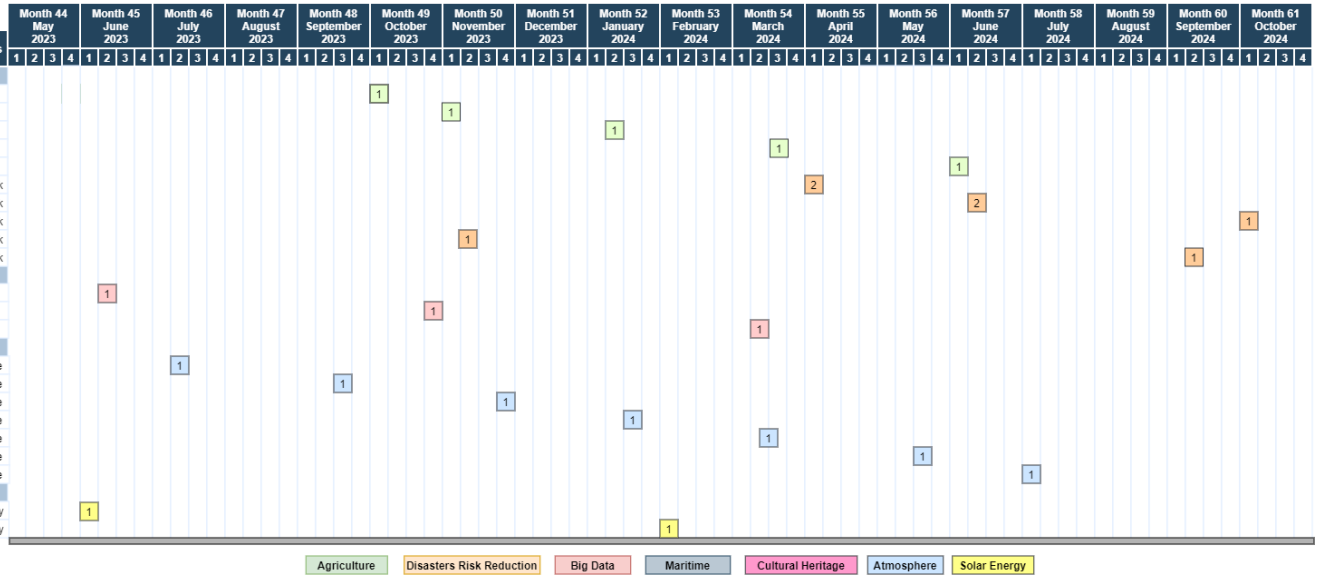
- GBS Maintenance and on-site operation
- GBS instrument integration
- Cloud Radar Operation
- GBS Data Evaluation Workshop
- Training on usage of LARDA remote sensing data cube (Atmosphere)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 857510.

This project has received funding from the Government of the Republic of Cyprus through the Directorate General for the European Programmes, Coordination and Development as well as the Cyprus University of Technology.

Table 4. GANTT chart for Capacity Building Scheme B Workplan

| | Activity Name | Type | Participants |
|---|---|---|---|
| | **NOA** | | |
| 1 | Land and crop suitability analysis | Training | Agriculture |
| 2 | Estimation of yield productivity | Seminar | Agriculture |
| 3 | Phenology monitoring using Earth Observation | Seminar | Agriculture |
| 4 | Data fusion of in-situ IoT sensors data and satellite data | Workshop | Agriculture |
| 5 | WebGIS for agricultural applications | Workshop | Agriculture |
| 6 | Overview of FloodHub workflows | Training | Disaster Risk |
| 7 | Overview of FireHub workflows | Training | Disaster Risk |
| 8 | Overview of GEObservatory workflow | Training | Disaster Risk |
| 9 | Decomposition of ascending and descending velocities | Training | Disaster Risk |
| 10 | Comprehensive training on PSI/SBAS and other advanced SAR | Training | Disaster Risk |
| | **DLR** | | |
| 1 | Basic training on processing data derived from flight campaign CERAD | Training | Big Data |
| 2 | First special-topic training on processing from flight campaign CERAD | Training | Big Data |
| 3 | Second special-topic training on processing from flight campaign CERAD | Training | Big Data |
| | **TROPOS** | | |
| 1 | Cloud Radar Operation | Workshop | Atmosphere |
| 2 | Lecture about microwave and radar remote sensing | Lecture | Atmosphere |
| 3 | GBS instrument integration at Leipzig | Workshop | Atmosphere |
| 4 | GBS Data Evaluation Workshop | Workshop | Atmosphere |
| 5 | Lecture about atmospheric remote sensing | Lecture | Atmosphere |
| 6 | Training on usage of LARDA remote sensing data cube | Training | Atmosphere |
| 7 | Cloud Radar Operation | Workshop | Atmosphere |
| | **PMOD/WRC** | | |
| 1 | Modeling of solar radiation, part 2 (with NOA) | Training | Solar Energy |
| 2 | Energy related products | Seminar | Solar Energy |




*The number in each cell refers to the of days in the specific week that will be allocated for the training. The duration, date, content and number of trainings will be adjusted according to the needs and availability of the trainers and trainees.

# 6 Conclusions

This deliverable provides an overview of the capacity building and knowledge transfer activities of Capacity Scheme A by the Strategic Partners. As well, the impact of the capacity building activities on generating publications and proposals was also indicated. A work plan is presented for Capacity Building Scheme B, which aims to address the gaps in skills, training, and knowledge required by ERATOSTHENES CoE researchers. By engaging in capacity building and knowledge transfer activities, the trainees and Strategic Partners will be able to identify any additional training or gaps that need to be addressed for the successful implementation of Capacity Building Scheme C.

Overall, based on the evaluations received from virtual workshops, it was recommended by the trainers and participants that more physical workshops would be more beneficial for capacity building activities, allowing for better comprehension and application of the training content.

# Appendix A - Selected trainings by TROPOS scheduled for Capacity Building Scheme B

TROPOS Capacity Building Scheme B will be featured as described in the below table:

| Partner | Title | Kind of training | | Length |
|---|---|---|---|---|
| ***(1) Atmospheric remote sensing workshop (Q4 2023)*** | | | | |
| **TROPOS** | Atmospheric active remote sensing | Lecture | Fall 2023 | 1 day |
| **TROPOS** | Optical remote sensing lidar | Lecture | | |
| **TROPOS** | Microwave and radar remote sensing | Lecture | | |
| **TROPOS** | Spaceborne remote sensing | Lecture | | |
| **TROPOS** | Remote Sensing of Wind | Lecture | | |
| **TROPOS** | Wrap-up and implementation session | Workshop | | |
| ***(2) Implementation of Cloudnet Processing Scheme (Q2 2024)*** | | | | |
| **TROPOS** | Setup of Cloudnet software on ECoE virtual server | Hands on training (secondment at TROPOS) | 2024 | 5 days (discontinuous) |
| **TROPOS** | ACTRIS-CLOUDNET Processing Chain and database | Lecture and implementation workshop | | 1 day |
| ***(3) Implementation of PollyNET Processing Scheme (Q3 2024)*** | | | | |
| **TROPOS** | Set up of PollyNet Processing chain on ECoE virtual server | Hands on training for specialists | 2024 | 5 days (discontinuous) |
| **TROPOS** | Manual and automated Raman lidar evaluation | Hands on training for specialists (secondment at TROPOS) | | 5 days (discontinuous) |
| **TROPOS** | ACTRIS-EARLINET Processing Chain and database | Lecture and implementation workshop | | 1 day |
| ***(4) GBS Setup at TROPOS (beginning in Q1 2024, may last until end of training period)*** | | | | |
| **TROPOS** | GBS Maintenance and on-site operation | Hands on training (secondment at TROPOS) | | At least 10 days |
| **TROPOS** | GBS instrument integration | | | |
| **TROPOS** | Cloud Radar Operation | | | |
| **TROPOS** | GBS Data Evaluation Workshop | | | |
| **TROPOS** | Training on usage of LARDA remote sensing data cube (Atmosphere) | | | |

# Training/ Workshop / Webinar form

| | |
|---|---|
| **Title of Training** | Cloud Radar Operation (Atmosphere) |
| **Introduction** | The course is intended for specialists working with Ground-Based Remote-Sensing Station (GBS) enabling them to handle the cloud radar system. |
| **Strategic Partner** | TROPOS |
| **Name of applicant** | TROPOS |
| **Name of presenter(s)** | Johannes Bühl, Patric Seifert (TROPOS) |
| **Number of Participants** | up to 5 |
| **Duration of Training** | 2 days |
| **Location of Training** | On-site (either at Leipzig or Limassol) |
| **Duration - dates** | 8 hours |
| **Type of Training** | Hands-on training |
| **Training skills required** | None |
| **Training equipment** | Notebook |
| **Training objective** | Basic training on operation of the MIRA-35 cloud radar. Turning on and off the system, handling generated raw data. Basic understanding of system setup and cabling. Raw data file formats and upload of data into database. |
| **Outcomes** | Participants are capable of running a MIRA-35 cloud radar on their own. |
| **Program (must be attached)** | TBD |
| **Activities (must be attached)** | TBD |

**The final approval is required by the ERATOSTHENES CoE and/or the EXCELSIOR Strategic Partner committee.**

# Training/ Workshop / Webinar form

| | |
|---|---|
| **Title of Training** | Lecture about microwave and radar remote sensing (Atmosphere) |
| **Introduction** | Basic and advanced knowledge about remote sensing of the atmosphere with active and passive measurement techniques working in the microwave wavelength regime. |
| **Strategic Partner** | TROPOS |
| **Name of applicant** | TROPOS |
| **Name of presenter(s)** | Patric Seifert, Heike Kalesse (Uni Leipzig) |
| **Number of Participants** | up to 10 |
| **Duration of Training** | 2h per week |
| **Location of Training** | online |
| **Duration - dates** | 4 hours each day |
| **Type of Training** | Lecture |
| **Training skills required** | Basic training in geophysics, physics or meteorology |
| **Training equipment** | Computer with internet access and web browser |
| **Training objective** | The lecture will teach the most important measurement principles of active and passive remote sensing in the microwave wavelength regime to the student:<br>• Introduction<br>• EM waves<br>• Physical laws of radiation scattering<br>• Inverse methods<br>• Passive remote sensing with microwaves<br>• Active remote sensing with radar<br>• The Doppler effect (effect, radar, dilemma)<br>• Doppler spectra<br>• Microphysics of the liquid phase<br>• Microphysics of the ice phase, radar polarimetry I<br>• Radar polarimetry II<br>• Radar forward modeling<br>• Cloud radar applications<br>• Advanced Cloudnet radar products |
| **Outcomes** | The student is capable of assessing the capabilities of the measurement techniques presented and able to apply them to available data. |
| **Program (must be attached)** | TBD |
| **Activities (must be attached)** | TBD |

**The final approval is required by the ERATOSTHENES CoE and/or the EXCELSIOR Strategic Partner committee.**

# Training/ Workshop / Webinar form

| | |
|---|---|
| **Title of Training** | GBS instrument integration at Leipzig (Atmosphere) |
| **Introduction** | The training is intended for specialists working with Ground-Based Remote-Sensing Station (GBS) to learn about the setup of the station. |
| **Strategic Partner** | TROPOS |
| **Name of applicant** | TROPOS |
| **Name of presenter(s)** | Johannes Bühl, Patric Seifert (TROPOS) |
| **Number of Participants** | up to 3 |
| **Duration of Training** | 2 weeks |
| **Location of Training** | On-site at Leipzig |
| **Duration - dates** | 4 hours each day |
| **Type of Training** | Hands-on training |
| **Training skills required** | Basic skills with tools |
| **Training equipment** | |
| **Training objective** | The participants of the workshop accompany the integration of the remote sensing instruments (cloud radar, microwave radiometer, disdrometer, computer equipment etc…) into a specialized sea-container. In this way the participants learn in detail about the interior workings, functioning, electrical wiring and mechanical setup of the GBS station. At the end, packing of the container is exercised. |
| **Outcomes** | Participants are capable of running and maintaining the GBS radar container. |
| **Program (must be attached)** | TBD |
| **Activities (must be attached)** | TBD |

**The final approval is required by the ERATOSTHENES CoE and/or the EXCELSIOR Strategic Partner committee.**

# Training/ Workshop / Webinar form

| | |
|---|---|
| **Title of Training** | GBS Data Evaluation Workshop (Atmosphere) |
| **Introduction** | The course is intended for students and scientists working with the Ground-Based Remote-Sensing Station (GBS) of the ERATOSTHENES CoE. It will teach handling of data from the complete station in a synergetic way. |
| **Strategic Partner** | TROPOS |
| **Name of applicant** | TROPOS |
| **Name of presenter(s)** | Johannes Bühl, Martin Radenz (TROPOS) |
| **Number of Participants** | up to 5 |
| **Duration of Training** | 2 days |
| **Location of Training** | Online or in-person |
| **Duration - dates** | 6 hours each day |
| **Type of Training** | Workshop |
| **Training skills required** | Basic computer and programming skills under windows with Python 3 |
| **Training equipment** | Computer with internet access |
| **Training objective** | The GBS provides a variety of data products that can be used in a synergetic way to understand complex processes in the atmosphere. The goal of the workshop is to enable the participants to learn basic workflows in order to process pre-processed data from the Cloudnet, PollyNET and Doppler-Lidar suite of algorithms. |
| **Outcomes** | Participants are capable of presenting and analyzing data from the GBS in a publication-ready form. |
| **Program (must be attached)** | TBD |
| **Activities (must be attached)** | TBD |

**The final approval is required by the ERATOSTHENES CoE and/or the EXCELSIOR Strategic Partner committee.**

# Appendix B - Selected trainings by DLR scheduled for Capacity Building Scheme B

# Training/ Workshop / Webinar form

| | |
|---|---|
| **Title of Training** | Training on processing and using data derived from flight campaign CERAD in Cyprus (Big Data) |
| **Introduction** | The course is intended for students and scientists working with the data derived from the CERAD flight campaign in June 2023 |
| **Strategic Partner** | DLR |
| **Name of applicant** | DLR |
| **Name of presenter(s)** | Thomas Krauß (DLR) |
| **Number of Participants** | up to 15 |
| **Duration of Training** | 1 day |
| **Location of Training** | Online |
| **Duration - dates** | 4 hours |
| **Type of Training** | Training |
| **Training skills required** | Basic knowledge on (airborne) remote sensing and hyperspectral imagery |
| **Training equipment** | Access to online-meeting (maybe zoom) |
| **Training objective** | In the CERAD joint flight campaign 10 locations across Cyprus will be acquired using in parallel the DLR 3K-camera system and the HySpex hyperspectral sensor. In the training the original data and their processing in the processing chain CATENA of DLR will be shown and the characteristics and further usage of the resulting imagery and derived information will be described (true-ortho-images, digital surface and terrain models, …) |
| **Outcomes** | Participants know how the original data was processed and can use the resulting outcomes for their own studies. |
| **Program (must be attached)** | TBD |
| **Activities (must be attached)** | TBD |

**The final approval is required by the ERATOSTHENES CoE and/or the EXCELSIOR Strategic Partner committee.**

# Appendix C - Selected trainings by NOA scheduled for Capacity Building Scheme B

# Training/ Workshop / Webinar form

| | |
|---|---|
| **Title of Training** | Land and crop suitability analysis (Agriculture) |
| **Introduction** | Knowledge transfer on agricultural monitoring sector and more specifica on land suitability models. |
| **Strategic Partner** | NOA |
| **Name of applicant** | ERATOSTHENES |
| **Name of presenter(s)** | George Giannarakis |
| **Number of Participants** | 1 |
| **Duration of Training** | 2 days |
| **Location of Training** | Athens, Greece |
| **Duration - dates** | June 2023 |
| **Type of Training** | On-to-one training |
| **Training skills required** | Basic knowledge on Machine Learning techniques |
| **Training equipment** | Laptop, internet connection |
| **Training objective** | Familiarize with causality and Machine Learning techniques, as well as jupyter notebook for practical applications. (Agriculture) |
| **Outcomes** | TBC |
| **Program (must be attached)** | TBC |
| **Activities (must be attached)** | TBC |

**The final approval is required by the ERATOSTHENES CoE and/or the EXCELSIOR Strategic Partner committee.**

# Training/ Workshop / Webinar form

| | |
|---|---|
| **Title of Training** | Estimation of yield productivity (Agriculture) |
| **Introduction** | This session could cover the theory and practical applications of various techniques for estimating crop yields, uncertainty analysis, and validation of results, with opportunities for participants to ask questions. Hands-on exercises to be decided depending on the infrastructure provision of ERATOSTHENES CoE. (Agriculture) |
| **Strategic Partner** | NOA |
| **Name of applicant** | ERATOSTHENES |
| **Name of presenter(s)** | Ilias Tsoumas, Thanassis Drivas, Alkis Koukos |
| **Number of Participants** | TBC |
| **Duration of Training** | 1 day |
| **Location of Training** | Limassol, Cyprus |
| **Duration - dates** | M50 (November 2023) |
| **Type of Training** | Seminar |
| **Training skills required** | Knowledge on EO techniques and data science |
| **Training equipment** | Laptops, internet connection, access to ECOE server |
| **Training objective** | Familiarize with yield productivity techniques. |
| **Outcomes** | TBC |
| **Program (must be attached)** | TBC |
| **Activities (must be attached)** | TBC |

**The final approval is required by the ERATOSTHENES CoE and/or the EXCELSIOR Strategic Partner committee.**

# Training/ Workshop / Webinar form

| | |
|---|---|
| **Title of Training** | Phenology monitoring using Earth Observation (Agriculture) |
| **Introduction** | This session could include: applications of different methods for phenology prediction using multiple heterogenous data sources (e.g., EO, satellite, meteorological); analyzing temporal patterns in remote sensing data; in-situ campaign protocol; interpretation of results. (Agriculture) |
| **Strategic Partner** | NOA |
| **Name of applicant** | ERATOSTHENES |
| **Name of presenter(s)** | Ilias Tsoumas, Thanassis Drivas, Alkis Koukos |
| **Number of Participants** | TBC |
| **Duration of Training** | 1 day |
| **Location of Training** | Limassol, Cyprus |
| **Duration - dates** | M52 (January 2024) |
| **Type of Training** | Seminar |
| **Training skills required** | Knowledge on EO techniques and data science |
| **Training equipment** | Laptops, internet connection, access to ECOE server |
| **Training objective** | Familiarize with phenology monitoring methods for prediction through data fusion. |
| **Outcomes** | TBC |
| **Program (must be attached)** | TBC |
| **Activities (must be attached)** | TBC |

**The final approval is required by the ERATOSTHENES CoE and/or the EXCELSIOR Strategic Partner committee.**

# Training/ Workshop / Webinar form

| | |
|---|---|
| **Title of Training** | Data fusion of in-situ IoT sensors data and satellite data (Agriculture) |
| **Introduction** | This session could include the different techniques for integrating at least two types of data sources to equip participants with the skills and knowledge needed to effectively fuse in-situ IoT sensors data (e.g., meteorological data or street-level images) and satellite data for various applications. (Agriculture) |
| **Strategic Partner** | NOA |
| **Name of applicant** | ERATOSTHENES |
| **Name of presenter(s)** | Ilias Tsoumas, Thanassis Drivas, Alkis Koukos, Nikolaos Bartsotas |
| **Number of Participants** | TBC |
| **Duration of Training** | 1 day |
| **Location of Training** | Limassol, Cyprus |
| **Duration - dates** | M54 (March 2024) |
| **Type of Training** | Seminar |
| **Training skills required** | Knowledge on EO techniques and data science |
| **Training equipment** | Laptops, internet connection, access to ECOE server |
| **Training objective** | Familiarize with fusion of data and more specifically satellite together with in-situ coming from meteorological sources. |
| **Outcomes** | TBC |
| **Program (must be attached)** | TBC |
| **Activities (must be attached)** | TBC |

**The final approval is required by the ERATOSTHENES CoE and/or the EXCELSIOR Strategic Partner committee.**

# Training/ Workshop / Webinar form

| | |
|---|---|
| **Title of Training** | WebGIS for agricultural applications (Agriculture) |
| **Introduction** | This activity is designed to provide participants with an introduction to the tools and techniques for visualizing and publishing geospatial data via web apps. The activity will guide participants through the process of creating a web-based map using popular geospatial software tools and will cover topics such as importing data, sharing data, configuring the map layout, customizing the appearance of the map and handlings users requests. Topics like experimenting with different features and creating a web app or/and API on the top of repository hosting geospatial data may be covered. (Agriculture) |
| **Strategic Partner** | NOA |
| **Name of applicant** | ERATOSTHENES |
| **Name of presenter(s)** | Thanassis Drivas, Alkis Koukos |
| **Number of Participants** | TBC |
| **Duration of Training** | 1 day |
| **Location of Training** | Limassol, Cyprus |
| **Duration - dates** | M57 (June 2024) |
| **Type of Training** | Seminar |
| **Training skills required** | Knowledge on EO techniques and data science |
| **Training equipment** | Laptops, internet connection |
| **Training objective** | Design webGIS services in general as well as focused on agricultural monitoring. |
| **Outcomes** | TBC |
| **Program (must be attached)** | TBC |
| **Activities (must be attached)** | TBC |

**The final approval is required by the ERATOSTHENES CoE and/or the EXCELSIOR Strategic Partner committee.**

# Training/ Workshop / Webinar form

| | |
|---|---|
| **Title of Training** | Overview of FloodHub workflows (Disasters Risk Reduction) |
| **Introduction** | This session could include an overview of using data and state-of-the-art technologies, models and scientific approaches with regard to: Real-time & near real-time disaster flood monitoring. (Disasters Risk Reduction) |
| **Strategic Partner** | NOA |
| **Name of applicant** | ERATOSTHENES |
| **Name of presenter(s)** | Alexia Tsouni, Stavroula Sigourou, Vaso Pagana |
| **Number of Participants** | TBC |
| **Duration of Training** | 2 days |
| **Location of Training** | Limassol, Cyprus |
| **Duration - dates** | M55 (April 2024) |
| **Type of Training** | Training / Workshop |
| **Training skills required** | EO background and water management specialization. |
| **Training equipment** | Laptops, internet connection, HEC-RAS |
| **Training objective** | ECoE to familiarize and start working on flood monitoring. |
| **Outcomes** | TBC |
| **Program (must be attached)** | TBC |
| **Activities (must be attached)** | TBC |

**The final approval is required by the ERATOSTHENES CoE and/or the EXCELSIOR Strategic Partner committee.**

# Training/ Workshop / Webinar form

| | |
|---|---|
| **Title of Training** | Overview of FireHub workflows (Disasters Risk Reduction) |
| **Introduction** | This session could include an overview of using multisource EO/in-situ/sensor data and state-of-the-art technologies, models and scientific approaches to support firefighting in all phases of crisis management (preparedness, during crisis, post crisis) with regards to: Dynamic fire risk; Damage assessment (post crisis); Early detection; Fire monitoring. (Disasters Risk Reduction) |
| **Strategic Partner** | NOA |
| **Name of applicant** | ERATOSTHENES |
| **Name of presenter(s)** | Stella Girtsou, Alexis Apostolakis |
| **Number of Participants** | TBC |
| **Duration of Training** | 2 days |
| **Location of Training** | Limassol, Cyprus |
| **Duration - dates** | M57 (June 2024) |
| **Type of Training** | Training / Workshop |
| **Training skills required** | EO background and fire management specialization. |
| **Training equipment** | Laptops, internet connection |
| **Training objective** | ECoE to familiarize and start working on fire services. |
| **Outcomes** | TBC |
| **Program (must be attached)** | TBC |
| **Activities (must be attached)** | TBC |

**The final approval is required by the ERATOSTHENES CoE and/or the EXCELSIOR Strategic Partner committee.**

# Training/ Workshop / Webinar form

| | |
|---|---|
| **Title of Training** | Overview of GEObservatory workflow (Disasters Risk Reduction) |
| **Introduction** | This session could cover the basic features and functionalities of the GEObservatory workflow and include examples of how the workflow has been used in NOA's projects, in order to illustrate its potential applications and benefits. (Disasters Risk Reduction) |
| **Strategic Partner** | NOA |
| **Name of applicant** | ERATOSTHENES |
| **Name of presenter(s)** | Stavroula Alatza, Alexis Apostolakis |
| **Number of Participants** | TBC |
| **Duration of Training** | 1 day |
| **Location of Training** | Limassol, Cyprus |
| **Duration - dates** | M62 (November 2024) |
| **Type of Training** | Workshop |
| **Training skills required** | Background on automisation, parallelization etc. |
| **Training equipment** | Access to ECOE's server |
| **Training objective** | Get to know the workflow of the NOA's GEObservatory to generate ideas on how to exploit these features for ECoE. |
| **Outcomes** | TBC |
| **Program (must be attached)** | TBC |
| **Activities (must be attached)** | TBC |

**The final approval is required by the ERATOSTHENES CoE and/or the EXCELSIOR Strategic Partner committee.**

# Training/ Workshop / Webinar form

| | |
|---|---|
| **Title of Training** | Decomposition of ascending and descending velocities (Disasters Risk Reduction) |
| **Introduction** | Presentation or workshop that covers the theory and practical applications of this technique. It covers the mathematical basis of the decomposition method, as well as the data requirements and processing steps involved. Additionally, the workshop could include hands-on exercises that allow participants to apply the decomposition method to datasets, with guidance and feedback provided by the trainer. (Disasters Risk Reduction) |
| **Strategic Partner** | NOA |
| **Name of applicant** | ERATOSTHENES |
| **Name of presenter(s)** | Stavroula Alatza |
| **Number of Participants** | 1 |
| **Duration of Training** | 1 day |
| **Location of Training** | Online |
| **Duration - dates** | M50 (November 2023) |
| **Type of Training** | One-to-one training |
| **Training skills required** | SAR processing |
| **Training equipment** | TBC |
| **Training objective** | Allow ECOE to produce velocities by using ascending and descending tracks through SAR interferometry. |
| **Outcomes** | TBC |
| **Program (must be attached)** | TBC |
| **Activities (must be attached)** | TBC |

**The final approval is required by the ERATOSTHENES CoE and/or the EXCELSIOR Strategic Partner committee.**

# Training/ Workshop / Webinar form

| | |
|---|---|
| **Title of Training** | Comprehensive training on PSI/SBAS and other advanced SAR processing techniques (Disasters Risk Reduction) |
| **Introduction** | This session could cover the theory, data processing steps, and practical applications of these techniques. The workshop could include lectures on the underlying principles of SAR interferometry, processing and analyze real SAR data using PSI/SBAS and other advanced techniques. Additionally, the workshop could cover topics such as data quality control, error analysis, and interpretation of results, with opportunities for participants to ask questions and receive feedback from the trainer. (Disasters Risk Reduction) |
| **Strategic Partner** | NOA |
| **Name of applicant** | ERATOSTHENES |
| **Name of presenter(s)** | Stavroula Alatza, Alexis Apostolakis |
| **Number of Participants** | 1 |
| **Duration of Training** | 1 day |
| **Location of Training** | Online |
| **Duration - dates** | M60 (September 2024) |
| **Type of Training** | Training/Workshop |
| **Training skills required** | EO background, SAR processing |
| **Training equipment** | Laptops, internet access, access to ECoE's server |
| **Training objective** | Introduce ECoE to other SAR techniques after the training performed in RP2. |
| **Outcomes** | TBC |
| **Program (must be attached)** | TBC |
| **Activities (must be attached)** | TBC |

**The final approval is required by the ERATOSTHENES CoE and/or the EXCELSIOR Strategic Partner committee.**

# Training/ Workshop / Webinar form

| | |
|---|---|
| **Training/ Workshop / Webinar form Title of Training** | Set-up of network of in-situ sensors and training on the fusion modeling /assimilating satellite and in-situ/sensor data |
| **Introduction** | The course is intended to provide practical skills on using Libradtran package for various radiation modelling applications |
| **Strategic Partner** | NOA (and PMODWRC) |
| **Name of applicant** | ECoE |
| **Name of presenter(s)** | S. Kazadzis, K. Papachristopoulou, I. Fountoulakis |
| **Number of Participants** | up to 10 |
| **Duration of Training** | 2 days |
| **Location of Training** | online |
| **Duration - dates** | Month 50, November 2023 |
| **Type of Training** | workshop |
| **Training skills required** | Basic computer and programming skills under windows, Libradtran inputs from previous related Workshops. Network instrumentation basic operation and installation knowledge |
| **Training equipment** | Computer with internet access |
| **Training objective** | Provide tips on quality assurance and control procedure for the solar network of ECoE<br>Demonstrate ideas of data assimilation use for solar energy applications |
| **Outcomes** | Standard operation procedure documents for the in-situ network<br>Calibration hierarch and maintenance schedule<br>Accuracy vs uncertainty for different applications |
| **Program (must be attached)** | tbd |
| **Activities (must be attached)** | tbd |

**The final approval is required by the ERATOSTHENES CoE and/or the EXCELSIOR Strategic Partner committee.**

# Appendix D - Selected trainings by PMOD/WRC scheduled for Capacity Building Scheme B

# Training/ Workshop / Webinar form

| | |
|---|---|
| **Title of Training** | Modeling of solar radiation, part 2 (Solar Energy) |
| **Introduction** | The training is a continuation of the one that took place in November 2022 at Davos, Switzerland.It is needed in order to enhance the knowledge on modelling aspects and related applications. Trainees are already model users and will have a more closer look at atmospheric aspects and also published results using such tools. Knowledge transferred will be both technical but also seminar based, sharing ideas for possible scientific research outcomes by ERATOSTHENES CoE scientists. |
| **Strategic Partner** | PMODWRC and NOA |
| **Name of applicant** | ERATOSTHENES CoE |
| **Name of presenter(s)** | S. Kazadzis (PMODWRC), I. Fountoulakis, K. Papachristopoulou (NOA) and two invited speakers |
| **Number of Participants** | > 5 |
| **Duration of Training** | 2 days, 3 hours each |
| **Location of Training** | Online |
| **Duration - dates** | 7 and 8th of June, 2023 |
| **Type of Training** | Workshop and webinar |
| **Training skills required** | Basic computer and programming skills under windows, Libradtran inputs from previous related Workshop in Davos, Nov. 2022. Basic atmospheric physics knowledge. |
| **Training equipment** | Libradtran model software package (already distributed) |
| **Training objective** | -Insights on radiative transfer modeling<br>-Sharing of ideas using RT modeling<br>-hands on exercises |
| **Outcomes** | Use of RT model (profiles, aerosol optical properties, dust properties). Discussing ideas for applications in Cyprus. |
| **Program** | Day 1- 07/06/2023<br>– Introduction to the training, solar forecasting discussion // Stelios Kazadzis (PMOD-WRC)<br>Presentation of relevant publications and work of the team / Ilias Fountoulakis (NOA)<br>– Solar radiation in Cyprus based on EO data<br>– Aerosol profiling and effects on solar radiation<br>–Dust effects on solar radiation<br>Hands on modelling // Kyriaki Papachristopoulou<br>– Libradtran aerosol inputs (columnar – profiles)<br>– Hands on examples in libradtran<br>– Exercise for day 2<br>Day 2 – 08/06/2023<br>Modeling exercise discussion // Kyriaki Papachristopoulou<br>Presentation of relevant publications and work from collaborators<br>– Aerosol lidar from space and typing // Anna Moustaka (NOA)<br>– Aerosol effects on PV // Dimitra Kouklaki (NOA) |

| | |
|---|---|
| | – Solar instruments // Stelios Kazadzis (PMOD-WRC) & Ilias Fountoulakis (NOA)<br>– Discussion on the demonstration project 1 and 2 aspects // All |
| **Activities (must be attached)** | -exercises solving<br>-atmospheric examples for real conditions<br>-overview of RT modeling aspects<br>-Seminar based knowledge for dust properties and RT applications |

**The final approval is required by the ERATOSTHENES CoE and/or the EXCELSIOR Strategic Partner committee.**

# Training/ Workshop / Webinar form

| | |
|---|---|
| **Training/ Workshop / Webinar form Title of Training** | Energy related products |
| **Introduction** | The seminars are intended in order to provide basic knowledge on applications that can be developed, used also in Cyprus |
| **Strategic Partner** | PMODWRC |
| **Name of applicant** | ERATOSTHENES CoE |
| **Name of presenter(s)** | S. Kazadzis, X. Hu and 2 invited speakers |
| **Number of Participants** | up to 10 |
| **Duration of Training** | 1 day |
| **Location of Training** | online |
| **Duration - dates** | 4 hours<br>scheduled for Month 53, February 2024 |
| **Type of Training** | Lecture |
| **Training skills required** | Basic knowledge of solar energy related research |
| **Training equipment** | Computer with internet access |
| **Training objective** | Provide ideas of applications and end user engagement to the ECoE scientists<br>(long term forecasting, roof top PV, soiling, hybrid forecasting methods) |
| **Outcomes** | ECoE scientists could use the existing ECOE infrastructure to develop similar to the presented applications |
| **Program (must be attached)** | tbd |
| **Activities (must be attached)** | tbd |

**The final approval is required by the ERATOSTHENES CoE and/or the EXCELSIOR Strategic Partner committee.**

# Training/ Workshop / Webinar form

| | |
|---|---|
| **Title of Training** | Solar energy scientist visiting Davos, Switzerland (Solar Energy) |
| **Introduction** | The purpose of the visit is for a young scientist to get acquainted with:<br>- Day to day solar measurements and quality control procedures<br>- Solar applications<br>- Publication writing |
| **Strategic Partner** | PMODWRC |
| **Name of applicant** | Early career scientist(s) from ERATOSTHENES CoE |
| **Name of presenter(s)** | S. Kazadzis and PMODWRC Staff |
| **Number of Participants** | 1 or 2 to be determined |
| **Duration of Training** | 2-3 months |
| **Location of Training** | PMODWRC Davos, Switzerland |
| **Duration - dates** | Scheduled between months 54 to 60, March to September 2024 |
| **Type of Training** | Transfer of knowledge – secondment |
| **Training skills required** | Solar radiation and atmospheric Physics PhD candidate level |
| **Training equipment** | Radiative transfer modeling tools |
| **Training objective** | Transfer of knowledge to a young researcher |
| **Outcomes** | Transfer of knowledge to young researcher on measurement and modeling basics, enhance collaboration towards publication and project writing. Integration to a high level institute on solar radiation research.<br>Joint publication. |
| **Program (must be attached)** | Tbd |
| **Activities (must be attached)** | Tbd |

**The final approval is required by the ERATOSTHENES CoE and/or the EXCELSIOR Strategic Partner committee.**

# Appendix E - Impacts resulting from the Activities from Capacity Building Scheme A

| Partner / Lecturer | Capacity Building / Knowledge Transfer Activity | Impact |
|---|---|---|
| **NOA** | Seminar on crop classification and crop monitoring for the control of the CAP: the RECAP, Sen2Agri and EOPEN paradigms. Content: DIAS platforms, Acquisition of Satellite Imagery & Data pre-processing, Data fusion S1 & S2 data, Introduction to the DataCube, Crop classification algorithm, Grassland mowing algorithm | This Capacity Building resulted in the following publication and project proposals:<br>• Identification of wheat crops usages utilizing Sentinel-2 Time Series and Classification model via Google Earth Engine, **Stelios P. Neophytides; Michalakis Christoforou; Constantinos F. Panagiotou; Christiana Papoutsa; Thanassis Drivas; Mariza Kaskara; Iason Tsardanidis; Ioannis Varvaris; Marinos Eliades; Zampela Pittaki-Chrysodonta; Charalambos Kontoes; and Diofantos G. Hadjimitsis. (Atlas Georesources International Conference, Hammamet, Tunisia, 2023)**<br>Project proposals:<br>• PANOPTICH: Providing Advanced and inNovative mOnitoring Perspectives through cuTting-edge and Immersive toolkit in Cultural Heritage. The PANOPTICH proposal was submitted on 14 March 2023 in the HORIZON-CL2-2023-HERITAGE-01-01 call.<br>• TERMA: ADVANCED TECHNOLOGIES FOR REMOTE MONITORING OF HERITAGE MONUMENTS & ARTEFACTS. The TERMA proposal was submitted on 14 March 2023 in the HORIZON-CL2-2023-HERITAGE-01-01 call.<br>• CITEX: Circular Textile Supply Chain: Accelerated adaptation of circularity along the textile supply chain through the application of cutting-edge technologies for sustainable climate transition. The CITEX proposal was submitted on 14 March 2023 in the HORIZON-CL2-2023-HERITAGE-01-02 call.<br>• STEPS: coaSTal Erosion in cyPrus from Space. The STEPS proposal was submitted on 16 March 2023 in the ESA Plan for European Cooperating States (PECS). |
| **NOA** | Earthquakes/Landslides: Basic training on data processing to ERATOSTHENES CoE based e.g. on the NOA's workflow for GEObservatory. Content: Acquisition of Satellite Imagery, Processing of Imagery, Theory on Persistent Scatter Interferometry | This Capacity Building resulted in the following publications and project proposals:<br>• K. Fotiou, C. Theocharidis, M. Prodromou, S. Alatza, A. Apostolakis, A. V. Argyriou, T. Polydorou, C. Loupasakis, C. Kontoes, D. Hadjimitsis, M. Tzouvaras. (2023). Demonstrating the enhanced research capacity of the ERATOSTHENES Centre of |

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| | methods for geo-hazards monitoring, Applications including earthquakes, landslides, volcanic activity, construction activity, etc. | Excellence for detecting ground displacements in Cyprus using advanced SAR satellite image processing techniques. EGU 2023, Vienna, April 2023. ***Submitted on 10 January 2023 and accepted for presentation.***<br>• K. Fotiou, A. V. Argyriou, S. Alatza, C. Theocharidis, C. Loupasakis, M. Prodromou, A. Apostolakis, Z. Pittaki-Chrysodonta, M. Kaskara, C. Kontoes, K. Themistocleous, D. Hadjimitsis, M. Tzouvaras (2023). *Impact Assessment of the Catastrophic Earthquakes of February 2023 in Turkey and Syria via the exploitation of satellite datasets*. RSCy 2023, Ayia Napa, Cyprus, April 2023. ***Submitted on 1 March and accepted for presentation. Submitted as conference paper in SPIE on 14 April 2023 and pending approval.***<br>• M. Tzouvaras, S. Alatza, K. Fotiou, C. Theocharidis, M. Prodromou, A. Argyriou, C. Loupasakis, A. Apostolakis, T. Polydorou, M. Kaskara, C. Kontoes, D. Hadjimitsis. (2023). Towards a systematic update of the Cyprus landslide inventory using Copernicus satellite data. 6th World Landslide Forum, Florence, Italy, November 2023. ***Submitted on 7 March 2023 and accepted for presentation.***<br>• M. Tzouvaras, S. Alatza, M. Prodromou, C. Theocharidis, K. Fotiou, A. Argyriou, C. Loupasakis, A. Apostolakis, Z. Pittaki, M. Kaskara, C. Kontoes, D. Hadjimitsis. (2023). SYNERGY OF ADVANCED PROCESSING TECHNIQUES USING COPERNICUS SAR AND OPTICAL SATELLITE IMAGERY TO DETECT GROUND DISPLACEMENTS: CASE STUDY OF PAREKKLISIA VILLAGE IN CYPRUS. ISPRS Geospatial Week, Egypt, September 2023. *Submitted on 14 April 2023 and pending approval (Decision expected by 15 June).*<br>• Argyriou A., Alatza S., Theocharidis C., Fotiou K., Loupasakis C., Prodromou M., Apostolakis A., Kaskara M., Kontoes C., Themistocleous K., Hadjimitsis D., Tzouvaras M. 2023. Impact assessment of the catastrophic earthquakes of 6 February 2023 in Turkey via the exploitation of satellite datasets. Ninth International Conference on Remote Sensing and Geoinformation of Environment ***-RSCY- 2023, 3-5*** April 2023, Cyprus, SPIE manuscript submission (pending).<br>• Theocharidis C., A. Argyriou A., Tsouni A., Kaskara M., Kontoes C., 2023. Comparative analysis of Sentinel-1 and Planetscope imagery for flood mapping of Evros river, Greece. Ninth International |

| Partner / Lecturer | Capacity Building / Knowledge Transfer Activity | Impact |
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| | | Conference on Remote Sensing and Geoinformation of Environment -RSCY- 2023, 3-5 April 2023, Cyprus, SPIE manuscript submission (pending).<br>Project proposals:<br>• CASSANDRA: enhanCed situAtional awareneSS for nAtural hazards and advaNced Decision support for optimized Response Actions. ERATOSTHENES CoE was invited by NOA to the consortium. **The CASSANDRA proposal was submitted on 23 November 2022 in the HORIZON-CL3-2022-DRS-01-05 call**. The proposal was not funded.<br>• PANOPTICH<br>• TERMA<br>• CITEX<br>• STEPS |
| **DLR** | Webinar on processing earth observation data in cloud environments. The activity will cover multispectral (Sentinel-2, Landsat, etc.) and SAR data (Sentinel-1). The thematic context will cover lakes, wetlands, river basins, coasts, but also agricultural areas and contribute to integrated water management strategies - Cloud infrastructures, GEE; Data storage; Processing and analysis | This Capacity Building resulted in the following publication and project proposals:<br>• Leventis, G., Melillos, G., Argyrioy, A., Varvaris, I., Pittaki, Z., Themistocleous, K., and Hadjimitsis, D.: Exploring the benefits of building a data cube towards the efficient risk monitoring and assessment of cultural heritage assets, EGU General Assembly 2023, Vienna, Austria, 24–28 Apr 2023, EGU23-15837<br>Project Proposals:<br>• PANOPTICH<br>• TERMA<br>• CITEX<br>• STEPS |
| **NOA** | **Scalable large-scale agriculture monitoring:** Installation of data cube, processing of Analysis ready S1 & S2 data, Identify APIs for free data, development of yaml files for indexing data in the cube, development of APIs for large scale agricultural monitoring. | This Capacity Building resulted in the following publication:<br>• Stelios P. Neophytides; Thanassis Drivas; Ioannis Varvaris; Marinos Eliades; Zampela Pittaki-Chrysodonta; Christiana Papoutsa; and Diofantos G. Hadjimitsis. 2023. The Data Cube of ERATOSTHENES Centre of Excellence to empower the space-based environmental monitoring in the EMMENA Region, Atlas Georesources International Conference, Hammamet, Tunisia |
| **DLR** | Sentinel-1 Products, Data Access and Processing: Introduction on the Copernicus mission Sentinel-1, the data structure, product levels and with Sentinel-1 Instrument | This Capacity Building resulted in the following project proposals:<br>Project Proposals:<br>• PANOPTICH |

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| | Processing Facility (IPF); Processing of Earth observation data in cloud environments; Data handling, implementation of data interfaces e.g. direct downlink or Copernicus Data Hub, following the rules for open data policy; Basics and first automated download from Copernicus since hub. | • TERMA<br>• CITEX<br>• STEPS |
| **DLR** | Principles of SAR-based maritime information retrieval for maritime safety and security: Basic insight into oceanographic processes and anthropogenic structures and their specific representation in SAR images; SAR image signatures used to derive maritime domain information such as sea state and wind properties, ship detection and classification and other. | This Capacity Building resulted in the following project proposals:<br><br>Project Proposal:<br>• PANOPTICH<br>• TERMA<br>• CITEX<br>• STEPS |
| **PMOD/WRC** | Training workshop on Solar Radiation/Energy measurements, modeling and applications | This Capacity Building resulted in the following project proposal:<br><br>Project proposal:<br>• ENFORCES: Enhanced Forecasting For intEgrated Regional ENergy sysTems. The ENFORCES proposal was submitted on 02 December 2022 in the CETPartnership Joint Call 2022 CETP-2022-00337 |
| **DLR** | An Introduction to Optical Remote Sensing Data Analysis in Google Earth Engine, with Applications to Cultural Heritage: Hands-on sessions on Google Earth Engine, performing environmental applications at small and large scales, relying on ESA's Sentinel satellites from the Copernicus program, including other data sources; applications to Cultural Heritage risk analysis included. | This Capacity Building resulted in the following publication and project proposals:<br><br>• Leventis G, Argyriou A.V., Cerra D., Hadjimitsis D. 2023. Enhancing risk assessment and monitoring for cultural heritage sites through data cubes: A multidimensional approach. Ninth International Conference on Remote Sensing and Geoinformation of Environment -RSCY- 2023, 3-5 April 2023, Cyprus, SPIE manuscript submission (pending).<br><br>Project Proposal:<br>• PANOPTICH<br>• TERMA<br>• CITEX<br>• STEPS |

Linked with capacity building from NOA during the demonstration project of AGRICULTURE.

1. Stelios P. Neophytides; Thanassis Drivas; Ioannis Varvaris; Marinos Eliades; Zampela Pittaki-Chrysodonta; Christiana Papoutsa; and Diofantos G. Hadjimitsis, 2023. The Data Cube of ERATOSTHENES Centre of Excellence to empower the space-based environmental monitoring in the EMMENA Region. Atlas Georesources International Conference, Hammamet, Tunisia.

Linked with capacity building from NOA and PMOD/WRC during the demonstration project of SOLAR ENERGY.

1. Charalampous G.,Fragkos K., Nisantzi A., Fountoulakis I., Papachristopoulou K., Hadjimitsis D., Kazadzis S., SATELLITE OZONE AND UV MEASUREMENTS OVER CYPRUS, Ninth International Conference on Remote Sensing and Geoinformation of the Environment, 3-5 April 2023, Ayia Napa, Cyprus, SPIE manuscript submission (pending). (Oral presentation)
2. Fragkos K., Nisantzi A., Fountoulakis I., Michaelides S., Charalampous G., Papachristopoulou K., Kontoes C., Hadjimitsis D., Kazadzis S., THE SOLAR RADIATION AND ENERGY LABORATORY OF ERATOSTHENES CENTRE OF EXCELLENCE: ESTABLISHMENT AND RESEARCH DIRECTIONS, Ninth International Conference on Remote Sensing and Geoinformation of the Environment, 3-5 April 2023, Ayia Napa, Cyprus. (Oral presentation)
3. Fountoulakis, I., Fragkos, K., Papachristopoulou, K., Nisantzi, A., Gkikas, A., Hadjimitsis, D., and Kazadzis, S.: Evolution of biologically active ultraviolet doses in Cyprus, EGU General Assembly 2023, Vienna, Austria, 24–28 Apr 2023, EGU23-6396, https://doi.org/10.5194/egusphere-egu23-6396, 2023. (Poster presentation)
4. Fragkos, K., Fountoulakis, I., Nisantzi, A., Papachristopoulou, K., Hadjimitsis, D., and Kazadzis, S.: Modelled-based Photosynthetically Active Radiation climatology for Cyprus: Validation with measurements and trends, EGU General Assembly 2023, Vienna, Austria, 24–28 Apr 2023, EGU23-7269, https://doi.org/10.5194/egusphere-egu23-7269, 2023. (Poster presentation)

Linked with capacity building from DLR during the demonstration project of WATER.

- Proposal: Nostradamus: Data Cube and Copernicus data for Food Security and European Independence. The Nostradamus proposal was submitted on 23 March 2023 in the HORIZON-CL6-2023-GOVERNANCE-01-13 call.