



Deliverable D1.22: **Steering & Advisory Committee Report, Period II**

Contract Number	FP7-316210, FP7-REGPOT-2012-2013-1	Acronym	BEYOND
Full title	Building Capacity for a Centre of Excellence for EO-based monitoring of Natural Disasters		
Project URL	http://www.BEYOND-EOCenter.eu		
EU Project officer	Ms Ralitsa ATANASOVA		

Deliverable	Number	D1.22	Name	Steering & Advisory Report, Period I		
Work package	Number	WP1	Name	Project Management		
Date of delivery	Contractual		M36	Actual	30.06.2016	
Status	Final					
Nature	Report					
Distribution Type	Public					
Authoring Partner	National Observatory of Athens					
Prepared by	Ms. Alexia Tsouni (member of Project Management Board)					
Quality Assurance	Dr. Charalampos Kontoes (Project Coordinator, WP1 Leader)					
Contact Person	Dr Charalampos (Haris) Kontoes		Project Coordinator			
	Metaxa & Vas. Pavlou Str. • 152 36 Penteli, Greece					
	Email	kontoes@noa.gr		Phone	+30-2108109113	Fax

Executive Summary

The objective of this deliverable is to summarize the minutes of the second Steering & Advisory Committee Meeting and to present the recommendations made by the Committee as well as the conclusions of the discussion. The document is divided into four parts. The first one gives an overview of the BEYOND project, as it was presented during the meeting by Dr. Haris Kontoes, BEYOND Project Coordinator. The second part of the deliverable is devoted to the presentation of the progress done in each field: Fires, Atmospheric Environment, Urban Thermal Environment, Geophysical, Floods, as it was presented by each member of Project Management Board. The third part of the document focuses on benchmarking BEYOND through success indicators, as well as looking beyond BEYOND, namely its outlook and sustainability. Finally, the fourth part records the questions & answers and the recommendations of the Advisory Committee and ends with the summary and the conclusions of the meeting.

Project Information

This document is a contractual commitment of the research project funded under the FP7-REGPOT-2012-2013-1: activity 4.1 - Unlocking and developing the research potential of research entities established in the EU's Convergence regions and Outermost regions.

Call Identifier: Integration of research entities from the EU's Convergence and Outermost regions in the ERA and enhancement of their innovation potential.

Project GA number: 316210

Project Title: BEYOND - Building Capacity for a Centre of Excellence for EO-based monitoring of Natural Disasters.

Table of Contents

Acronyms and Abbreviations	v
1. Introduction.....	1
2. Overview, Dr. Haris Kontoes, Research Director NOA/IAASARS	2
3. From fireHUB to disasterHUB, Dr. Haris Kontoes, Research Director NOA/IAASARS	4
4. Atmospheric Services, Dr. Vassilis Amiridis, Senior Researcher NOA/IAASARS.....	6
5. Monitoring the Urban Thermal Environment, Dr. Iphigenia Keramitsoglou, Senior Researcher NOA/IAASARS.....	8
6. Spaceborne and Airborne Geohazard Monitoring – BEYOND GeoHUB, Dr. Ioannis Papoutsis, Assistant Researcher NOA/IAASARS.....	10
7. Floods monitoring at national scale – FloodHUB service, Ms. Alexia Tsouni, Assistant Researcher NOA/IAASARS.....	13
8. Benchmarking BEYOND through success indicators, Dr. Ioannis Papoutsis, Assistant Researcher NOA/IAASARS.....	15
9. Questions & Answers and Recommendations	17
10. Summary / Conclusions.....	21

Acronyms and Abbreviations

Acronym	Description
DLR	German Aerospace Center
DRR	Disaster Risk Reduction
EC	European Commission
EMS	Emergency Management Service
EO	Earth Observations
ESA	European Space Agency
EU	European Union
GA	Grant Agreement
GEO	Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
GRNET	Greek Research & Technology Network
IAASARS	Institute of Astronomy, Astrophysics , Space Applications and Remote Sensing
JRC	Joint Research Centre
MoU	Memorandum of Understanding
NASA	National Aeronautics and Space Administration
NHRF	National Hellenic Research Foundation
NOA	National Observatory of Athens
OASP	Organization of Antiseismic Planning and Protection of Greece
SAR	Synthetic Aperture Radar
UAV	Unmanned Aerial Vehicle
UHI	Urban Heat Islands
UN	United Nations
UN-SPIDER	United Nations Office for Outer Space Affairs
WMO	World Meteorological Organization
WP	Work Package

1. Introduction

The second Steering & Advisory Committee Meeting took place on Friday 24 June 2016.

PRESENT:

Dr. Haris KONTOES - BEYOND Project Coordinator, Research Director of IAASARS/NOA

Dr. Gunther KOHLHAMMER - European Space Agency (ESA)

Dr. Slobodan NICKOVIC - World Meteorological Organization (WMO)

Dr. Stefan VOIGT - German Aerospace Center (DLR)

Prof. Minas KAFATOS - Chapman University

Dr. Vassilis AMIRIDIS - National Observatory of Athens (NOA)

Dr. Iphigenia KERAMITSOGLOU - National Observatory of Athens (NOA)

Dr. Ioannis PAPOUTSIS - National Observatory of Athens (NOA)

Ms Alexia TSOUNI - National Observatory of Athens (NOA)

APOLOGIES:

Dr. Xenophon TSILIMPARIS - Greek Research & Technology Network (GRNET)

Dr. Vassilis TSAGARIS - IRIDA Labs

Ms Georgia TZENOU - National Hellenic Research Foundation (NHRF)

2. Overview, Dr. Haris Kontoes, Research Director NOA/IAASARS

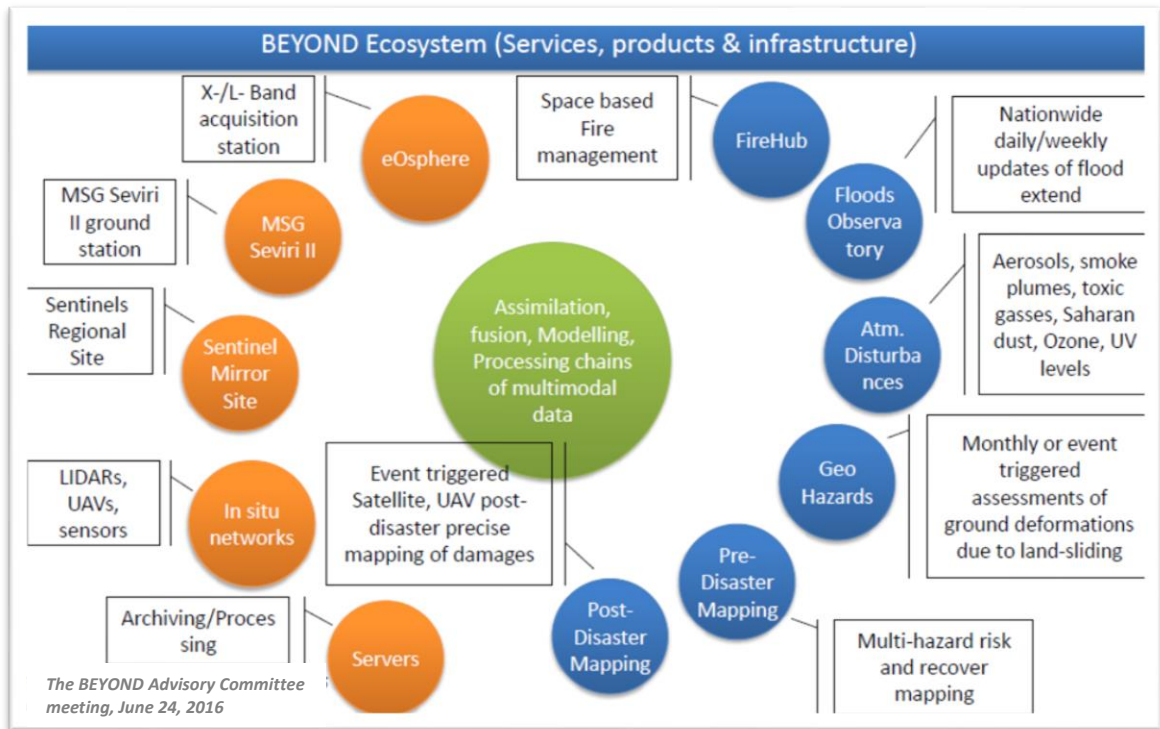
BEYOND Project Coordinator, Dr. Haris Kontoes, opened the meeting welcoming the participants and thanking all the members of the Steering & Advisory Committee for their support. He stressed that for the BEYOND team collecting and reporting to the EC the opinion of the Advisory Committee about the progress and their recommendations are much more than a contractual obligation. The BEYOND team highly appreciates and takes into account the valuable comments of the members of the Advisory Committee, who are all experts in their domain and provide useful high-level feedback to the BEYOND team.

Dr. Kontoes underlined that BEYOND will not end with the end of the project. On the contrary, BEYOND will continue as a Center of Excellence in the premises of NOA for Earth Observation based monitoring of Natural Disasters (<http://www.beyond-eocenter.eu>), given that it has achieved its goals to:

- expand the existing state-of-the-art, skills, and interdisciplinary research potential in EO, for Building a Centre of Excellence for Earth Observation based monitoring of Natural Disasters;
- address GEO societal challenges and COPERNICUS EMS priorities in South-Eastern Europe, and the wider Mediterranean region through the integrated cooperation and coordinated use of capacities and skills from more than 20 twinning partners, international organisations, and operational user authorities;
- set up innovative observational solutions, allowing to a multitude of monitoring networks (space borne and in-situ) to operate in a complementary, unified, and coordinated manner;
- transform Earth Observations to new information and knowledge, ready for down-streaming to specific societal needs in the domain of Disaster Risk Reduction (DRR);
- deliver through web observations and higher level products and services to stakeholders, international research, and end-user communities.

Dr. Kontoes noted that in the framework of BEYOND, NOA operates a Region-wide X-/L- band multi-mission station, two MSG acquisition stations of DVB-S & DVB-S2 systems, the 1st Collaborative Ground Segment (Hellenic Sentinel Data Hub- Mirror Site), in-situ monitoring networks, as well as Ground Lidar Stations. Furthermore, IAASARS/NOA has empowered its computational infrastructure with high-performance server hardware.

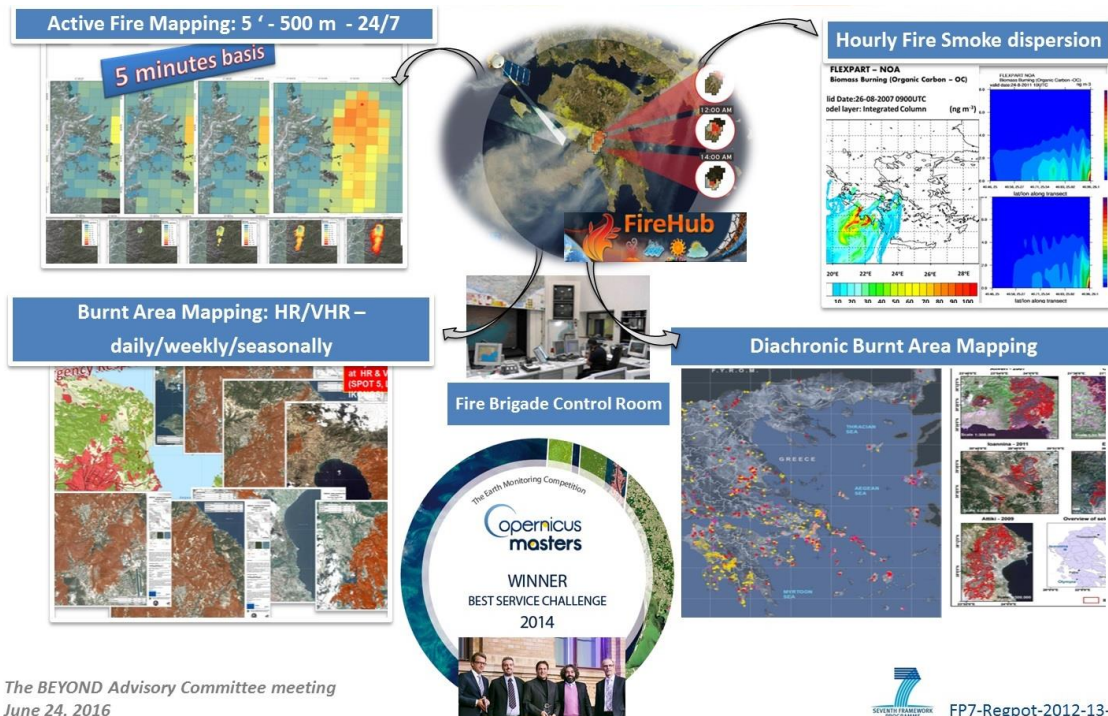
Dr. Kontoes concluded with the presentation of the BEYOND Ecosystem, which consists of services, products & infrastructure, as shown in the following figure:



3. From fireHUB to disasterHUB, Dr. Haris Kontoes, Research Director NOAA/IAASARS

Dr. Haris Kontoes, Research Director and responsible for the FireHub of BEYOND (<http://ocean.space.noa.gr/BEYONDsite/index.php/fires>), presented the Fire Management Services in the BEYOND project, highlighting that the operational EO based fire management service, known as “FireHub: A Space Based Fire Management Hub” won in the Best Service Challenge Copernicus-Masters competition 2014. The service consists of four pillars:

- the real-time fire monitoring system (<http://ocean.space.noa.gr/BEYONDsite/index.php/fires/fire-monitoring-system>);
- the diachronic mapping of burned areas over Greece (1984-2013) (<http://ocean.space.noa.gr/BEYONDsite/index.php/fires/burnt-scar-mapping>);
- the fire smoke dispersion forecasting tool (<http://ocean.space.noa.gr/BEYONDsite/index.php/fires/fire-smoke-dispersion>);
- the fuel maps (<http://ocean.space.noa.gr/BEYONDsite/index.php/fires/fires-fuel-maps>).



Dr. Haris Kontoes mentioned the institutional end-users and stakeholders who receive the fire disaster services, and noted that currently NOAA’s Collaborative Ground Segment dedicated to ESA Sentinel missions (Copernicus) is being integrated, allowing near real time acquisition of S-1, S-2 and future S-3, S-5P satellite missions.

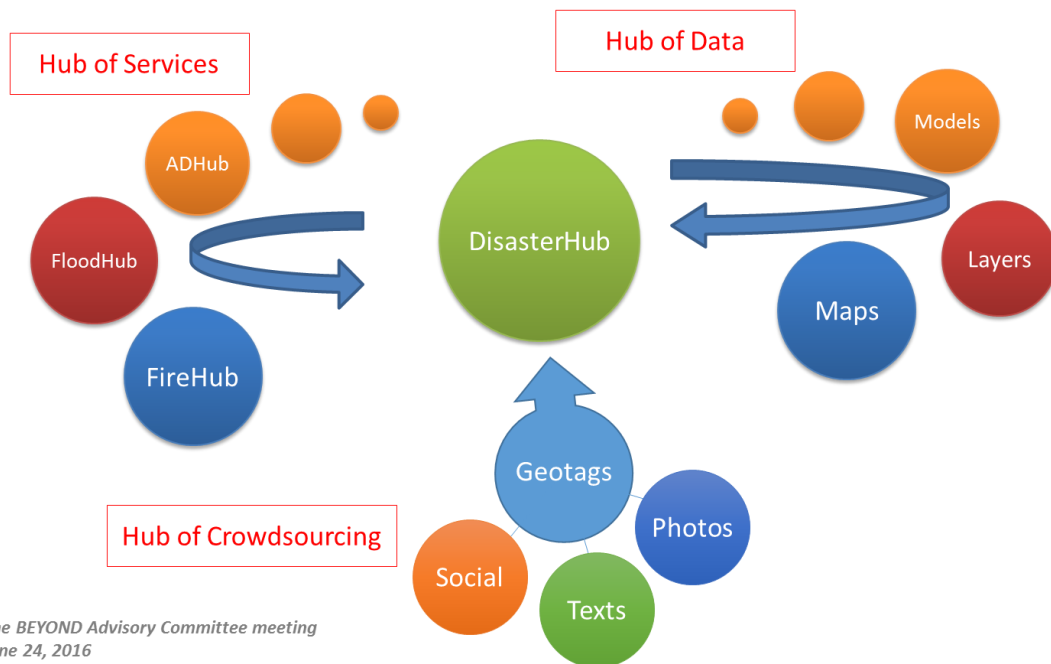
Dr. Haris Kontoes then explained that in the last year the new concept of DisasterHub was introduced, a mobile application for enabling crowd generated data fusion in EO disaster management services. DisasterHub, also called as the Hub of Hubs, conceptually comprises of two things: a) the fusion of the different hubs, such as firehub, floodhub, geohub, into a common platform, and b) the use of mobile platforms for setting up a two-way communication with the crowd, while ingesting crowd data in the data processing and assimilation.

DisasterHub:

- enables the users to send a geotag specifying a location stricken by a hazardous phenomenon;
- provides the users with a near real-time feed of data derived from the BEYOND services;
- offers a (currently limited) toolbox that allows the management and visualization of the data derived from the BEYOND services, combined with crowd generated and GEOSS based data.

What is innovative?

DisasterHub introduces to the EO community the **Hub of Hubs** architecture.



*The BEYOND Advisory Committee meeting
June 24, 2016*

4. Atmospheric Services, Dr. Vassilis Amiridis, Senior Researcher NOA/IAASARS

Examples of systematic atmospheric hazards over Greece include the Forest Fire Smoke and the Saharan Dust. Dr. Vassilis Amiridis, responsible for the Atmospheric Hub of BEYOND (<http://ocean.space.noa.gr/BEYONDsite/index.php/atmospheric>), presented the Atmospheric Services in the BEYOND project:

- The first service concerns smoke dispersion, combining remote sensing information (burnt area, fuel type, fire radiative power) with modeling (meteorology). It includes:
 - wild fire smoke dispersion (operational modeling system providing 3D forecast fields in Greece);
 - industrial accident smoke dispersion (early-warning system stand by also for Europe);
 - volcanic ash dispersion; and
 - nuclear accident release (prognostic forward trajectories for a conceptual scenario of nuclear accident over Europe).

Langrangian atmospheric models (FLEXPART) are utilized in BEYOND in conjunction with RS data to provide smoke and volcanic ash dispersion forecasts.

- The second service concerns desert dust modeling and forecasting. It includes the optimization of Saharan dust forecasts through assimilation techniques. It is based on validated and optimized algorithms developed in UK-Met Office with validation by IAASARS (lidar measurements in Crete during CHARADMexp field campaign <http://195.251.203.238/beyond/index.php/atmospheric/charadmexp>).

Eulerian state-of-the-art models (NMME/DREAM) were utilized in BEYOND to simulate the atmospheric desert dust cycle. Assimilation of MSG dust retrievals showed to improve forecasts when compared to ground-based lidar profiles.

- The third service is LIVAS, which provides a global 3D climatology of aerosols and clouds in 1x1 degree, available under: <http://lidar.space.noa.gr:8080/livas>. It includes CALIPSO-AERONET collocation in pure dust cases from CALIPSO typing, as well as CALIPSO-MODIS collocation. Starting from DUST and expanding to other aerosol types, the final BEYOND product in UV is envisioned to serve as the link between CALIPSO and EarthCARE (using EARLINET data), in order to bridge the missions for the provision of a multi-decadal harmonized climatic record.

Assimilation of 3D fields from CALIPSO dust LIVAS product of BEYOND is under development. For this development UV dust extinction wavelengths will be used in order to be consistent with future ESA missions (ADM-Aeolus and EarthCARE).

Dr. Vassilis Amiridis highlighted some of the infrastructure in the Atmospheric Hub:

- Development of a sophisticated multi-wavelength backscatter / Raman / depolarization lidar system (PollyXT) in collaboration with TROPOS Institute in Leipzig, Germany, for systematic operation in Finokalia station, Crete island (ACTRIS Infrastructure Networks, Integrated Carbon Observation System, European Monitoring and Evaluation Programme).
- The EMORAL (Esa’s MOBILE RAmAn Lidar) system: IAASARS is responsible for the operation of this system which is property of ESA and offered to be operated by NOA in the framework of BEYOND.

BEYOND ground-segment is also used for real-time acquisition of space-borne observations for both services and assimilation in models.

Scheduled future activities:

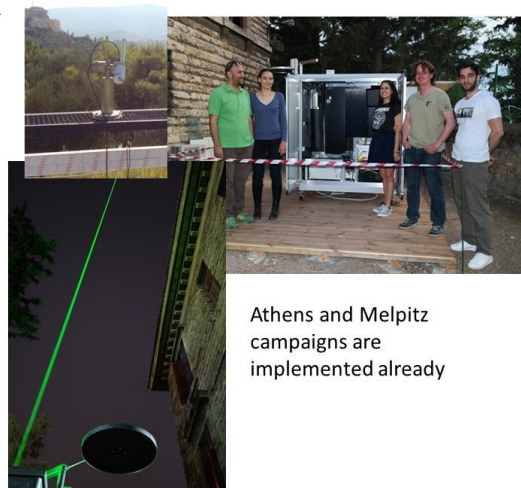
ACTRIS-2 campaigns: NOA will organize 4 experimental campaigns @ Athens, Crete, Granada, Melpitz

Night-time retrievals with sun/lunar/star photometer and Raman lidar



CIMEL sunphotometer PollyXT OCEANET lidar

In-situ measurements with Unmanned Aerial Vehicles (UAVs) and/or tethered balloons



Athens and Melpitz campaigns are implemented already

Large scale experimental campaign in Eastern Mediterranean – April 2017

NOA:
Replicate LACROS @ Crete



DLR:
50 flight-hours over East.Med.
(ERC project A-LIFE)



TROPOS:
LACROS @ Cyprus



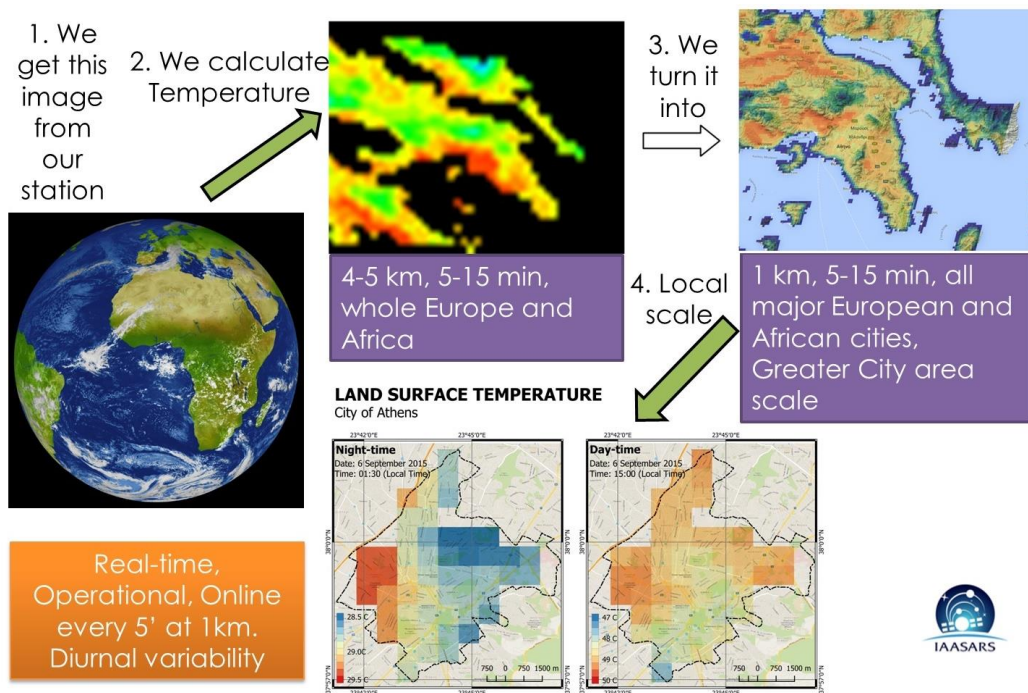


5. Monitoring the Urban Thermal Environment, Dr. Iphigenia Keramitsoglou, Senior Researcher NOA/IAASARS

Dr. Iphigenia Keramitsoglou, responsible for the Urban Thermal Environment Hub of BEYOND (<http://ocean.space.noa.gr/BEYONDsite/index.php/urban-environment>), presented the advancement which has been made in the research domain of the urban thermal environment, and in particular Surface Urban Heat Islands (SUHI) and Heatwave mapping.

Dr. Iphigenia Keramitsoglou noted that urban areas are warmer than their rural surroundings. UHIs prolong and intensify heatwave events; for example the 2003 heatwave resulted to 70,000 excess deaths in Europe. Many countries are affected, and there is a need for preparation. However, currently, no operational service to provide high spatiotemporal urban temperature data exists.

The application of urban thermal environment in BEYOND uses Thermal Remote Sensing in a fully automated system for the continuous operational monitoring of Land Surface Temperatures of European cities in real time every 5 minutes at 1 km resolution. EO data from MSG2-SEVIRI RSS is employed.



Dr. Iphigenia Keramitsoglou underlined that the system offers four significant advantages:

- it exploits the high temporal resolution of SEVIRI RSS imagery (5 min);
- it enhances the spatial resolution of LST down to 1 km;
- it covers a large number of cities around the world; and
- the derived products are available in real time.

The highlights are:

- MoU with the City of Athens;
- Negotiations with Region of Attica;
- Co-Leader GEO Task.

Three twinnings were implemented in the field of Urban Thermal Environment with:

- NASA Marshall Space Flight Centre, Earth Science Office, USA;
- Center for Earth System Research and Sustainability, University of Hamburg, Germany;
- University of Valencia, Spain.

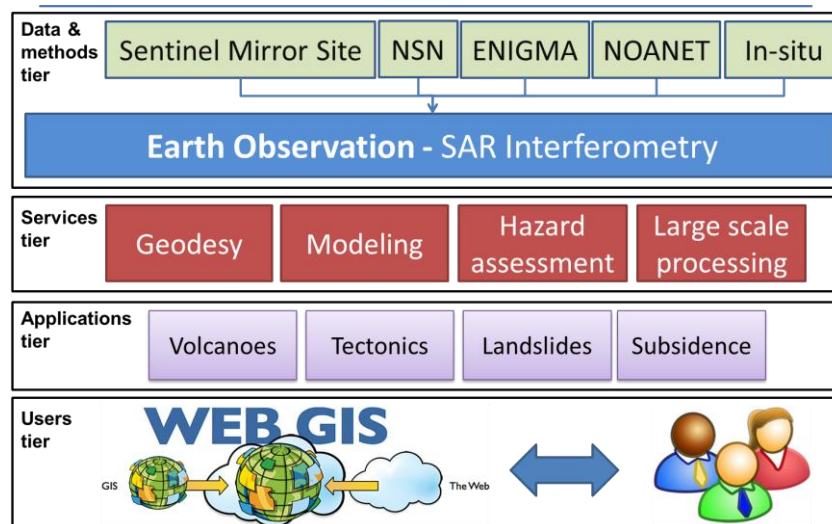
Dr. Iphigenia Keramitsoglou finally referred to the way forward, which includes:

- Scale up;
- Inclusion of more Cities;
- Development of Applications.

6. Spaceborne and Airborne Geohazard Monitoring – BEYOND GeoHUB, Dr. Ioannis Papoutsis, Assistant Researcher NOAA/IAASARS

Dr. Ioannis Papoutsis, responsible for the GeoHub of BEYOND (<http://ocean.space.noa.gr/BEYONDsite/index.php/geophysical>), presented the Spaceborne and Airborne Geohazard Monitoring Services in the BEYOND project.

GeoHUB overview:



Dr. Ioannis Papoutsis first presented an overview of all the services and then focused on their highlights.

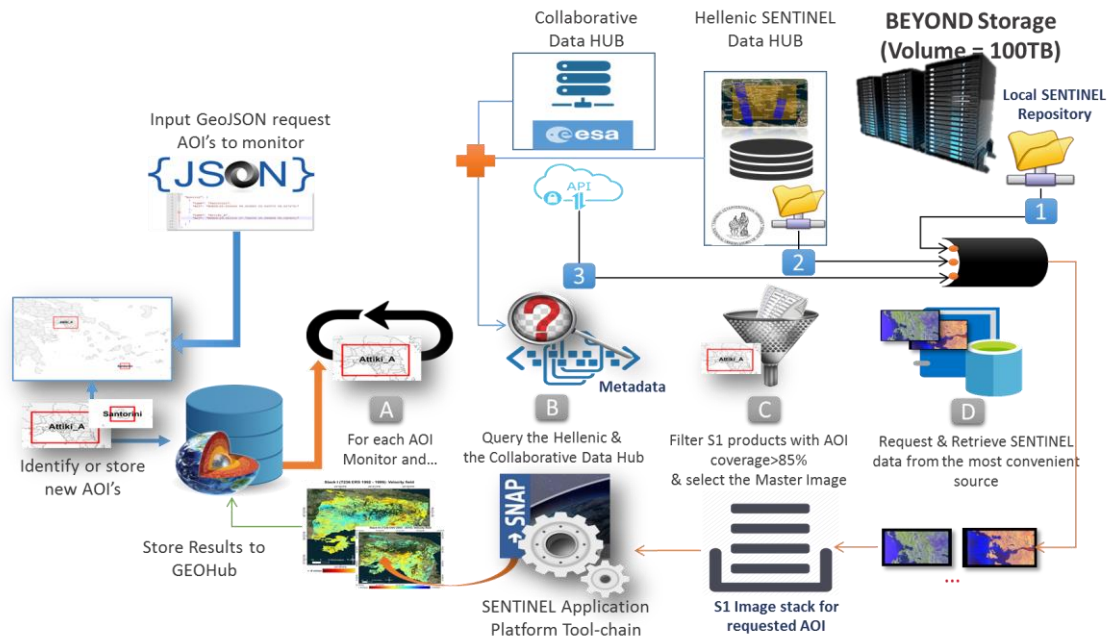
Overview:

Service	Status	Input data	Scale
Mapping of large-scale ground velocities & 3D decomposition	Operational	SAR, GPS	National
Estimation of earthquake 3D crustal deformation	Operational	multi-angle SAR, GPS	Local
Seismic risk estimation	pre-operational	SAR, in-situ, GIS	Local
UAV based damage assesement	Operational	Aerial data	Local
Mapping of tectonic hazard areas in subduction zones	Research	SAR, GPS	Regional
Monitoring of volcanic activity	Operational	SAR, GPS, in-situ	Local
Monitoring dispersion of volcanic ash	pre-operational	Weather data	Regional
Detection of new landslides	Operational	SAR	Local
Update of landslide inventory maps	pre-operational	SAR, in-situ	Regional
Estimation of landslide susceptibility	pre-operational	SAR, in-situ, GIS	Regional
Detection of subsidence in urban & peri-urban areas due to manmade activities & physical processes	Operational	SAR, GPS	Regional
Monitoring of construction activities in urban environment	Operational	SAR, GPS	Local

Highlights:

- Earthquake deformation mapping: Radar interferometry is applied to measure deformation that was inflicted after abrupt catastrophic events, like an earthquake, or rapidly deforming calderas. Input data are typical multi-resolution, multi-temporal and multi-frequency Synthetic Aperture Radar (SAR) images. Example: 3-D crustal deformation field from TerraSAR-X and COMSO-SkyMed for measuring deformation for the Cephalonia earthquake in 2014, with inversion to estimate fault parameters.
- Damage assessment using satellite & aerial imagery: Example: UAV based damage assessment for Cephalonia earthquakes in 2014 with 8 UAV flights. Three types of damages were monitored via simple ortho-interpretation: damages 1) on ground level such as damages on roads, harbor infrastructure, cemeteries etc. and also small landslides, 2) on walls and 3) on roof-tops. This was very useful for the relevant National Agency registering damages. Then an UAV octocopter was procured by NOA; and currently this is an operational BEYOND service.
- Monitoring volcanic activity: Example: A large inflation episode started in Santorini in 2011. The post-inflation activity of the volcano is monitored; currently it returns to its previous state.
- Urban subsidence monitoring & uplift tracking: Example: The urban area of Kalohori and Sindos, Thessaloniki is monitored using ERS 1-2 and ENVISAT data. An interesting observation was that the subsidence with a velocity of 3 cm/year in the period 1992-2000 reverted to an uplift in the period 2002-2010. The first trend was explained by the underground water over-pumping in the area and the change in the trend of the surface velocity was due to the aquifer level recovery.
- Large scale ground velocity estimation: Satellite SAR data are used. Example: Crete island in the period 1992-2010. Several ERS and ENVISAT tracks were used to cover the entire island. Modelling of the geodynamic processes was done in this seismic active area and some assessments were made about the hazard in the area.
- Regional landslide hazard assessment: Timeseries of SAR data are used to generate velocity, and together with other layers (e.g. geospatial, precipitation) they are imported in probabilistic models to estimate the landslide susceptibility. Example: A pilot study was done in Evritania and Etolia regions in west Greece for the period 1992-2010 using persistent scatterer interferometry techniques and an in-situ visit took place to check the correlation of the results.
- New geomagnetic data service: Processed data from the ENIGMA magnetometer network of NOA are published. Example: magnetic storm in 2015.

The future: BEYOND GeoHUB architecture:



7. Floods monitoring at national scale – FloodHUB service, Ms. Alexia Tsouni, Assistant Researcher NOA/IAASARS

Ms. Alexia Tsouni, responsible for the Floods Hub of BEYOND (<http://www.beyond-eocenter.eu/index.php/floods>), presented the progress in the Floods Monitoring Services of BEYOND; specifically the Floods Observatory and the FloodHUB. Both services contribute to the implementation of the EU Floods Directive, aiming to reduce and manage the risks that floods pose to human health, the environment, cultural heritage, economic activity and infrastructure.

Ms. Alexia Tsouni underlined that floods monitoring with the exploitation of Earth Observation data is a new domain in Greece, first developed in the framework of BEYOND, and it supports the integrated flood risk management.

The Floods Observatory (<http://www.beyond-eocenter.eu/index.php/floods/floods-observatory>) is an online platform where major flood events in Greece and south-eastern Europe are registered and the flood mapping results produced following the processing and photo-interpretation of satellite Optical and SAR images are published.

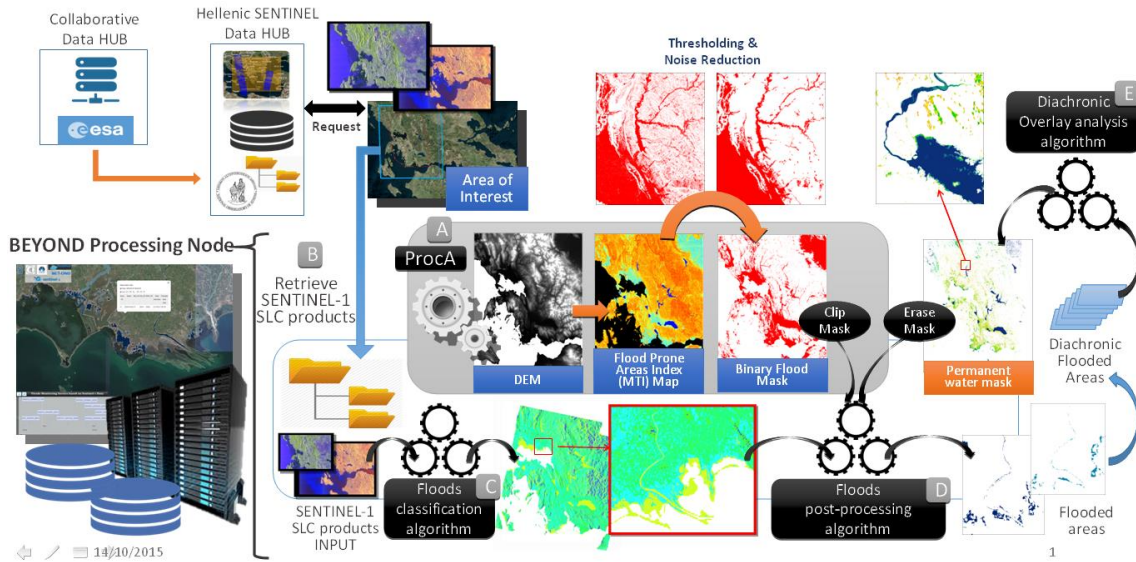
Ms Alexia Tsouni presented three case studies of floods mapping: 1) the flood event of May 2014 in Bosnia and Herzegovina with the use of Landsat 8 satellite images; 2) the flood event of February 2015 in Evros river in Greece with the use of Sentinel 1 SAR images; 3) the flood event of February 2015 in Albania with the use of Sentinel 1 SAR images.



The FloodHUB (<http://www.beyond-eocenter.eu/index.php/floods/floodhub>) is BEYOND's Floods Monitoring Service where all the flood events in selected river basins are monitored, and the flood mapping results are published on the online platform following the processing of Sentinel-1 images from the Hellenic National Sentinel Data Mirror Site (the first fully automated process). The service provides floods mapping and floods extent measuring per flood event, as well as diachronic flood classification results. After the retrieval of Sentinel-1 products [B], the floods monitoring application also uses a number of other input data layers and applies the following processing modules: Binary Flood Mask extraction [A], Floods classification algorithm [C], Floods post-processing algorithm [D], Diachronic Overlay analysis algorithm [E].

Ms Alexia Tsouni presented the first pilot study, which is Arachthos & Acheloos river basins in west Greece, where the Public Power Corporation S.A. Hellas is operating major hydroelectric plants. The processing and analysis for the first hydrological year with available Sentinel-1 images (2014-2015) is completed; and the second hydrological year (2015-2016) is now being processed.

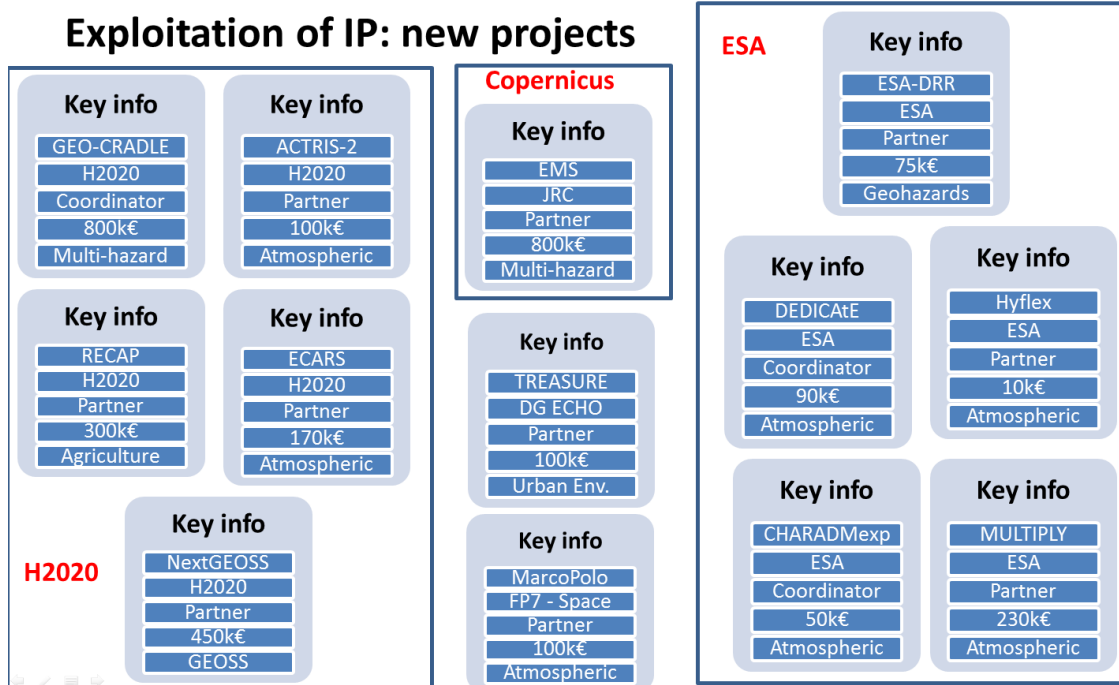
BEYOND FloodHUB architecture:



8. Benchmarking BEYOND through success indicators, Dr. Ioannis Papoutsis, Assistant Researcher NOA/IAASARS

Dr. Ioannis Papoutsis presented an overview of the success indicators of the BEYOND Center of Excellence, which were established as a contractual obligation in order to objectively evaluate the performance of the project:

- Boosting innovative research: 17 new recruitments of researchers & key professionals; 70% of them being women.
- Infrastructure upgrading: 635,000 € value of new equipment & software, 20 new end-to-end services, 5 participations to Research Infrastructure and scientific networks (regional support office of UN-SPIDER, CEOS, ACTRIS, EARLINET, Sentinel Collaborative Ground Segment, GEO SB-04).
- Visibility: 8 press releases, 5 webinars, 11 BEYOND workshops.
- Enhancing research capacity: 27 journal publications, 48 3rd party citations, 30 proposals.
- Exploitation of Intellectual Property: 1 patent for FireHub (first ever in NOA); 30 proposals leading to 11 new projects, namely 36% success rate (quite high considering the European average), bringing 3M € new funds (exclusively European funding).



Dr. Ioannis Papoutsis underlined the GEO-CRADLE project which is coordinated by NOA and started in February 2016: Coordinating and integrating state-of-the-art Earth Observation Activities in the regions of North Africa, Middle East, and Balkans and Developing Links with GEO related initiatives towards GEOSS.

Dr. Ioannis Papoutsis also highlighted the Copernicus Emergency Management Service Risk & Recovery, in which NOA provides on-demand EO-based geospatial information in support to emergency management for several disaster types. NOA undertook 6 activations on multi-hazard risk assessment so far:

1. [EMSN018](#): Multiple natural hazard risk assessment – Planning and Recovery in the Azores Islands, Portugal;
2. [EMSN020](#): Multiple natural hazard risk assessment – Planning and Recovery in Madeira and Porto Santo islands, Portugal;
3. [EMSN021](#): Earthquake risk assessment – Planning and Recovery in Austria;
4. [EMSN022](#): Post-disaster analysis, damage assessment, recovery and rehabilitation planning and monitoring, flood risk assessment, disaster preparedness and response mechanisms in Bulgaria;
5. [EMSN025](#): Forest fire damage assessment – Planning and Recovery in Greece;
6. [EMSN026](#): Post-disaster assessment of toxic cloud dispersion after an industrial accident in Catalonia, Spain.

In addition Dr. Ioannis Papoutsis noted that NOA was awarded for the first time the European Research Council Consolidator Grant 2016 (Dr. Vassilis Amiridis) for the project D-TECT: Does dust TriboElectrification affect our Climate?

To sum up, BEYOND's flagships are:

- FireHub: A Space Based Fire Management Hub;
- Smoke dispersion services;
- Operational real time system for Continuous Monitoring of the Urban Thermal Environment;
- UAV based damage assessment;
- Sentinel-1 Ground Segment for mapping of large-scale ground velocities;
- Geomagnetic data portal;
- Floods Observatory for south-eastern Europe.

BEYOND's outlook and sustainability focuses on the following fields:

- Disaster Hub: EO-based multi-disaster monitoring, coupled with crowdsourcing information;
- Improved Saharan dust forecasts based on satellite data assimilation;
- Urban Thermal Monitoring as a downstream service in new application areas (Health, Fitness, Environment, Heat stress, Energy, Smart Cities);
- Near-real time InSAR applications using Sentinel Collaborative Ground Segment;
- Floods Early Warning System.

9. Questions & Answers and Recommendations

Dr. Haris Kontoes thanked the members of the Advisory Board for their attention and gave them the floor for comments, questions and recommendations.

Dr. Stefan Voigt thanked for the presentations and commented that it is really impressive to see this rich firework of activities coming out of BEYOND with all these different hubs. He asked to what extent FireHUB provides interactive mapping or serving and streaming to the data users. Dr. Haris Kontoes replied that BEYOND has a direct and continuous interaction with the authorized user, which is the Fire Service. BEYOND seeks to use the information provided by the Fire Service for the enhancement of the service mapping the fires.

Dr. Stefan Voigt then noted that indeed BEYOND contributed greatly to the capacity building, the upgrading of software, the hiring of new staff and the enhancement of research at NOA, as well as to the establishment of operational ties with end-users. He asked where NOA intends to go from now on; focus on research or operational services for end-users?

Dr. Haris Kontoes replied that NOA is a research center, so research will continue to be central to its work. NOA keeps developing new things. Its innovative services mean that the research is not left apart. Therefore conducting research activities will continue, as long as we continue being successful in receiving funding from H2020 or similar framework programmes in the future, because these research activities are mainly supported by competitive European funding. This gives rise to new research and innovation activity, services and products. So NOA will proceed to this direction for sure.

In addition, Dr. Haris Kontoes noted that there are specific research outcomes that have already become rather mature. Several of them are provided on a systematic routine basis; for example: 1) Part of the FIREHUB services are provided on a routine basis to the Fire Brigade Authorities, which rely on them for the management of the fire hazard; 2) The FLOODHUB is useful for the Special Secretariat for Water of the Ministry of Environment in the direction of meeting the requirements of the EU Floods Directive; 3) The Organization of Antiseismic Planning and Protection of Greece under the Ministry of Infrastructure has asked NOA several times to fly its UAV units and provide them in short time information about the earthquake damages to be used for the compensation of the affected people and the rehabilitation of the affected regions.

Therefore, Dr. Haris Kontoes concluded that, because of the BEYOND Center of Excellence, NOA is able at the same time to develop new research and install observational capacities and develop processing chains that can advance both the research and the production of routine services, especially in the domains in which NOA is more mature in providing standardized and validated products. So, NOA will seek funding on the one side for research and on the other side for operational framework programmes like EMS or the future EFIS activity, which will allow NOA to

offer the existing and validated services on a routine basis for the needs of authorized users, trying to meet their requirements on an operational basis. Moreover, NOA has already signed agreements with authorized users, and has lately initiated discussions with the Ministry of Infrastructure in order to prepare a legislation framework that will define an official protocol of communication between the BEYOND Center of Excellence and the Ministry. This will establish a direct communication and provision of information and services in case of specific hazards, like fires, earthquakes or floods. In this framework NOA will also seek some national financial support for the operations of the BEYOND Center of Excellence which serve the needs of the Greek Ministries.

Dr. Stefan Voigt expressed his concern that research centers should stick to their research work to some extent; so if some work is fully operational it may be better to choose other ways, like outsourcing, even giving it to industry and get license and revenues from it. There is definitely some cross-fertilization, but it is better to somehow keep the research separate from the routine operational work. It can be tricky to do both together and maintain them. Research should be more innovative and creative.

Dr. Vassilis Amiridis replied that it is indeed a dilemma for NOA too, how to achieve this balance. Dr. Haris Kontoes added that it is difficult also for NOA to have a clear plan on how to sustain fully operational services for all these types of disasters in the future. However, for the time being, NOA develops and provides useful tools and information to the operational users to help them in their daily operations. It's not directly NOA performing these daily operations, or assuming the full responsibility, or acting for the emergency disaster management. NOA is somewhere in the middle.

Dr. Slobodan Nickovic also commented on this issue, saying that he fully understands the point of Dr. Stefan Voigt, and that NOA seems to be at a turning point, what to do with the operational part. BEYOND has indeed developed a number of useful products. The question is if NOA will establish an operational unit with a 24/7 service for delivering the products, or still engage the scientific staff who developed the applications to cover the operational services. This is a tricky business and NOA has to solve this question on how to proceed. Dr. Slobodan Nickovic added that, anyway, BEYOND is a big step ahead, a very successful project with a number of scientifically based applications and services delivered to users; and NOA will find the best way to make it sustained in the future.

Dr. Haris Kontoes agreed with Dr. Stefan Voigt and Dr. Slobodan Nickovic and said that NOA will continue providing on a routine basis the services and products, but in a rather automatic way, in a way that they do not need to have on-site operational staff operating on a 24/7 basis. This is not possible at the moment, given our profile which is a research organization, and our main funding scheme which is based on competitive European frameworks. However there may be some development if the above-mentioned legislation is adopted with specific mandates for NOA and financial support by the national budget. Anyway NOA can continue providing services and products which are delivered on a 24/7 basis in an automatic way through our processing center as done today, for example for the needs of the Fire Brigade authority.

Dr. Slobodan Nickovic also referred to the existing excellent cooperation between NOA and the Serbian MET service in the field of dust forecast. Dr. Vassilis Amiridis confirmed that there is a great collaboration, and said that NOA will continue improving the dust modelling and evaluating improvements against the ground-based measurements. Measurements have already been collected from Crete but also from Cyprus, where the improvements of data assimilation are checked also for the Middle East deserts; and this is crucial to dust modeling. So the collaboration will continue and there is also a future exploitation gateway; an application for dust research in the United Arab Emirates and other frameworks. Dr. Vassilis Amiridis thanked Dr. Slobodan Nickovic for his support in all these actions.

Dr. Slobodan Nickovic noted that BEYOND has developed a useful application for flood mapping. Dr. Slobodan Nickovic said that modeling is a key component for the flood early warning system and asked Ms Alexia Tsouni how NOA will proceed with this, and if soil moisture observations could be available from the Sentinel satellites.

Ms Alexia Tsouni replied that apart from the two flood services already developed by BEYOND (the Floods Observatory and the FloodHub), NOA seeks to develop a floods early warning system, for which modelling is a key component indeed. There is an ongoing cooperation with CIMA Research Foundation in this field, established as a twinning in the framework of BEYOND. The floods early warning system will include the Continuum hydrological model as well as a hydraulic model. In this direction NOA signed a MoU with the Public Power Corporation S.A. Hellas which have a great interest in this field because they are operating major hydroelectric plants. Therefore, the first pilot study was chosen to be the Arachthos & Acheloos river basins in west Greece, because it's there where the most important hydroelectric plants are located. Currently the water level measurements are being collected in order to estimate the river discharges and use them for the validation of the hydrological model. Afterwards the results of the hydraulic model will be compared with the available satellite images in order to calibrate the parameters of the model and achieve the best accuracy. As for the soil moisture, Ms Alexia Tsouni said that it is indeed the most crucial parameter, and there are relevant Sentinel products for this which will be examined and evaluated in the future, to improve the results of the floods modelling. Ms Alexia Tsouni added that this could be a field of cooperation with the Serbian MET service which has great experience in modelling. Dr. Slobodan Nickovic agreed and said that it is an interesting field to combine the hydrological and hydraulic modelling with the earth observation.

Dr. Stefan Voigt asked about the synergy between the Copernicus Emergency Management Service and the other NOA work; if it is smooth or if it is causing any trouble.

Dr. Haris Kontoes stressed that NOA is part of the Risk and Recovery pillar, not the Rapid Mapping. NOA with its partners receive activations and provide products to the end-users. Up to now this was done in a rather smooth way and the deliverables have received the recognition and the appreciation of end-users; as it was also presented in the last meeting in JRC, where JRC shared the feedback of the end-users. Both sides are satisfied. As regards the Greek end-users who have applied or requested from

Copernicus EMS to provide them support in several cases of disasters, NOA has supported them and they were rather keen on collaborating. NOA provided them with the appropriate support and assistance in forming their requests to the EMS Risk and Recovery pillar. Dr. Haris Kontoes concluded that NOA is satisfied about the level of cooperation with the Greek end-users community. However NOA is not part of the EMS Rapid Mapping pillar, so there has been no opportunity yet to collaborate with the Civil Protection Authority, which is the authorized user to activate emergency response services.

Dr. Stefan Voigt, sharing his experience from Germany, noted that it can be even advantageous not to be part of the Copernicus EMS in order to be able to complement what the Service is doing for the end-users, and be able to be an independent part to validate and add services.

Dr. Haris Kontoes thanked for this comment too, and on behalf of the BEYOND team, thanked all the Members of the Advisory Board for all their support and feedback. Dr. Haris Kontoes stressed that it is important to continue the discussion and collaboration in the future in different frameworks and project opportunities, given that there is so high complementarity in terms of research activities as well as operational activities.

10. Summary / Conclusions

BEYOND will not end with the end of the project. On the contrary, BEYOND will continue as a Center of Excellence in the premises of NOA for Earth Observation based monitoring of Natural Disasters (<http://www.beyond-eocenter.eu>), given that it has achieved its goals to:

- expand the existing state-of-the-art, skills, and interdisciplinary research potential in EO, for Building a Centre of Excellence for Earth Observation based monitoring of Natural Disasters;
- address GEO societal challenges and COPERNICUS EMS priorities in South-Eastern Europe, and the wider Mediterranean region through the integrated cooperation and coordinated use of capacities and skills from more than 20 twinning partners, international organisations, and operational user authorities;
- set up innovative observational solutions, allowing to a multitude of monitoring networks (space borne and in-situ) to operate in a complementary, unified, and coordinated manner;
- transform Earth Observations to new information and knowledge, ready for down-streaming to specific societal needs in the domain of Disaster Risk Reduction;
- deliver through web observations and higher level products and services to stakeholders, international research, and end-user communities.

These achievements are confirmed by the success indicators of the BEYOND Center of Excellence, which were established as a contractual obligation in order to objectively evaluate the performance of the project:

- Boosting innovative research: 17 new recruitments of researchers & key professionals; 70% of them being women.
- Infrastructure upgrading: 635,000 € value of new equipment & software, 20 new end-to-end services, 5 participations to Research Infrastructure and scientific networks (regional support office of UN-SPIDER, CEOS, ACTRIS, EARLINET, Sentinel Collaborative Ground Segment, GEO SB-04).
- Visibility: 8 press releases, 5 webinars, 11 BEYOND workshops.
- Enhancing research capacity: 27 journal publications, 48 3rd party citations, 30 proposals.
- Exploitation of Intellectual Property: 1 patent for FireHub (first ever in NOA); 30 proposals leading to 11 new projects, namely 36% success rate (quite high considering the European average), bringing 3M € new funds (exclusively European funding).

To sum up, BEYOND's flagships are:

- FireHub: A Space Based Fire Management Hub;
- Smoke dispersion services;
- Operational real time system for Continuous Monitoring of the Urban Thermal Environment;
- UAV based damage assessment;
- Sentinel-1 Ground Segment for mapping of large-scale ground velocities;
- Geomagnetic data portal;
- Floods Observatory for south-eastern Europe.

BEYOND's outlook and sustainability focuses on the following fields:

- Disaster Hub: EO-based multi-disaster monitoring, coupled with crowdsourcing information;
- Improved Saharan dust forecasts based on satellite data assimilation;
- Urban Thermal Monitoring as a downstream service in new application areas (Health, Fitness, Environment, Heat stress, Energy, Smart Cities);
- Near-real time InSAR applications using Sentinel Collaborative Ground Segment;
- Floods Early Warning System.

The Advisory Board recognizes and highly appreciates both the quantity and the quality of the different activities and services developed by the BEYOND Center of Excellence. The Advisory Board encourages the BEYOND team to find effective and sustainable ways to ensure the smooth synergy and balance between the operational and the research activities of NOA.

END OF DOCUMENT