



**8<sup>th</sup>**

**GEO European  
Projects Workshop  
12 & 13 June 2014**

**Draft Book of Abstracts  
Of Oral Presentations**



## ABSTRACTS

### ***Thursday 12th June - Morning Sessions***

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### **Plenary Session: Overview of key European and Greek activities supporting the implementation of GEOSS**

**Chair: Gilles Ollier (EC-RTD), Rapporteur: Evangelos Gerasopoulos (NOA)**

#### **Selected GEO Activities at Greek Institutions**

***Prof. Christos Zerefos (Academy of Athens)***

#### **The first Mirror Site of ESA's Sentinels at the National Observatory of Athens**

***Prof. Kanaris Tsinganos (National Observatory of Athens)***

#### **Horizon 2020 and Earth Observation research funding opportunities**

***Jose Miguel Rubio-Iglesias (European Commission – DG Research and Innovation)***

Horizon 2020 is the biggest EU Research and Innovation programme ever with nearly €80 billion of funding available over 7 years (2014 to 2020) – in addition to the private investment that this money will attract. It promises more breakthroughs, discoveries and world-firsts by taking great ideas from the lab to the market. Horizon 2020 is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative aimed at securing Europe's global competitiveness.

By coupling research and innovation, Horizon 2020 is helping to achieve this with its emphasis on excellent science, industrial leadership and tackling societal challenges. The goal is to ensure Europe produces world-class science, removes barriers to innovation and makes it easier for the public and private sectors to work together in delivering innovation.

During this talk, this new EU Research and Innovation programme will be introduced with a special focus on those areas related to Earth Observation (both GEO and Copernicus related topics).

#### **Copernicus Earth Observation Programme: a status and future perspective**

***Silvo Žlebirić (European Commission – DG Enterprise)***

Copernicus, the European Union's most important contribution to the Global Earth Observation System of Systems (GEOSS), is an EU-wide programme that integrates satellite data, in-situ data and modeling to provide user-focused information services to support researchers, policymakers, businesses and citizens. Land monitoring service and Emergency service are fully operational, Atmosphere monitoring service and Marine environment monitoring service are preoperational and will become fully operational in the following year, while Climate change service and Security service



are in an earlier development phase. New legislative basis has been recently adopted by the European Parliament which secures a sustainable long-term operational provision of the services. Series of a number of dedicated satellite missions will be launched in the following years, operated by the European Space Agency and EUMETSAT, started with Sentinel 1A satellite early this year.

**Role of GEOSS to support Environmental Policies**  
***Josiane Masson (European Commission - DG Environment)***

Today there is an increasing need of timely, accurate and sustainable information for monitoring the state of our changing environment and for environmental policymaking. Earth observation from space combined with in situ observation contributes to better knowledge of the Earth (marine, atmosphere, land systems) and prediction about its future. The added value of Earth Observation is to provide cross-border, harmonised data and time series for monitoring changes at local, regional and global scale. Earth Observation is very relevant for measuring environmental threats (e.g. biodiversity loss, deforestation, desertification, soil degradation, land take...) and climate change, which are big challenges for the next coming decade. Improving our knowledge for better implementation of environment policy is in the top priorities of the 7<sup>th</sup> EAP (the EU Environment Action Programme to 2020) which is called "Living well within the limits of our planet". The challenge ahead is to make EU environmental policy more effective and better implemented. For many years DG Environment is being supportive of Earth Observation activities at European level and was closely involved in definition of user requirements both for Copernicus (ex-GMES) programme and GEO GEOSS. With GEO we have already made advances in the last decade with practical application of Earth Observation data for environmental purposes. There are some very interesting GEO initiatives from environmental perspective:

- The GEO Biodiversity Observation Network initiative (GEO BON) launched in 2008 is very relevant for measuring the impact of our policies and our 'footprint' on biodiversity at global level. This is very relevant in support to our international commitments (e.g. RAMSAR, Convention on Biodiversity).
- The Global Forest Observation Initiative for monitoring forest areas, carbon stocks and greenhouse gas emission in support to our development policies and international treaty obligations.
- And also the GEO Global Agricultural Monitoring Initiative (GEO-GLAM) requested by the Group of Twenty (G20) Agricultural Ministers in June 2011
- and many others..

Another very important achievement of GEOSS is the GEOSS Data Sharing principles based on full and open access to Earth Observation data, which is now implemented as good practice by many GEO countries and organisations. Those principles are fully in line with our European INSPIRE Directive, the Public Access to Environmental information Directive and our SEIS initiative (Shared Environmental Information System). It was also instrumental in the recently adopted Copernicus (ex-GMES) data



policy based on free, full and open access to Sentinel data and Copernicus services information. Satellite data are not useful if they are not combined with in situ data. There is a need to strengthen in-situ observation infrastructure that is managed by multiple public and private stakeholders. In particular, current financial crisis negatively affects amount of public funds available for in-situ data collection. New innovative solutions are emerging facilitated by social networks, cloud computing and internet facilities: DG ENV believes that GEO initiatives such as citizen observatories are very promising for complementing traditional in situ data collection.



## **Splinter Session: GEOSS for Citizens**

**Chair: Alan Edwards (IPWG Member), Rapporteur: Elena Roglia (EC-JRC)**

### **Citizens Observatories - The CITI-SENSE project**

**Arne Berre (SINTEF)**

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CITI-SENSE will develop Citizens Observatories to empower citizens to contribute to and participate in environmental governance, to enable them to support and influence community and societal priorities and associated decision making. CITI-SENSE will develop, test, demonstrate and validate a community-based environmental monitoring and information system using innovative and novel Earth Observation applications. To achieve this, the project will: (i) raise environmental awareness in citizens, (ii) raise user participation in societal environmental decisions and (iii) provide feedback on the impact that citizens had in decisions. It will address the call for request for effective participation by citizens in environmental stewardship, based on broad stakeholder and user involvement in support of both community and policy priorities. The project aims to learn from citizen experience and perception and enable citizenship co-participation in community decision making and co-operative planning.

### **COBWEB, Citizen ObservatOry WEB**

**Gregory O'Hare (EDINA)**

COBWEB: Citizen ObservatOry WEB is a project which is creating a platform to enable citizens within UNESCO Biosphere Reserves to collect environmental data using mobile devices. The project is working with researchers, policy makers, enterprise and local citizens and communities, to make sure tools and approaches developed will suit their needs and goals, and benefits their communities. COBWEB is working with the UNESCO World Network of Biospheres: Dyfi (Wales); Samaria, Mount Olympus (Greece); and Wadden Sea and Islands of Schleswig-Holstein (Germany).  
<http://cobwebproject.eu/>

### **Citizen ObservatOry and GEOSS: WeSenseIt conceptual integration**

**Leonardo Alfonso (UNESCO-IHE)**

WeSenseIt (FP7, 2012-2016) promotes Citizen Observatories of Water by means of new sensing technologies to complement existing EO data. WeSenseIt enables citizens to become active stakeholders in information capturing, evaluation and communication for the water environment including flood risk. WeSenseIt employs innovative sensor devices; citizens' collective intelligence via social media; direct upload of data to the observatory by citizens and communities; predictive models and decision support tools. Two-way feedback and exchange of environmental knowledge/experience between citizens and authorities enhances decision-making, planning and governance.



WSI features and current conceptual integration with GEOSS are presented.  
<http://www.wesenseit.eu>

### **Ecological status and its measurement in surface marine waters**

**Luigi Ceccaroni (Citclops)**

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Measuring simple indicators, such as transparency and color, contributes to determine the ecological status of surface marine waters. These indicators are related to chlorophyll, algal biomass.

The Citclops action (2012-2015) develops an observatory based on citizens' science applications for the bio-optical monitoring of coast and ocean.

Specifically, the Citclops action develops systems to retrieve and use data on the colour, transparency and fluorescence of seawater using low-cost sensors and smart phones along with contextual information.

<http://citclops.eu>

### **Sensor Platforms For Citizens Observatories**

**Leonardo Santiago (ATEKNEA)**

The aim of the CITI-SENSE project is to develop Citizen's observatories. CITI-SENSE creates a distributed data collection network using innovative static, portable and personal devices, which will be presented in this talk.



## **Splinter Session: How GEOSS-related projects are responding to European challenges in different Societal Benefit Areas (I)**

**Chair: Michael Berger (EC-RTD), Rapporteur: Gerassimos Papadopoulos (NOA)**

### **EuroGeoSurveys - Progress towards a geological information system for Europe** *Nikolaos Arvanitidis (EuroGeoSurveys)*

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The European Geological Data Infrastructure (EGDI) has been designed by EuroGeoSurveys together with other key stakeholders via a feasibility study (EGDI-Scope) concluded in May 2014. The EGDI will build on results achieved by the OneGeology-Europe project in particular the harmonization of geological terms and maps and will constitute the long-term sustainable platform for geological data and information generated by important European geoscientific projects and databases. A major contributor to the EGDI is the recently launched Minerals Intelligence Network for Europe (Minerals4EU), which will produce the most comprehensive European Minerals Yearbook developed with the contribution of all Geological Surveys. The project will also set up an operational INSPIRE compliant EU Minerals Knowledge Data Platform that will allow all stakeholders to search, view and acquire standardised geo-resources and related data and foresight studies on non-energy raw materials.

### **EU BON: challenges and opportunities for integrating biodiversity information for GEOSS**

*Christoph Hauser (Natural Museum of Berlin)*

Biodiversity data exist in many different types and diverse formats, ranging from field observations of individual organisms, genome sequence data, to fine-scaled habitat classifications based on large remote sensing datasets. The European Biodiversity Observation Network, EU BON ([www.eubon.eu](http://www.eubon.eu)) presents an innovative approach towards the integration of multiple biodiversity datasets, covering terrestrial as well as freshwater and marine environments.

The main aim of EU BON is to provide a European contribution to the information infrastructure of the Group on Earth Observations Biodiversity Observation Network (GEO BON), as part of GEOSS. It will rely on existing biodiversity and observation systems, in particular GBIF, the emerging LifeWatch infrastructure, and national biodiversity data centers in Europe, as well as other environmental datasets.

A key goal of EU BON will be the delivery of relevant, fully integrated data customized for the needs of different stakeholders and end users ranging, from research to politics, and from local to global levels, thereby attracting additional and different user communities to GEOSS. Through development and application of new standards and protocols, EU BON will enable greater interoperability of different data layers and systems, also to support biodiversity science-policy interfaces, and facilitate political decisions for sound environmental management, ranging from communal park management to IPBES. Combining data types from different sources



such as from citizen science efforts to long-term monitoring programs offer also new opportunities to customized information presentation and analysis.

The project is implemented via a consortium of 30 partners from 18 countries, coordinated by the Museum für Naturkunde, Berlin, and is supported by the European Commission under the 7th Framework Program (contract no. 308454). For more details, see also: Hoffmann et al. 2014. Improved access to integrated biodiversity data for science, practice, and policy - the European Biodiversity Observation Network (EU BON). *Nature Conservation* 6: 49–65.

### **Real-time and online monitoring of Urban Heat Islands**

***Chris T. Kiranoudis (National Technical University of Athens)***

Real time monitoring of the diurnal variations in the distribution of the land surface temperatures (LST) across a city is significant to a range of issues most importantly heat wave risk, energy demand and health. Geostationary satellites, such as Meteosat Second Generation- Spinning Enhanced Visible and Infrared Imager (MSG-SEVIRI) viewing Europe and Africa, are the only remote sensing platforms that can offer continuous monitoring of LST distribution at quarter-hourly basis which is unparalleled for the diurnal study of the Urban Heat Island (UHI) phenomenon. However, their coarse spatial resolution of 3-5km has prohibited their extensive use for urban studies. The only way to exploit the dataset from this significant monitoring platform for urban applications is to employ computational methods for downscaling the imagery down to 1km or better.

### **Developing a tool for monitoring coastal and marine ecosystems in North African countries: The Medina e-Infrastructure**

***Emilia Guisado Pintado (UPO)***

The Medina FP7 project (Marine Ecosystem Dynamics and Indicators for North Africa) seeks to enhance the capacities of Mediterranean Northern African Countries (Morocco, Algeria, Tunisia, Libya and Egypt) in monitoring their coastal and marine ecosystems, supporting the management capacities for those regions and identifying as well major risks through the use of a wide range of indicators, tools and models. Medina is oriented towards a full integration of coastal and marine monitoring into GEOSS, taking full advantage of the tools available upon the Group of Earth Observation (GEO) and contributing to GEO activities and Communities of Practice. For that purpose an e-infrastructure fully compatible to GEOSS and the GCI has been developed in order to compile, access and visualise results. The Medina e-infrastructure (Mel) is a full Spatial Data Infrastructure understood and constructed as a compound of interoperable web services (compliant with OGC standards) and a set of analysis tools. The EU FP7 project MEDINA has developed a set of indicators and models for the assessment of coastal marine ecosystems along the Mediterranean coastline of North Africa, as well as guidelines for monitoring optimization. The project can then provide a valuable contribution to the implementation of the UNEP-MAP Ecological Approach in the Region, as well as to the implementation of the EU





Marine Strategy Framework Directive in the Mediterranean. Indicators of Pressure and Ecosystem status have been estimated making best possible use of remotely sensed Earth Observations. The most significant results are available through the Medina-e-Infrastructure, which is fully compatible and accessible through GEOSS. The MeI enables end-users to visualize the spatial distribution of the selected indicators and retrieve their values, by means of an interoperable viewer, which also allows one to look into the dynamics of important variables, such as Sea Surface Temperature and Chlorophyll a.

**Supporting marine ecosystem monitoring and assessment in North Africa: the MEDINA e- Infrastructure**

**Roberto Pastres (UNIVE)**

The EU FP7 project MEDINA has developed a set of indicators and models for the assessment of coastal marine ecosystems along the Mediterranean coastline of North Africa, as well as guidelines for monitoring optimization. The project can then provide a valuable contribution to the implementation of the UNEP-MAP Ecological Approach in the Region, as well as to the implementation of the EU Marine Strategy Framework Directive in the Mediterranean. Indicators of Pressure and Ecosystem status have been estimated making best possible use of remotely sensed Earth Observations. The most significant results are available through the Medina-e-Infrastructure, which is fully compatible and accessible through GEOSS. The MeI enables end-users to visualize the spatial distribution of the selected indicators and retrieve their values, by means of an interoperable viewer, which also allows one to look into the dynamics of important variables, such as Sea Surface Temperature and Chlorophyll a. The mapping of the main pressures allows one, on the hand, to prioritize and optimize monitoring strategies. In the presentation, we will show the main results concerning the assessment at the regional scale as well as at the local scale for five pilot cases, namely the Bay of Bejaia in Algeria, the Gulf of Syrte in Lybia, the Lake Burullus in Egypt and the Gulf of Gabes in Tunisia. MEDINA results will therefore provide a relevant contribution to the GEO Task Blue Planete as well as the Coastal Zone Communities of Practice.



## **Splinter Session: How Copernicus and its Downstream Projects can contribute to the GEOSS**

**Chair: Silvo Žlebir (EC-ENTR), Rapporteur: Vassilis Amoiridis (NOA)**

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### **Integrated Carbon Observing System - greenhouse gas observations for GEO and Copernicus**

**Jean Daniel Paris (CEA-CNRS-UVSQ)**

ICOS is a European research infrastructure designed to monitor in situ greenhouse gas fluxes to and from the atmosphere. Its long-term observations are essential for understanding the present state, and predicting the future behaviour, of the global carbon cycle and greenhouse gases emissions. In support of the ongoing design and construction of ICOS, the ICOS-INWIRE (Improved sensors, Network and Interoperability for Copernicus) FP7 project started in 2013. The fundamental objective of ICOS-INWIRE is to enhance the capabilities of ICOS and fill in critical gaps for monitoring fluxes and concentrations of greenhouse gases, in order to meet the data needs of operational users, especially in the Copernicus program, and in particular MACC-II. It will achieve this by: developing and testing autonomous sensors systems for greenhouse gas fluxes and concentration, enhancing the data processing operational capabilities of the ICOS concentration and flux measurement network and developing inter-operability between IC.

### **CORE-CLIMAX - Coordinating earth observation data validation for re-analysis for climate services**

**Bert Boer (University of Twente)**

The project aims to provide coordination for producing and validating essential climate variables (ECVs) with the objective of reanalysing existing data to develop a clearer picture of global climate change and its implications. The project is coordinated by the University of Twente. Together with the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) coordination is established with European Space Agency's Climate Change Initiative through several key national ECV producers and climate change service providers – along with the major reanalysis centre in Europe (ECMWF), and satellite data processing and validation centres. In addition, the two ICPC participants are tasked with maintaining all of the activities at the major climate observations stations situated on the Tibetan Plateau (also known as the Third Pole). As such these participants provide an essential role in coordinating the validation of ECVs and reanalysis results. In January 2104, the "CORE-CLIMAX Essential Climate Variable (ECV) Capacity Assessment Workshop" took place at EUMETSAT HQ. About 40 participants representing all relevant European climate data record producers including EUMETSAT SAF network, ESA CCI projects, EC projects and EUMETSAT member state weather services as well as stakeholders (EC, CGMS, CEOS, WMO). The main aim of the workshop was to assess



European capacity for sustainable generation of ECV data records in preparation of the Copernicus climate change service covering data records for Land, Ocean, and Atmosphere constructed from satellite and in situ data as well as reanalysis. There were 30 data sets (23 are based on satellite measurements, 6 are based on in situ measurements, and one is reanalysis based) with System Maturity Matrix (SMM, one of the tools data set assessment tools developed by the project consortium) results for analyses during the workshop. The workshop endorsed the tools developed by the consortium and made recommendations for further steps to be taken.

**PREFER FP7 project for the management of the pre- and post-fire phases: presentation of the products**

***Georgios Eftychidis (CENTER FOR SECURITY STUDIES - KEMEA)***

The PREFER FP7 project aims at responding to major fire prevention needs in Southern Europe. The Mediterranean area is systematically affected by uncontrolled forest fires with large impact on ecosystems, soil erosion, slope instability, desertification trends, and local economies as a whole, with a negative mid-to-long term prospect because of Climate Change. In this scenario, the need to improve the information and the intelligence support to forest fire prevention is widely recognized to be relevant. Fire prevention is still the most cost-effective strategy when compared to firefighting and extinguishing that are costly, local, and triggered only in response to already ongoing crises.

**Copernicus and GNSS: fostering innovativeness and competitiveness in the mobile service industries**

***Lena Klemm (Anwendungszentrum GmbH Oberpfaffenhofen)***

Since 2011, the Copernicus Masters competition has showcased the most innovative solutions for business and society based on Earth observation data. Its purpose is to drive the development of market-oriented applications for utilising data generated through Europe's Copernicus programme. The year 2013 was the competition's most successful to date, having garnered 144 submissions from 23 European countries – an increase of 35% from the previous year. The winners from the past three years are currently turning their business ideas into reality with the help of their challenge partners. Some even have already transformed their projects into market-ready products. Copernicus Masters is organised and carried out by Anwendungszentrum GmbH Oberpfaffenhofen.

**Operational Production and Dissemination of Biophysical Variables from 300m PROBA-V Data**

***Roselyne Lacaze (HYGEOS)***

The Copernicus Global Land service provides continuously to European, African and international users a set of biogeophysical variables describing, over the whole globe, the vegetation dynamic, the energy budget at the continental surface and some





components of the water cycle. These generic products serve numerous applications such as agriculture and food security monitoring, weather forecast, climate change impact studies, water, forest and natural resources management. They are generated on a reliable and automatic basis from both near real time and historical Earth Observation satellite data to get consistent time series as long as possible. All products are accessible, free of charge after registration through FTP/HTTP (<http://land.copernicus.eu/global/>) and through the GEONETCast satellite distribution system. For the service continuity, research and development are performed on two parallel ways. On one hand, the existing retrieval methodologies are adapted to PROBA-V 1km resolution data.



**Thursday 12th June - Afternoon Sessions**

**Splinter Session: How GEOSS-related projects are responding to European challenges in different Societal Benefit Areas (II)**

**Chair: Albert Fischer (IOC-UNESCO), Rapporteur: George Petihakis (HCMR)**

**Global Earth Observation for integrated Water resources assessment**

**Maggie Kossida (SEVEN Engineering Consultants G.P.)**

The availability and quality of water resources are still not fully accounted for in different regions of the world, while many countries lack basic information such as observations of the required hydro-meteorological variables. The accurate mapping and estimation of global water resources requires the use of many sources of earth observations (such as satellite and ground-based remote sensing, in situ measurements, vertical profiles, etc.), combined with state-of-art earth system modelling components that are developed for hydro-meteorological and environmental applications. The earthH2Observe project aims to methodologically address these issues by integrating available earth observations from different missions, in-situ datasets from various sources, and state-of-art models to construct a consistent Global Water Resources Reanalysis (WRR) dataset of sufficient length (at least 30 years). This WRR will boost the availability of information worldwide, and will support a range of applications, at various scales and settings (i.e. local, regional, pan-European, global; from data-rich to data-poor areas), enhancing the capabilities of the research, policy and business communities to evaluate water resources across catchments, identify water stress, detect hotspots, deepen the knowledge in trans-boundary areas, determine water related risks, and plan targeted actions. The operational value of the outputs will be demonstrated and validated in a number of case-studies across the world, covering multiple continents, with a variety of hydrological, climatological and governance conditions: Spain, Morocco, Estonia, Ethiopia, Colombia, Australia, New Zealand and Bangladesh. The current presentation provides an overview of the earthH2Observe objectives, activities, and expected impacts, with the overall purpose to inform the GEOSS community, seek feedback, and stimulate the engagement and interest of more stakeholders in the earthH2Observe activities.

**GloboLakes A global observatory of lake responses to environmental change: relevance to GEO WATER Work Plan**

**Michael Grant (Plymouth Marine Laboratory)**

The world's freshwater ecosystems are vital components of the global biosphere, providing key ecosystem services in a variety of societal benefit areas, and are vulnerable to climate and other human-induced change. There are estimated to be over 300 million lakes globally, of which over 17,000 are greater than 10 km<sup>2</sup> in



surface area. However, our understanding of how lakes respond to environmental change at a global scale is hampered by limited information on their chemical, physical and ecological condition. GloboLakes is a five-year UK research programme investigating the state of lakes and their response to climatic and other environmental drivers of change. It will establish a satellite-based observatory with archive and near-real time data processing to produce a time series of observed biogeochemical parameters and lake temperature for over 1000 lakes globally. These data will be freely available through a web-portal and other mechanisms.

**Next generation, Cost-effective, Compact, Multifunctional Web Enabled Ocean Sensor Systems Empowering Marine, Maritime and Fisheries Management**  
*Jay Pearlman (IEEE)*

Collection of in-situ observation of a volume that covers over 70% of the planet is difficult and costly in time and resources, with yet rather unsatisfactory results, in particular, with respect to space-time resolution. To this end, a number of challenges need to be overcome - as recognized in the Blue Planet GEO Ocean SBA description. Development of a new generation of multifunctional sensor systems is underway in the NeXOS Project to address some of these ocean monitoring challenges. NeXOS is focused on optical and passive acoustic sensors with applications ranging from more precise monitoring of the marine environment to an improved management of fisheries. From a technical perspective, NeXOS is addressing improved life cycle cost-efficiency via the implementation of innovations, such as multi-functionality, multiplatform integration, greater reliability through better antifouling management and greater sensor and data interoperability. Requirements for the sensors have been refined from this perspective through surveys and discussions with science and industry users.

**Using open data in water quality management applications. The cases of wPRISMA and wPOLIS in SWITCH-ON**  
*Apostolos Tzimas (EMVIS)*

wPOLIS and wPRISMA are two new products that will be developed in the framework of SWITCH-ON, a collaborative project under FP7 ENV.2013.6.5-3 (Exploiting the European Open Data Strategy to mobilise the use of environmental data and information). The overall goal of wPRISMA and wPOLIS is to make use of open data and water related information in order to produce added value information related to water quality of surface water bodies. wPOLIS and wPRISMA will be developed as web applications and are both based on a simple water quality model. The model makes use of several open datasets, like European Pollutant Release and Transfer Register, Corine Land Cover, Digital Elevation Models in order to estimate the amount of pollutant loads and their fate in surface water bodies. Hydrological data are obtained from E-HYPE, an open hydrological model that enables the calculation of river discharges in each catchment, while procedures developed by FOCUS are used in order to estimate the quantity of plant protection.



## **SeaDataNet II - EMODNet - building a pan-European infrastructure for marine and ocean data management.**

**Dick M. A. Schaap (MARIS)**

SeaDataNet II is well underway since October 2011. Main objective is to improve operations and to progress towards an efficient data management infrastructure able to handle the diversity and large volume of data collected via research cruises and monitoring activities in European marine waters and global oceans. The SeaDataNet infrastructure comprises a network of interconnected data centres and a central SeaDataNet portal. The portal provides users a unified and transparent overview of the metadata and controlled access to the large collections of data sets, managed by the interconnected data centres. Recently the 1st Innovation Cycle has been completed, including upgrading of the CDI Data Discovery and Access service to make it fully INSPIRE compliant. The population of directories has increased considerably in cooperation and involvement in associated EU projects and initiatives. SeaDataNet now gives overview and access to more than 1.55 million data sets for physical oceanography, chemistry, geology, geophysics, bathymetry and biology from more than 90 connected data centres and more than 500 institutes from 34 countries riparian to European seas. SeaDataNet is also leading in the development of the EMODnet (European Marine Observation and Data network). Portals have been initiated for marine data themes. These are being expanded to all European sea regions. The EMODnet Bathymetry project is very illustrative. The project develops and publishes Digital Terrain Models (DTM) for the European seas. The portal provides a versatile DTM viewing service with many relevant map layers and functions for retrieving. The presentation will also highlight the Ocean Data Interoperability Platform (ODIP) project in which Europe works together with leading marine data infrastructures in USA and Australia to establish common standards and interoperability solutions. This includes strengthening the interoperability and contributions towards global portals such as GEOSS and IODE Ocean Data Portal.

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## **EO-assisted agricultural water management**

**Anna Osann (UCLM)**

SIRIUS project "Sustainable Irrigation Water Management and River-basin Governance: Implementing User-Driven Services" is developing satellite assisted services for efficient water resources management in support of food production in water-scarce environments. It addresses water governance and management in line with the vision of bridging and integrating sustainable development and economic competitiveness.

A set of pilot Case Studies represents a sample of the wide range of conditions found in the world, covering Spain, Italy, Romania, Turkey, Egypt, Mexico, Brazil, and India.



## **Splinter Session: GEOSS for Disasters (I)**

**Chair: Athanassios Ganas (NOA), Rapporteur: Evangelos Kosmidis (DRAXIS)**

### **The European Supersites coordination: joining efforts for a federated data infrastructure**

***Carmela Freda (EPOS Management Office)***

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The integration of satellite and in-situ Earth observations envisioned in the GEO Geohazards Supersites and National Laboratories (GSNL) initiative is aimed at providing access to spaceborne and in-situ geoscience data for selected sites prone to earthquake, volcano or other environmental hazards. The development of the GSNL and the integration of in-situ and space Earth observations require the implementation of in-situ e-infrastructures and services to scientific users and stakeholders. These e-science implementation plans must be coherent and coordinated in order to guarantee interoperability among the different supersites. The establishment of a network of supersites in Europe will facilitate the link with the Global Earth Observation System of Systems (GEOSS). Here we present the EPOS federated approach to integrating Research Infrastructures for solid Earth science in Europe and we discuss the synergies with the three European supersites projects: FUTUREVOLC, Marsite and MEDSUV.

### **The BEYOND project: Building a Center of Excellence for EO based Monitoring of Natural Disasters**

***Haris Kontoes (NOA)***

Established in the framework of the FP7- REGPOT-2012-2013-1 Coordination and Support Actions, the BEYOND project aims at conducting cutting edge interdisciplinary research, by Building a Centre of Excellence for Earth Observation based monitoring of Natural Disasters in South-Eastern Europe. BEYOND foresees to increase its access range to the wider Mediterranean region through the integrated cooperation with twining organizations in Europe and USA. BEYOND Center of Excellence is hosted at the National Observatory of Athens. The operations of BEYOND officially started in June 2013, and will last for the next three years.

### **New Directions in Seismic Hazard Assessment through Focused Earth Observation in the MARmara SuperSITE (MARSITE)**

***Semih Ergintav (Boğaziçi University)***

The devastating 1999 İzmit/Düzce, Turkey earthquake sequence ( $M_w=7.4, 7.2$ ) was the most recent in a 20th Century series of predominantly westward migrating,  $M>7$  seismic events that cumulatively ruptured approximately 1000 km of the North Anatolian Fault. The only major remaining "seismic gap" along the fault is the ~150 km long segment under the Sea of Marmara that approaches to within 15 km of the center of Istanbul, one of the most populous and rapidly expanding cities in the world. The probability of a large earthquake within the Sea of Marmara has been





estimated to be about 35-70% over the next 30 years. Under this real and irrepressible perspective, to mitigate and improve the preparedness of geological disasters in the Marmara, MARSite Project was initiated in November 2012, under the EC/FP-7 framework as an initiative towards establishment of new directions in seismic hazard assessment through focused earth observation in Marmara Region. The objectives of the project are to achieve long-term hazard monitoring and evaluation by in-situ monitoring of earthquakes, tsunamis, landslides, displacements, chemical-radioactive emission and other physical variables and by the use of space-based techniques; to improve existing earthquake early-warning and rapid-response systems; to improve ground shaking and displacement modelling by development of source models; to establish novel borehole observation system in western Marmara; to interact with end users and contribute to the improvement of existing policies and programs on preparedness, risk mitigation and emergency management; and to build on past and on-going European projects by including their contributions to create a better understanding of geo-hazards.

### **Earthquakes and tsunamis: implications for hazard assessment in the Mediterranean Sea and the North East Atlantic**

***Gerassimos Papadopoulos (NOA)***

The tragic experiences from the big earthquakes and tsunamis generated in the zones of lithospheric subductions of Sumatra (2004), Chile (2010 and 2014), and Japan (2011), raised the question if similar big events may happen in other subduction zones around the globe. This hot topic is already under examination by organized research groups but also by independent researchers. Of particular interest is the region of North Atlantic and Mediterranean (NEAM) where the Tsunami Warning System (TWS) coordinated by IOC/UNESCO became operational since the summer of 2012. In fact, reliable historical documentation leaves little doubt that very large earthquakes of magnitude 8+ generated in the Hellenic Arc (Greece) along with their associated tsunamis caused extensive destruction in the eastern Mediterranean basin in AD 365 and again in AD 1303. It seems that a similar event occurred in Lisbon, Portugal, in AD 1755, and possibly in Calabria, south Italy in 1783.

### **Monitoring geophysical activity from Space, in the framework of BEYOND Center of Excellence**

***Ioannis Papoutsis (NOA)***

Within the National Observatory of Athens (NOA) it has been recently established a Centre of Excellence for Earth Observation based monitoring of Natural Disasters in south-eastern Europe, named BEYOND - <http://beyond-eocenter.eu/>. It aims primarily at setting up innovative integrated observational solutions to operate space-borne and ground-based monitoring networks in a complementary, unified and coordinated manner. The research portfolio covers a broad spectrum of phenomena, addressed under the various research domains of BEYOND: geohazards, meteorological and human induced hazards, and atmospheric pollution and air



quality. Concerning geo-hazard mapping, BEYOND primarily builds upon state-of-the-art optical remote sensing technologies and differential interferometry techniques. The resulting products are integrated with in-situ observations from the National Seismological Network, the NOANET GPS network, and the ENIGMA magnetometer network established at NOA, to monitor the geodetic activity in Greece and beyond, interpret geophysical phenomena, assess and map damages after catastrophic events. Characteristic examples of services offered in the framework of BEYOND will be highlighted, starting from the study on the intense geophysical activity that took place at Santorini volcano in early 2011, observed with radar interferometry. In the same direction, a complimentary modeling application for the simulation of volcanic ash dispersion has been customized for Santorini, designed to provide an early warning system. This information is of particular interest for aviation safety. Persistent scatterer techniques are also employed to monitor diachronic surface displacement in wider Athena area, to showcase the significance of the accurate, seamless and consistent monitoring of subsidence in an urban environment. Finally, crustal deformation estimated with high resolution TerraSAR-X and COSMO-SkyMed imagery and associated with the mainly right-lateral 3.2.2014 Cephalonia earthquake ( $M_w 5.9$ ) will be also discussed. More importantly, the potential for fast and accurate post-earthquake damage assessment using a UAV at Lixouri is discussed.

**From PRE-EARTHQUAKES to a global EarthQuake Observing System (EQuOS) -  
Valerio Tramutoli (University of Basilicata)**

In this paper strategy and results of the EC-FP7 PRE-EARTHQUAKES project will be described as well as its possible contribution to a GEO initiative for a global EarthQuakes Observing System (EQuOS).



## **Splinter Session: Infrastructures and Data Management (I) - GCI Session**

**Chair: Jose-Miguel Rubio-Iglesias (EC-RTD), Rapporteur: Arne Berre (SINTEF)**

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### **The new GEOSS Portal: Live Demo**

**Guido Colangeli (ESA-ESRIN)**

The current status of the GEOSS Portal will be presented. A live demo of the Portal would be performed.

### **The GCI and the GEO DAB role**

**Stefano Nativi (CNR-IIA)**

The presentation deals with the GEOSS Common Infrastructure architecture, a vision of the next components configuration and roles to address Big Data challenges and the next GEOSS phase.

### **The GEOSS Data CORE and GEOSS Common Infrastructure (GCI): awareness, involvement and challenges**

**Elena Roglia (EC-JRC)**

The GEOSS interoperability for Weather, Ocean and Water GEOWOW project supports the development of GEOSS by developing services for data discovery, access and use establishing and promoting data sharing and usage procedures consistent with the implementation guidelines for the GEOSS Data Sharing Principles. We present the results of two survey circulated among the GEO Community to identify the stakeholders perception of using the GEOSS Common infrastructure that allows accessing, searching and using the data, information, tools and services available through GEOSS, and the GEOSS Data CORE. Moreover we attempt to assess the added value of using and contributing to the GEOSS Data Core. Survey participants have been invited to answer about the actual discoverability and accessibility of resources providing information about perceived benefits, limitations and barriers. Participants opinions on how to improve its visibility, quality and quantity of resources have also been collected.

### **GEOWOW Improving EO data exploitation for GEOSS**

**Roberto Cossu (ESA-ESRIN)**

GEOWOW is a FP7 co-funded project coordinated by ESA aiming at improving discoverability, accessibility and exploitability of Earth Observation data, in particular for end-users related to the societal benefit areas Weather, Ocean Ecosystems and Water. Based on end-user requirements on the one hand and emerging technologies



on the other hand, GEOWOW has implemented a whole series of technical solutions, referred to as the GEOWOW offer on our GEOWOW web-site (<http://www.geowow.int>), which includes the GEO Data Access Broker and Sandboxes that are based on cloud-technology. The presentation will elaborate on how these solutions have been integrated and provide added value for selected SBAs.

### **Sharing experiences with big data web services infrastructure to support the Data-CORE**

**Mike Grant (Plymouth Marine Laboratory)**

The GEOSS Data-CORE implements the GEO data sharing principles in a community-driven infrastructure to provide free and open access to globally-distributed Earth Observation (EO) data resources. Contributing organisations provide resources by registering servers in a centralised catalogue. As the quantity of EO data has grown, driven by new sensors and greater computing capability, it is increasingly complex to maintain a high quality service and contributing organisations would benefit from sharing their experiences. Plymouth Marine Laboratory recently established a multi-machine cluster to support high-availability, high-performance web services (WMS, WCS, OPeNDAP, WCPS and WPS). A large range of datasets are supported, e.g. a 25TB+ Earth Observation dataset, multiple model runs, an ocean-colour in-situ dataset, etc. The use cases primarily revolve around supporting interactive portals and interactive/batch analysis in a big data environment. Two FP7 projects, both significant contributors to the GEOSS Data Core, provide this context: Earthserver [1] provides open access data services and ad-hoc analytics for extremely large datasets, using the rasdaman array database. PML operates the Ocean Data Service (one of 6 "Lighthouse" applications) providing EO data and querying capabilities, plus supporting other deployments. Earth2Observe [2] is assessing global water resources via new datasets and techniques. The Data-CORE contributions include a consistent ~30 year global water resource reanalysis dataset, plus regional downscaled outputs and supporting water resource model outputs, EO and insitu datasets. The outputs will be further shared via an open-source Water Cycle Integrator portal, itself contributing to GEO objectives, that will allow collaborative and interactive exploration and analysis. The presentation shares experiences in establishing, populating and evaluating/tuning the infrastructure cluster, and aims to inform related projects of the best contemporary options for and pitfalls in implementing high quality Data-CORE services.

### **The GEOSS Common Infrastructure as a step towards global data integration - Experience from the EC funded project COOPEUS**

**Christoph Waldmann (University of Bremen/MARUM)**

The EC funded project COOPEUS brings together five research infrastructures that operate in the environmental field from the US and the EU. The main goal is to harmonize data policies and to define a minimum set of data standards to achieve interoperability within the involved disciplines across the Atlantic and to facilitate the



same processes across disciplines. After the first half of the lifetime COOPEUS has made some good progress in regard to identifying gaps and barriers for data sharing and currently it is planned to use GEOSS as a tool to integrate the different architectures. For that purpose the GEOSS Component and Service Registry (CSR) has been established that will facilitate the process of discovery and access to available environmental data. It has been decided that COOPEUS will support the GCI by exploring the capabilities of the CSR and probably also get involved in the extension of the functionality.



## **Splinter Session: Capacity Building within GEOSS**

**Chair: Lieven Bydekerke (VITO), Rapporteur: Boris Antić (University of Novi Sad)**

### **IASON - Fostering sustainability and uptake of research results through Networking activities in Black Sea & Mediterranean areas**

***Petros Patias (AUTH)***

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IASON Project has the ultimate goal to establish a permanent and sustainable Network of scientific and non-scientific institutions, stakeholders and private sector enterprises belonging in the EU and third countries located in two significant areas: The Mediterranean and the Black Sea regions. The main focal points of the project will be the usage and application of Earth Observation (EO) in the following topics: climate change, resource efficiency, raw materials management IASON aims to build on the experiences gained by 5 FP7 funded projects, OBSERVE, enviroGRIDS, GEONETCab, EGIDA, and BalkanGEONet. All of the above projects focused on enhancing EO capacities, knowledge and technology in the EU and in neighborhood countries. During their execution time they managed to establish links with a critical mass of research institutions, organizations, public organizations, stakeholders, and policy makers in the Balkan region, the Mediterranean, and the Black Sea Basin.

### **AGRICAB Project**

***Tim Jacobs (VITO)***

Science plays a key role in understanding the dynamics of agricultural and forest resources. Remote sensing provides recurrent information on natural resources in various timescales and periods.

A key challenge is to enhance scientific and remote sensing capacity in Africa to enable African institutes to independently monitor and generate information on agricultural and forest resources to adequately support management and policy actions.

AGRICAB (Developing increased EO Capacity for better agriculture and forestry management in Africa) aims to develop a framework for enhancing Earth observation capacity to support agriculture and forestry management in Africa. The project aims at improving and sustaining capacity for data access, agrometeorological modeling, early warning, agricultural statistics, livestock monitoring and forest mapping. These components are developed through specific case studies in Senegal, Kenya, Tunisia, Mozambique, South Africa and Niger, leading to dedicated training actions capitalizing on the findings.

### **INTERACT - building capacity for research, monitoring and data access in arctic and northern alpine areas**

***Zhanna Tairova (Aarhus University)***

INTERACT is an infrastructure project funded by the EU, representing a circumarctic network of 59 terrestrial field stations in all arctic countries and northern alpine areas.





The main objective of the project is to build capacity for identifying, understanding, predicting and responding to diverse environmental changes throughout the wide environmental and land-use envelopes of the Arctic. INTERACT offers Transnational Access to more than 20 research stations throughout the arctic and northern alpine areas. Another component of INTERACT, Station Managers' Forum, provides a platform for exchange of information within the network and between managers and stakeholders, including external partners, local communities and the general public. This platform facilitates knowledge exchange, and collects and disseminates information from participating research infrastructures related to ecosystem monitoring, data management and practical station management and administration. The Station Managers' Forum has produced a catalogue of field stations in the network and a report on good practices of station management at arctic and northern alpine research stations. Additionally, a report on research and monitoring, describing best practices for measuring different ecological parameters will be produced by the end of 2014. The above mentioned activities improve the coordination and implementation of scientific agendas and activities, enabling circumarctic site-based assessments that are relevant for improved scientific understanding and informed decision making. INTERACT is one of the European Projects in GEO, and co-lead two Task Components; WA 01-C3 Information Service for Cold Regions and EC-01-C2 Operational Monitoring of Key Ecosystems and Related Services. INTERACT aims to promote GEOSS and the end users of earth observation data by providing data to GEOSS Data-CORE and GEOSS Component and Service Registry, and by bringing together remote sensing and in-situ sensing communities for better integration of data and knowledge.

### **Marketing and impact assessment of earth observation solutions - the EOPOWER project**

**Mark Noort (HCP International)**

Earth observation has long been characterized by a technology push. This has led to a situation where earth observation solutions are successfully applied in some areas, but are underused in others. Most people are interested in what works for them and not in the technology behind the solution. Still, they want to know enough about a project or service to be able to evaluate what they are buying. Think of the example of your laptop or your car. Probably you are not completely aware of what happens inside, but you know enough about the product to make a balanced purchasing decision. With earth observation solutions this is usually not the case: people have no clue what they can expect, how reliable or expensive it is, and are therefore hesitant to adopt the new technology, even though it may be better than what they have now. The presentation focuses on better marketing options for earth observation applications and how the impact of the earth observation solutions.



## **Activities of the Black Sea GOOS and recent efforts for increasing its efficiency and sustainability**

**George Petihakis (HCMR)**

The aim of this project is to improve the Black Sea - Global Ocean Observation System (BSGOOS) and to sustain it within a capable regional organization to enhance cooperation among scientists both between the Black Sea countries as well as with EU partners and globally. An operational oceanographic service will both benefit the marine industry in the Black Sea region and contribute to and improve the efficiency of marine operations, reduce the risk of accidents, optimize monitoring of the marine environment, improve the assessment of fish stocks and aid marine management. In the Black Sea, this could be realized through close cooperation amongst national governmental agencies, mainly oceanographic and hydro-meteorological institutions and other relevant institutions including end-users. This was the original idea for the establishment of the BSGOOS with an MoU signature in the IOC Session in Paris on July 6, 2001 by all six Black Sea countries. BSGOOS is a regional component of the Global Ocean Observations.

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## **Learning how to leverage resources for capacity building, S&T and innovation on a global scale.**

**Bente Lilja Bye (BLB)**

This presentation is about how responding to the grand challenges requires global cooperation and coordination on multiple levels, including resource mobilisation. Within resource mobilisation it is also possible and necessary to leverage resources between the three 'capacity building', 'S&T' and 'innovation'. Using the GEO work plan (ID-05) as the cooperative framework, a multidisciplinary team of experts is developing a project that will result in new knowledge about global funding, what kind of barriers, good practices etc that in turn will facilitate more efficient use of the limited resources available for responding to the grand challenges.





## **Splinter Session: GEOSS for Disasters (II)**

**Chair: Prof. Kanaris Tsinganos (NOA), Rapporteur: Haris Kontoes (NOA)**

### **The Mediterranean Supersite Volcanoes (MED-SUV) Project: an overview** **Giuseppe Puglisi (INGV)**

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The overall goal of the MEDiterranean SUPersite Volcanoes (MED-SUV) EC-FP7 Project is to apply the rationale of the Supersites GEO initiative to Mt. Etna and Campi Flegrei/Vesuvius. The Project activities will focus on the optimisation and integration of ground and space monitoring systems, the breakthrough in understanding of volcanic processes, and on the increase of the effectiveness of the coordination between the scientific and end-user communities in the hazard management. For the purpose MED-SUV will integrate long-term observations of ground-based multidisciplinary data available for these volcanoes, i.e. geophysical, geochemical, and volcanological datasets, with Earth Observation (EO) data. Merging of different parameters over a long period will provide better understanding of the volcanic processes. MED-SUV proposes the implementation of a state-of-the-art e-infrastructure for the data integration and sharing and for volcanic risk management life-cycle. Experiments and studies will be devoted to better understanding of the internal structures and related dynamics of the case study volcanoes, as well as to recognition of signals associated with impending unrest or eruptive phases. Hazard quantitative assessment will benefit by the outcomes of these studies and by their integration into the cutting edge monitoring approaches, thus leading to a step-change in hazard awareness and preparedness.

### **PanGeo: Enabling access to Geohazard information in Europe** **Claire Roberts (CGG, NPA Satellite Mapping)**

PanGeo is a unique service that provides geohazard information to increase the knowledge of the presence of geohazards in urban areas. PanGeo started as a European Commission funded FP7 project with the objective of enabling open access to geohazard information in support of Copernicus. The service provides proactive geohazard information for 52 of the largest towns and cities across Europe and aims to support the prevention, preparedness and risk reduction phases of disaster management in urban areas. This is achieved by providing an INSPIRE compliant, online geohazard information service where standard geohazard products can be accessed and visualised through the PanGeo website ([www.pangeoproject.eu](http://www.pangeoproject.eu)) The PanGeo results for each town comprises of two parts: A Ground Stability Layer (GSL) which is an attributed vector polygon that indicates areas of ground instability; and a Geohazard Document (GHD) that describes the geological interpretation for each GSL polygon. These are generated by the individual geological surveys from the integration of: Satellite PSI results processed by ESA qualified providers; geological and geohazard information available from the local geological survey; and land-cover



data contained in the European Environment Agency (EEA) 'Urban Atlas'. One of the positive outcomes has been the uptake of PanGeo by a number of local authority departments which has led to an increased level of collaboration between them and their respective geological survey. Examples show that the combined knowledge from a number of different professions including geologists, urban planners and EO/GIS specialists can create a geohazard product that integrates all available knowledge for the substantial benefits for all parties. The initial phase of the project drew to a close at the end of January 2014, but the PanGeo website remains available. Future opportunities are being sought to ensure the development, continuity and expansion of the service to support the prevention, preparedness and risk reduction phases of disaster management in European urban areas. For further information please contact Claire Roberts at [Claire.roberts@cgg.com](mailto:Claire.roberts@cgg.com).

### **European collaboration for improved studies of Icelandic volcanoes: Status of the FUTUREVOLC project after the initial 18 months**

***Freysteinn Sigmundsson (University of Iceland)***

FUTUREVOLC is a collaborative project funded through a FP7 Environment supersite call, with 26 partners in 10 countries. The main objectives of FUTUREVOLC are to establish an integrated volcanological monitoring procedure, develop new methods to evaluate volcanic crises, increase scientific understanding of magmatic processes and improve delivery of relevant information to civil protection and authorities. To reach these objectives the project combines broad expertise in seismology, volcano deformation, volcanic gas and geochemistry, infrasound, eruption monitoring, physical volcanology, satellite studies of plumes, meteorology, ash dispersal forecasting, and civil protection. The consortium members together with a more extensive group of collaborators, applied to CEOS for making the Iceland volcanoes a permanent geohazard supersite. In summer 2013 FUTUREVOLC partners improved volcano monitoring in Iceland by installing new equipment, including seismometers, GPS receivers, an infrasound array.

### **Current status of the NOANET GNSS network (infrastructure, services, science, vision)**

***Athanassios Ganas (NOA)***

NOANET is a national GNSS network of twenty two (22) continuous GNSS stations belonging to the Institute of Geodynamics, National Observatory of Athens (NOA) Greece. NOA is the national Greek coordinator of the HELPOS RI project and is in charge of defining and preparing the integration of the existing Greek Geodetic Infrastructures that will support the Greek Solid Earth Community, which is the ultimate goal of the HELPOS project. NOANET comprises a team of NOA scientists, engineers, technicians and support staff and releases its 30-s data to the entire geodetic and solid Earth community via its web site ([www.gein.noa.gr/gps.html](http://www.gein.noa.gr/gps.html)) and the NOANET GSAC (an open-source UNAVCO tool for web services). This presentation intends to outline the work being produced within the NOANET group



related with both science products and strategies towards the implementation of the best solutions that will permit to the end-users, and in particular geo-scientists, to access the geodetic data, derived solutions, and associated metadata using transparent and uniform processes. The following core services will be presented: (1) the core services associated to data (diffusion, archive, long-term preservation, quality check, rapid analysis) (2) core services associated to geodetic products (analysis, products definition like position time series, velocity field and Zenithal Total Delay) (3) User oriented services (real-time solutions for early warning systems, strain rate maps, meteorology etc).

**AEROVIS, Urban clusters impact on regional air pollution and climate and generic visualization software for satellite data applications**

***Panagiotis Symeonidis, Kostas Kourtidis & Evangelos Kosmidis (Draxis Environmental & DUTH)***

The aim of the project (to be presented) is the development and implementation of an extendable web based visualization software, for map-based presentation of long time series of air pollution data.



## **Splinter Session: Infrastructures and Data Management (II) e-Infrastructures and Linked Data session**

**Chair: Stefano Nativi (CNR-IIA), Rapporteur: Xenofon Tsilibaris (GRNET)**

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### **The ENVRI project: speeding up construction of European Environmental Research infrastructures and enabling their contribution to GEOSS**

**Roberto Cossu (ESA-ESRIN)**

Distributed, long-term observational networks are of key importance to increase our understanding of processes to develop new predictive power in solid Earth systems and ecosystems, hydrology, climate change, biodiversity, marine, etc. Environmental sciences benefit from a wide range of Research Infrastructures to address these needs. Measurements and monitoring are required from fixed and mobile platforms and range across physics, chemistry, biology and geosciences. Sophisticated large-scale analytical and informatics facilities from physical and biological sciences are likely to be used with increasing intensity by geoscientists. All these resources should contribute to GEOSS. The ENVRI project, "Common Operations of Environmental Research infrastructures" ([www.envri.eu](http://www.envri.eu)) is a collaboration in ESFRI Environment Cluster, with support from ICT experts, to develop common e-science components and services for their facilities. The results will speed up the construction of these infrastructures and will allow scientists to use data and software from each facility to enable multi-disciplinary science. Starting from the State of the Art of the Environmental ESFRI Research Infrastructures and the user/system requirements, the project has developed:

- Software tools, based on OGC OpenSearch standard, facilitating Environmental ESFRI communities to easily discover data which are heterogeneous and stored at different places, enabling interoperability within different facilities, with the larger GEOSS, and with other infrastructures of relevance;
- Services for publishing, accessing, visualizing, and processing geospatial datasets, based and contributing to the gCube open source technology, a comprehensive software system supporting the creation and management of an HDI.

The project has paid attention to interoperations with GEO-GEOSS and the first samples of ESFRI data have now become discoverable from the GEOSS Portal and via the Discovery and Access Broker to the GEOSS users.

### **Integration of Atmospheric Observing Platforms under the umbrella of a National Research Infrastructure**

**Evangelos Gerasopoulos (NOA)**

Climate change is governed to a large extent by atmospheric processes, in particular the interaction between radiation and atmospheric components (e.g. aerosols, clouds,



greenhouse, and trace gases). Some of these components also contribute significantly to air quality degradation inducing adverse health impacts. The IPCC Fourth Assessment Report and EU's Thematic Strategy on Air Pollution have both stressed the need to strengthen the ground-based component of the Earth Observing System for a number of key atmospheric variables. Even if the expertise and a lot of the components exist, such an integrated Research Infrastructure (RI) for specialized atmospheric observations is presently lacking in Greece. PANACEA will fill this observational gap by developing a coordinated system for monitoring of atmospheric composition, solar radiation variations, climate change and related natural hazards in Greece. This will be achieved through merging, enhancing, and coordinating all existing Greek ground-based stations (e.g., in-situ gas and aerosol, LIDAR and AERONET stations, solar radiation networks) under the umbrella of a single integrated RI, essential to achieve excellence in research and innovation. Competitive advantages include the existence of several excellent Greek research groups in the atmospheric chemistry and physics areas, the availability of state-of-the-art instrumentation, and the strong photochemical activity in the atmosphere over Greece making it a perfect natural laboratory for relevant studies.

### **The MELODIES project: Exploiting Open Data**

***Manolis Koubarakis (National and Kapodistrian University of Athens)***

The European Open Data Strategy establishes important new principles that ensure that European public sector data will be released at no cost (or marginal cost), in machine-readable, commonly-understood formats, and with liberal licences enabling wide reuse. These data encompass both scientific data about the environment (from Earth Observation and other fields) and other public sector information, including diverse topics such as demographics, health and crime. Many open geospatial datasets (e.g. land use) are already available through the INSPIRE directive and made available through infrastructures such as the Global Earth Observation System of Systems (GEOSS). The intention of the Open Data Strategy is to stimulate the growth of research and value-adding services that build upon these data streams; however, the potential value inherent in open data, and the benefits that can be gained by combining previously-disparate sources of information are only just starting to become understood.

### **Linked Open Data for Agro forestry Management: The SmartOpenData Project Approach**

***Ramon Baiget (TRAGSA)***

The SmartOpenData project focuses its tasks on how Linked Open Data can be applied to public and voluntary spatial data resources such as INSPIRE, GEOSS Data-CORE, GMES, OpenStreetMap or GEOWIKI.



**Linked Open Data in the Earth Observation Domain: the Vision of Project LEO**  
*Manolis Koubarakis (National and Kapodistrian University of Athens)*

Lots of Earth Observation data has become available at no charge in Europe and the US recently and there is a strong push for more open EO data. Open EO data that are currently made available by space agencies are not following the linked data paradigm. Therefore, from the perspective of a user, the EO data and other kinds of geospatial data necessary to satisfy his or her information need can only be found in different data silos, where each silo may contain only part of the needed data. Opening up these silos by publishing their contents as RDF and interlinking them with semantic connections will allow the development of data analytics applications with great environmental and financial value. This is the goal of the new European project LEO which we introduce in this presentation.

**Citizen Science: Geo-Wiki contributing to GEOSS**  
*Ian McCallum (IIASA)*

Geo-Wiki is a visualization, crowdsourcing and validation tool for improving global biophysical information. The online application ([www.geo-wiki.org](http://www.geo-wiki.org)) is comprised of several branches that are devoted to different types of land cover and land-use, e.g. to improve cropland, urban extent, biomass characterization and land cover more generally. Through regular crowdsourcing competitions run at IIASA, we have collected more than 250,000 samples of land cover and human impact. These samples have been used to validate a map of land availability for biofuel production and in the development of a global hybrid cropland map. There is also a mobile application called Geo-Wiki Pictures for Windows, Android and iPhone for the collection of in-situ data. Users can take pictures of the landscape and then classify the land cover or use the customized menu builder to gather user-defined information that is more land-use related, e.g. specific crop types or types of managed land.



## ***Friday 13th June***

### **Plenary Session: Exploiting the wealth of the GEOSS**

**Chair: Max Craglia (EC-JRC), Rapporteur: Elena Roglia (EC-JRC)**

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#### **Bridge the gap between data and decision making**

***Javier de la Torre (Vizzuality)***

Developing applications on top of Earth Observation and GIS systems is challenging. In this presentation we will show the latest on web GIS and usability on maps.

#### **Space App Camp (M2G2S2 Project) Development and upmarket experiences**

***Lena Klemm (Anwendungszentrum GmbH Oberpfaffenhofen)***

As part of the EU co-funded project S2G2M2, the Space App Camp is organised with the aim to support the development mobile applications, which integrate EGNOS and Copernicus data. From 5 May to 12 May 2014, 20 mobile developers are invited to the European Space Agency in the Netherlands work together on the development of mobile applications, learn how to integrate satellite data into their mobile applications, and gain insight into European space programmes. A winning team will be selected by a jury of ESA, EC and consortium representatives on the final day of the Space App Camp.

#### **GEO Appathon 2014: turning data into decisions**

***Giovanni Rum (GEO Secretariat)***

The Group on Earth Observations (GEO) launched on May 7, 2014 the GEO Appathon 2014, a global competition to develop mobile apps using Earth observation data available through GEO's Global Earth Observation System of Systems (GEOSS). Competitors are competing for \$20,000 in prizes, being offered by the U.S. Agency for International Development (USAID), to develop Applications focused on addressing environmental and societal challenges facing decision leaders and individual citizens in developing countries across nine GEO Societal Benefit Areas of agriculture, biodiversity, climate, disasters, ecosystems, energy, health, water and weather. Apps can be created for any of the main operating systems, as well as open source platforms, and can be designed for any type of portable device. Participation in the GEO Appathon is open to any non-commercial entity, individual or team from any background in any country. Registration for the GEO Appathon remains open.

#### **AIP-7**

***Arne Berre (SINTEF)***

The GEOSS Architecture Implementation Pilots (AIP) develops and deploys new process and infrastructure components for the GEOSS Common Infrastructure (GCI)



and the broader GEOSS architecture. Six yearly GEOSS AIP efforts have been completed since 2007, and AIP-7 started in April 2014. The GEOSS AIP-7 work will during 2014 be organised through the following vertical scenario-related groups: water, oceans, land, health, agriculture and disasters management,. There are also transversal horizontal activities, supporting all the verticals, which includes crowdsourcing, architecture, application frameworks, tutorials, capacity Building, SystemDesign and Community portal.

### **The Earth observation market, trends and creating business opportunities**

***Mark Noort (HCP International)***

Quite some market studies exist for space technology or geospatial technology, predicting impressive growth rates. However, it is more difficult to single out market perspectives for earth observation applications. Return on investment for some applications can be easily calculated, but for others it is more difficult, in particular when earth observation supports solutions in fields that are not easily captured by current economic models, such as environmental management or climate change. The presentation touches on market perspectives for all GEO societal benefit areas: disasters, agriculture, energy, health, climate, ecosystems, water, biodiversity and weather. In addition, aspects related to the (future) role of the private sector, factors that determine the environment for doing business and the European dimension will be highlighted.





## **Plenary Session: How the GEO Global Initiatives benefit European policy makers and users**

**Chair: Alexia Massacand (GEO Secretariat), Rapporteur: Michael Berger (EC – RTD)**

### **GEO Carbon: The European effort to respond to the need for a Coordinated Global Carbon Observing System**

**Antonio Bombelli (CMCC)**

Thanks to current and past observations and data analysis, we know that anthropogenic emissions have caused a 40% increase of the CO<sub>2</sub> concentration in the atmosphere from the pre-industrial age till now, and the main consequence of this increase is the greenhouse effect that is affecting the global climate system. "Fortunately" only less than an half of the carbon emitted by human activities is accumulating as CO<sub>2</sub> in the atmosphere, while the remainder is taken up by the ocean and the land sinks. This growing trend tracks scenarios that lead to the highest increase of the global average temperature, much above the "recommended" 2°C threshold. Local, regional and global carbon data and products, need to be collected and analyzed in a coordinated way to better understand the impacts of the increasing emissions and the behavior of the carbon sinks, and to provide decision makers with the information necessary to develop and undertake timely and effective adaptation and mitigation actions and the following verification process. GEOCARBON ([www.geocarbon.net](http://www.geocarbon.net)) is an international project funded by the European Commission (FP7) with the aim to support the Group on Earth Observations (GEO) in developing a coordinated Global Carbon Observation and Analysis System, which addresses indeed to the above issues.

### **GEOGLAM: SIGMA as contribution to GEO GLAM and its link to the EU policy objectives**

**Lieven Bydekerke (VITO)**

The GEOGLAM Initiative (Global Agricultural Monitoring), a key component of GEO (Group on Earth Observation), aims to improve transparency in global agricultural monitoring. SIGMA's objective is to actively contribute to GEOGLAM and in specific to its research agenda.

### **GEO BON and its contributions to EU policies**

**Joerg Freyhof (GEO BON, iDiv)**

A sound understanding of the state and development of natural resources, the possible impact of response options and their consequences are essential for economic growth and human welfare. In this field, the uncertainties surrounding



future trends in ecosystems and their services are a major stumbling stone for future development.

The Group on Earth Observations Biodiversity Observation Network – GEO BON – coordinates and links together the fragmented research and innovation actors and activities relating to the Societal Benefit Area (SBA) on Biodiversity of the Global Earth Observation System of Systems (GEOSS). Some 100 governmental, inter-governmental and non-governmental organizations are collaborating through GEO BON to organize and improve terrestrial, freshwater and marine biodiversity observations globally and make their biodiversity data, information and forecasts more readily accessible to policymakers, managers, experts and other users. Moreover, GEO BON has been recognized by the Parties to the Convention on Biological Diversity. One major European project actually contributing to GEO BON is the FP7 project EU BON.

Scientifically sound and feasible Biodiversity Observation is essential for the EU's Habitats Directive, the Birds Directive, the Water Framework Directive and the Marine Strategy Framework Directive. For these Directives, biodiversity data are collected in the field all over Europe with large efforts following EU-internal protocols. Raw data or Metadata descriptions which could be implemented to GEOSS are not publically available and interoperability of the data and results remains a challenge. Especially EU BON is actually investing to improve biodiversity data and information interoperability, visualization and public availability. But still, European and national players and projects in the field of biodiversity observation are poorly interlinked and data and metadata are dispersed and their availability is very limited. GEO BON's role is actually to develop the Global Biodiversity observation network and interlink the relevant scientific communities, funding bodies and user communities in Europe.

### **GEO-GNOME: The GEO Global Network for Observations and information in Mountain Environments**

***Antonello Provenzale (CNR-ISAC)***

The GEO-X Plenary approved the creation of GEO-GNOME, the GEO Global Network for Observations and Information in Mountain Environments. GEO-GNOME will capitalize on previous achieved results and outcomes, with the goal to provide free and open-access to data and products, scientific results and future climate and environmental projections for mountain regions at global scale; foster exchange of data and information across different mountain areas and between the scientific community and stakeholders and better connect them; build capacity in mountain research, especially in remote areas; and create a distribution system for the dissemination of this knowledge, in particular to the local communities and decision makers to enable for change. In this talk I review the current activities of GEO-GNOME and the actions to be taken in the near future.

### **Global Land Cover**

***Alan Belward or Max Craglia (EC - JRC)***





## **The Global Mercury Observation System: Progress and foreseen initiatives in H2020**

**Nicola Pirrone (CNR-IIA)**

The overall goal of the Global Mercury Observation System (GMOS) project is to develop a coordinated global observation system for mercury, including ground-based stations at high altitude and sea level locations, ad-hoc oceanographic cruises over the Pacific, the Atlantic and the Mediterranean, and free tropospheric mercury measurements. This will then provide high quality data for the validation and application of regional and global scale atmospheric models, to give a firm basis for future policy development and implementation.

GMOS will closely cooperate with major international programs including the UNEP Global Partnership Area on Atmospheric Mercury Transport and Fate Research (UNEP F&T), the Task Force on Hemispheric Transport of Air Pollutants (TF HTAP) of the UNECE-LRTAP convention, the GEO Task HE-02 "Tracking Pollutants" and AMAP. The results of past EU funded projects (i.e., MAMCS, MOE, MERCYMS) will provide a solid basis of knowledge in terms of state-of-the-art atmospheric models, monitoring methodologies, interoperable tools management and environmental policy analysis instruments.

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## **GEO Blue Planet and EU policy objectives**

**Albert Fischer (IOC - UNESCO)**

### **AfriGEOSS**

**Giovanni Rum (GEO Secretariat)**

A coordinated GEO initiative has been recognized essential to enhance Africa's capacity for producing, managing and using Earth observations, thus also enabling the Region's participation in, and contribution to, the Global Earth Observation System of Systems (GEOSS). The GEO partnership currently includes 23 Member States and five Participating Organisations from Africa. Even if this number has increased in recent years, more needs to be done to ensure wider participation to GEO, effective contribution and widespread beneficitation. AfriGEOSS is expected to be a suitable vehicle to accelerate this process.

The AfriGEOSS initiative, developed within the GEO framework, will strengthen the link between the current GEO activities with existing capabilities and initiatives in Africa and will provide the necessary framework for African countries and organizations as well as international partners to access and leverage on-going local and international bilateral and multilateral EO-based initiatives across Africa, thereby creating synergies and minimizing duplication for the benefit of the entire continent.

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