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The BEYOND center of excellence for the effective exploitation of satellite time series towards natural disasters monitoring and assessment

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BEYOND project (2013-2016, 2.3Meuro) funded under the FP7-REGPOT scheme is an initiative which aims to build a Centre of Excellence for Earth Observation (EO) based monitoring of natural disasters in south-eastern Europe (http://beyond-eocenter.eu/), established at the National Observatory of Athens (NOA). The project focuses on capacity building on top of the existing infrastructure, aiming at unlocking the institute's potential through the systematic interaction with high-profile partners across Europe, and at consolidating state-of-the-art equipment and technological know-how that will allow sustainable cutting-edge interdisciplinary research to take place with an impact on the regional and European socioeconomic welfare. The vision is to set up innovative integrated observational solutions to allow a multitude of space borne and ground-based monitoring networks to operate in a complementary and cooperative manner, create archives and databases of long series of observations and higher level products, and make these available for exploitation with the involvement of stakeholders.

In BEYOND critical infrastructural components are being procured for fostering access, use, retrieval and analysis of long EO data series and products. In this framework NOA has initiated activities for the development, installation and operation of important acquisition facilities and hardware modules, including space based observational infrastructures as the X-/L-band acquisition station for receiving EOS Aqua/Terra, NPP, JPSS, NOAA, Metop, Feng Yun data in real time, the setting up of an ESA's Mirror Site of Sentinel missions to be operable from 2014 onwards, an advanced Raman Lidar portable station, a spectrometer facility, several ground magnetometer stations. All these are expected to work in synergy with the existing capacity resources and observational networks including the MSG/SEVIRI acquisition station, nationwide seismographic, GPS, meteo and atmospheric networks.

The analysis of the satellite time series from this diverse EO based monitoring network facilities established at NOA covers a broad spectrum of research activities. Indicatively using Landsat TM/ETM+ imagery we have developed algorithms for the automatic diachronic mapping of burnt areas over Greece since 1984 and we have been using MSG/SEVIRI data to detect forest wildfires in Greece since 2007, analyze their temporal and geographical signatures and store these events for further analysis in relation with auxiliary geo-information layers for risk assessment applications. In the field of geophysics we have been employing sophisticated radar interferometry techniques using SAR sensor diversity with multi-frequency, multi-resolution and multi-temporal datasets (e.g. ERS1/ERS2, ENVISAT, TerraSAR-X, COSMO-SkyMED) to map diachronic surface deformation associated with volcanic activity, tectonic stress accumulation and urban subsidence. In the field of atmospheric research, we have developed a 3-dimentional global climatology of aerosol and cloud distributions using the CALIPSO dataset. The database, called LIVAS, will continue utilizing CALIPSO observations but also datasets from the upcoming ADM-Aeolus and EarthCARE ESA missions in order to provide a unique historical dataset of global aerosol and cloud vertical distributions, as well as respective trends in cloud cover, aerosol/cloud amount and variability of the natural and anthropogenic aerosol component. Additionally, our team is involved in Swarm magnetic field constellation, a new Earth Explorer mission in ESA's Living Planet Programme launched on November 22, 2013, as member of the validation team of the mission. Finally, assessment of heat wave risk and hazards is carried out systematically using MODIS satellite data.