Copernicus Earth Observation and Big Data for Cultural Heritage Management

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Since 2015, the Sentinel-1 and -2 sensors systematically provide radar and optical images, that can be accessed and processed by the end-users. This initiative is strongly supported by the European Space Agency (ESA) free and full open access (FFO) policy [1]. However, the use of these satellite datasets has not yet fully adopted by the archaeological community. This is partially due to the lower resolution of the Sentinel and other similar sensors (in comparison to the high-resolution optical satellite data [2-3]), and the different demands of the end-users [4]. Nevertheless, this is a unique opportunity for the archaeological community to gain access into an extensive multi-temporal satellite repository. In this respect, big data cloud platforms are essential for facilitating these images' processing.

This paper presents, through various applications, the benefits and limitations of multi-temporal change detection analysis using multi-source radar and optical medium resolution satellite datasets for supporting heritage disaster risk management cycle [5]. In specific, the use of Sentinel-1 and Sentinel-2 sensors and Landsat images are processed in the Google Earth Engine cloud platform. The analysis includes a temporal trend investigation over archaeological sites in Cyprus, through integrated harmonized Landsat observations (Landsat 5 TM; Landsat 7 ETM+ and Landsat 8 OLI) [6], as well as supervised Random Forest classification for monitoring urban sprawl and land-use changes. Vertical sprawl over the archaeological site of Amathus in Cyprus using the Rapid and Easy Change detection in radar TIme-series by Variation coefficient (REACTIV) algorithm [7], are also presented. Finally, disturbance mapping and multi-temporal vegetation indices and Tasseled Cap coefficient trends are provided [8].

The results of the research here presented make part of an ongoing project, entitled "Copernicus Earth Observation Big Data for Cultural Heritage", in short NAVIGATOR (under the grant agreement EXCELLENCE/0918/0052). The project investigates novel methodologies for monitoring natural and anthropogenic hazards, employing Copernicus and other related satellite products and using big data cloud platforms.

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For us

- Disturbance Mapping
- Multi-temporal Trends
- Classification analysis
- Harmonized Landsat Observations
  https://code.earthengine.google.com/798ae7a268f8e2c8022433b9562785c0
- REACTIV algorithm

Google Earth Engine:

- Classification-Random-Forest
- REACTIV
- Landsat8 Harmonic Modeling
- LT-Data-Visualization-Download-App