

PROTECTION OF EUROPEAN CULTURAL HERITAGE FROM GEOHAZARDS

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**How Copernicus supports Europe's regions to improve prevention
and preparedness to natural disasters**

Thursday | 18 November 2021 | 10.00–11.30



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The challenge: Direct and indirect impacts of GEO-Hazards on CH worsened by Climate



Hegra – Thermal stress, erosion and geomorphological instability process in KSA© Spizzichino



Blackening -Vittoriano (Roma)



Sea level rise - Venice



Surface recession S. Filippo church



Vegetation Terme di Baia (Naples) © Sp



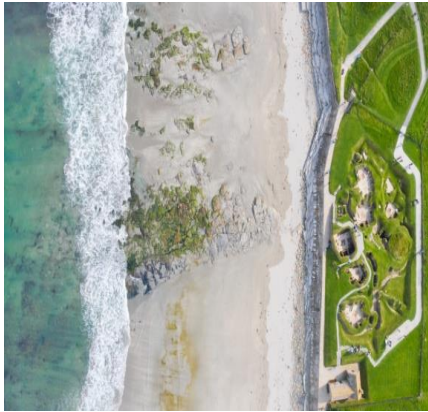
Rock facade collapse in Petra (Jordan) and in David Gareja Monastery complex (Georgia) © Spizzichino



Rock facade collapse in Petra (Jordan) and in David Gareja Monastery complex (Georgia) © Spizzichino



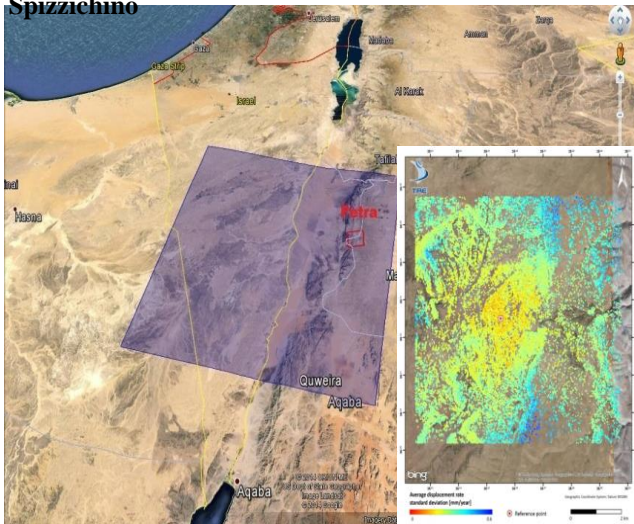
Erosion in the Akapana pyramid (Bolivia) © Spizzichino



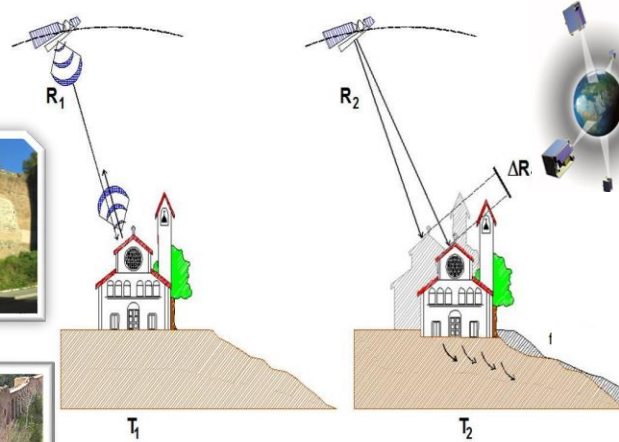
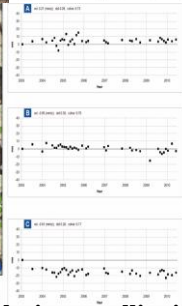
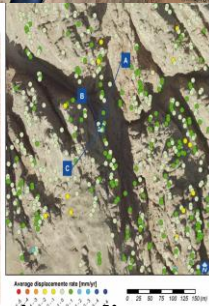
Coastal Erosion Skara Brae © Hist. Eng. Scotland

This figure shows an aerial view of a city with a yellow highlighted path. A legend in the top left corner identifies various urban features: 'Urban' (purple triangle), 'Water' (blue triangle), 'Forest' (green triangle), 'Park' (yellow triangle), 'Road' (red triangle), 'Rail' (orange triangle), 'Water' (blue triangle), 'Forest' (green triangle), 'Park' (yellow triangle), 'Road' (red triangle), 'Rail' (orange triangle). A text box in the bottom right corner indicates 'City of New York, 2010' and 'City of New York, 2010'.

Spizzichino



Surface deformation medium-resolution satellite images



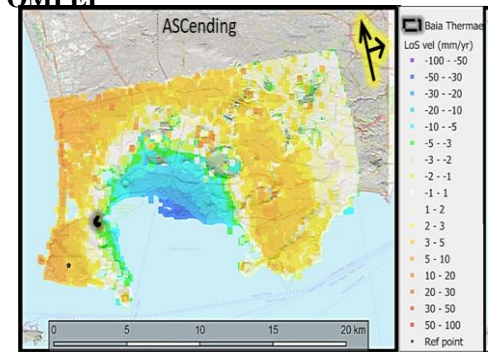
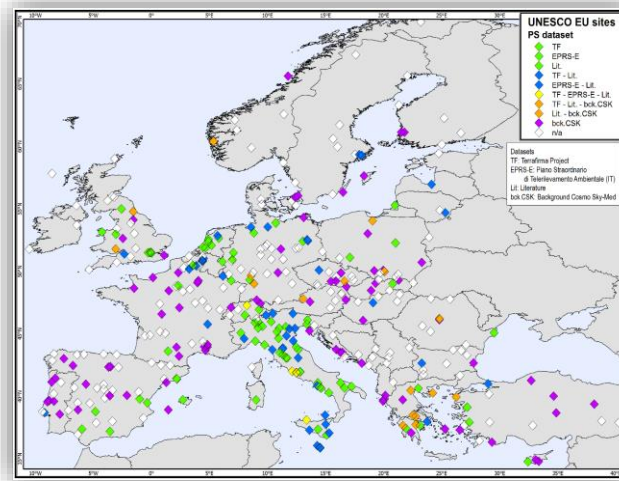
Total Displacement (mm)
 ASC (18/10/2013 - 16/03/2016)

- 38.9 - -30.0
- 28.9 - -20.0
- 18.9 - -10.0
- 8.9 - 0.0
- 0.1 - 9.9
- 10.0 - 19.9
- 20.0 - 29.9
- 30.0 - 38.9

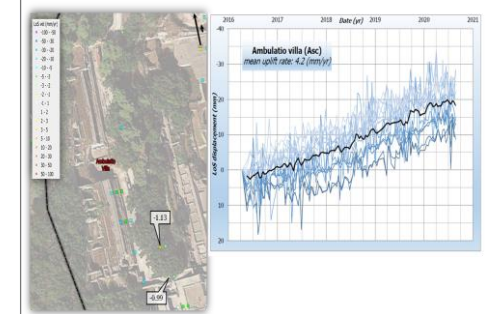
0 50 100 200



Instability processes and SAR data analysis

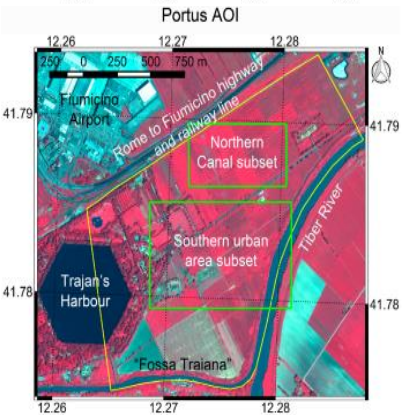
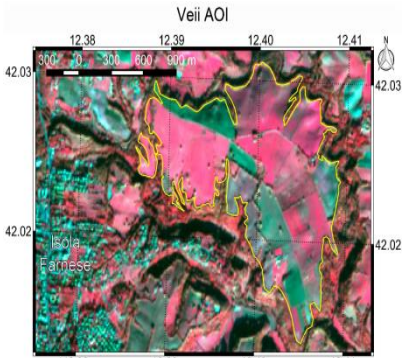


All data after processing, must be calibrated, validate and interpreted by in situ survey in order to be used as support for the mitigation measures

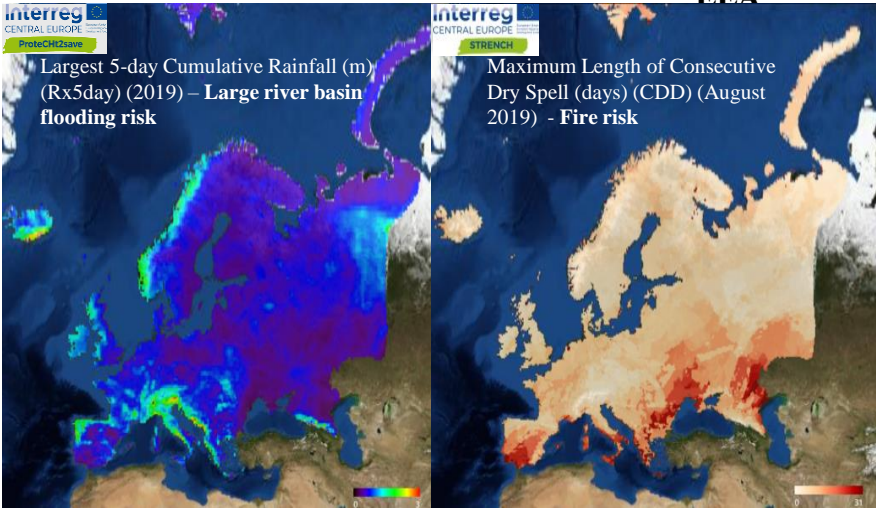


**Subsidence and uplift by satellite analysis PACF
Park © Spizzichino**

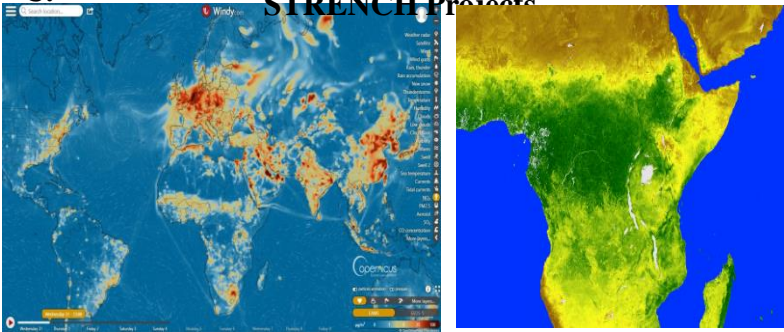
The space base solution and the added value



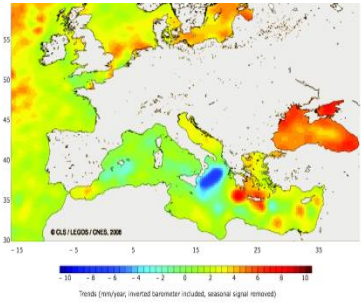
Land use, change detection and buried sites © ESA – C. Stewart



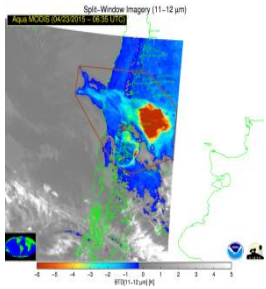
Climate variables and extreme events impact on Cultural Heritage @ ProteCHt2save and STRECH Projects



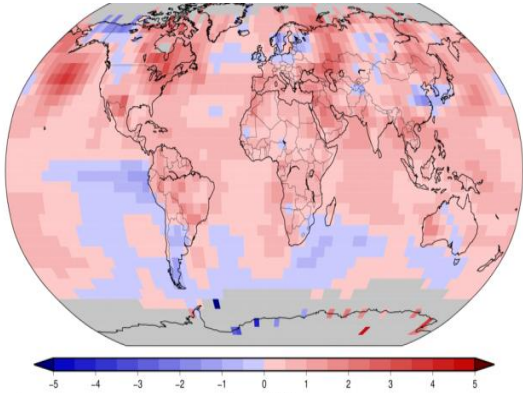
Pollutant concentration © Windv.com
NDVI Vegetation © Copernicus



sea level rise © EEA



© NOAA/CIMSS Volcanic Cloud Monitoring website.



Land & Ocean Temperature anomaly © NOAA Global

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The PROTHEGO Project

- PROTHEGO's goal is to enhance cultural heritage management practices at the national level, reinforcing institutional support and governance through knowledge and innovation.
- The project identifies, assesses and monitors risks with the aim of strengthening disaster preparedness for heritage properties in the future. The project promoted interdisciplinary and collaborative R&D activities, transferring the highest level of knowledge, quality and standards from space and earth sciences to cultural heritage conservation sciences.

benefits to the citizens;



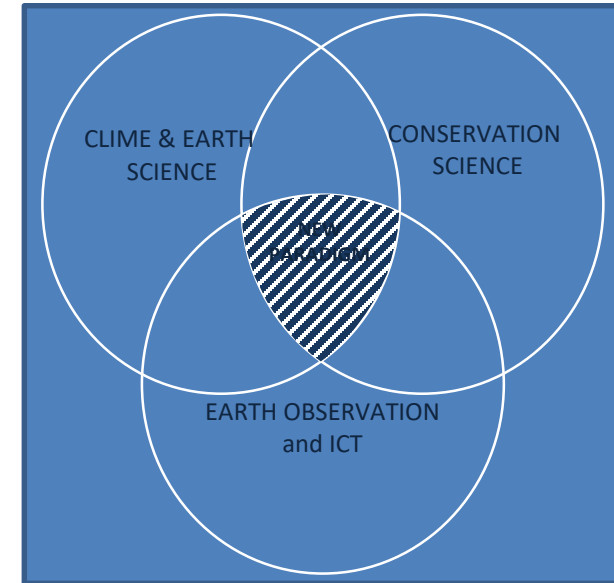
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outlook to the future

1. Identify World Heritage sites most vulnerable to phenomena induced and worsened by climate change and strengthen systems for continuous assessment, monitoring and early warning of the impacts.
2. Fully incorporate the latest climate and earth science and EO approach models into the adaptation strategies as well as into World Heritage site nomination, inscription and management procedures.

An agreement amongst EU institutions (e.g. member states, EU Commission, ESA, EEA etc.) on the use of satellite services for monitoring geohazards affecting cultural heritage would help define best practice guidelines and standard methodologies for adoption by practitioners in this field.

The HOLISTIC approach and the new paradigm



evolution on the use of sentinels

