

DInSAR analysis for geohazard assessment at the Roman city of Carsulae (Central Italy)



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¹ ISPRA

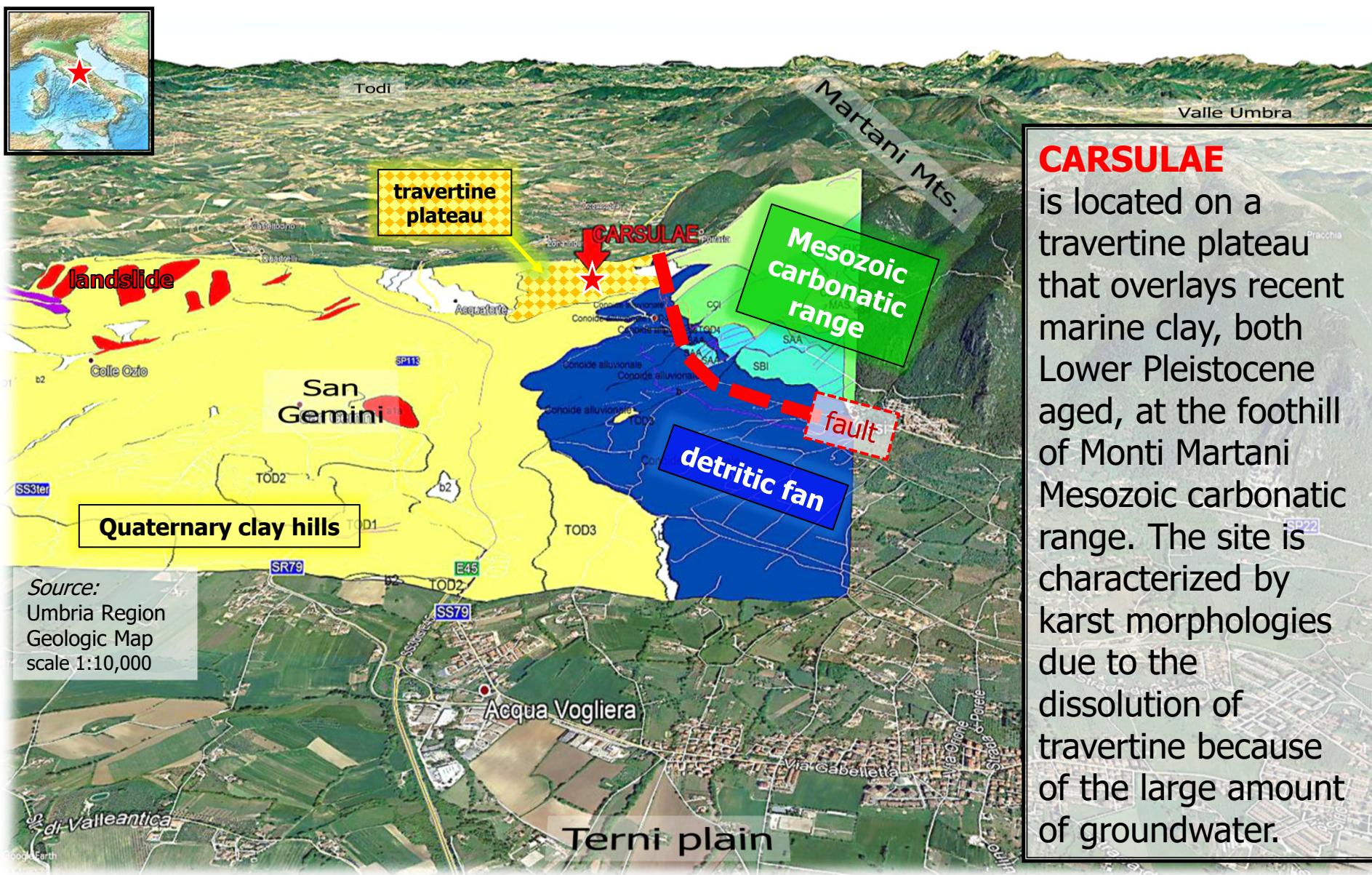
Geological Survey of Italy

² MIBACT

Polo Museale dell'Umbria

³ MIBACT, Parco Archeologico dei Campi Flegrei

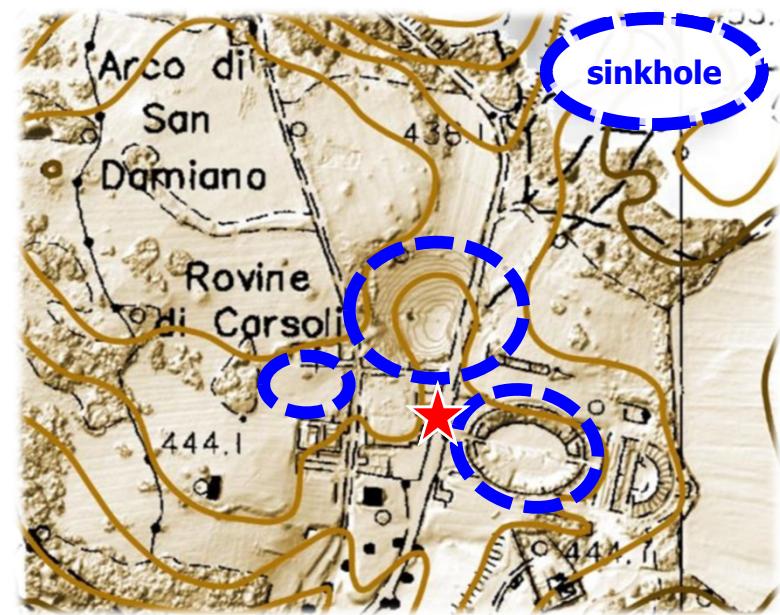
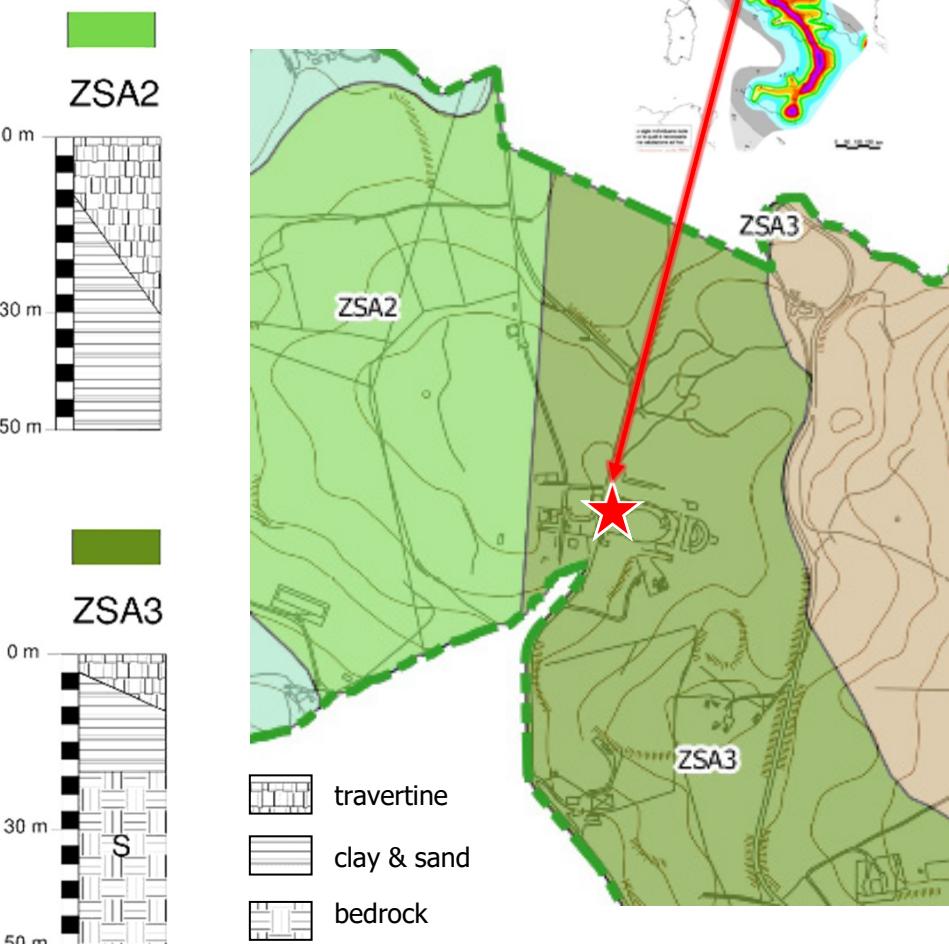
Geological setting



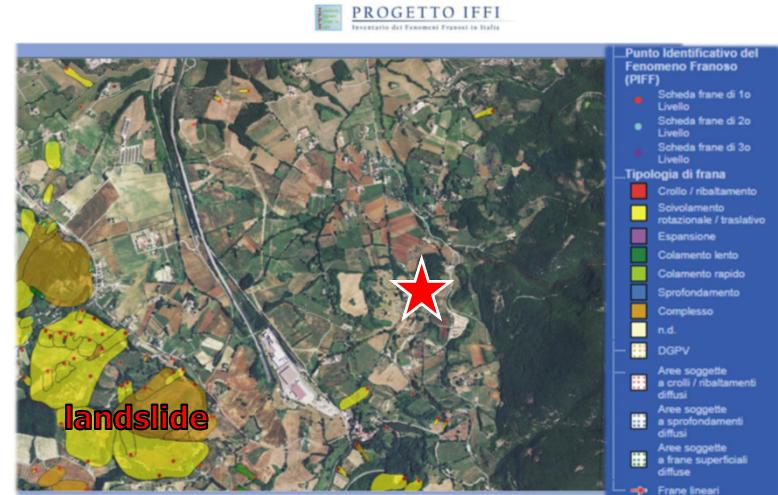
SEISMIC HAZARD

Seismic Microzonation

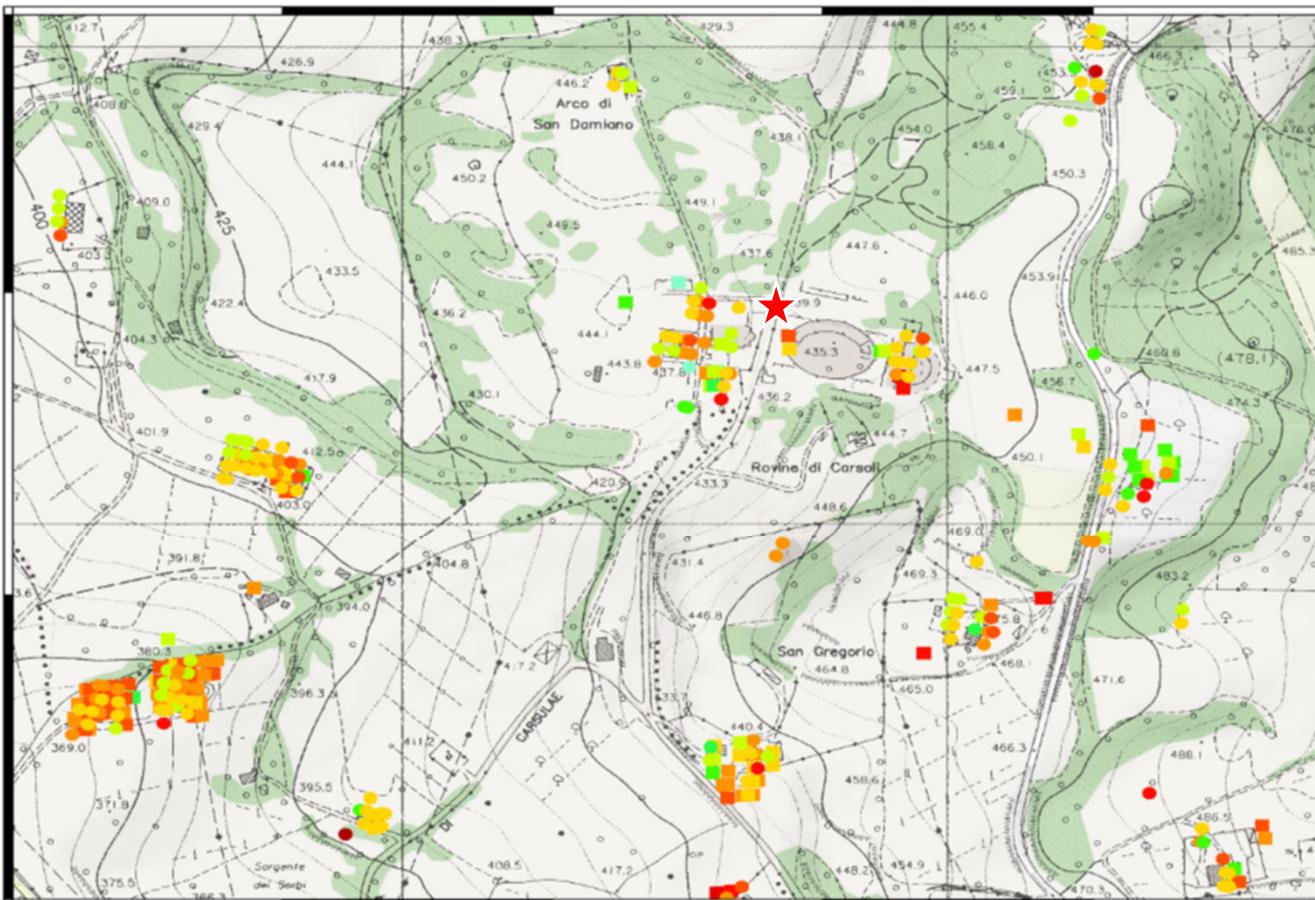
Terni Municipality (2015)



GEOMORPHOLOGICAL HAZARD



PS ground displacements, period August 2018 – July 2019



- Ascendent
- Descendent

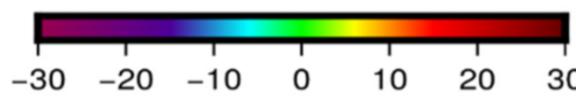


LOS 75°



LOS 285°

Velocity along LOS (mm/year)

**DInSAR analysis**

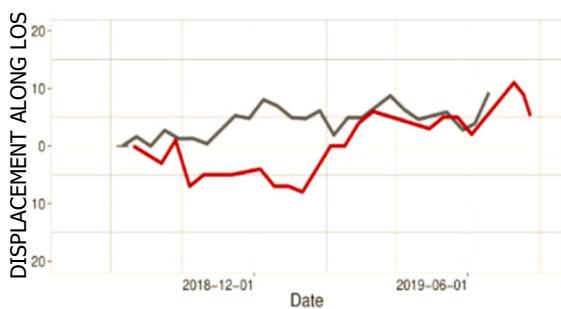
has been conducted using SAR data from Sentinel-1 to run the SBAS technique.

This good combination of wavelength band, data resolution and revisit time optimizes the results in rural areas.

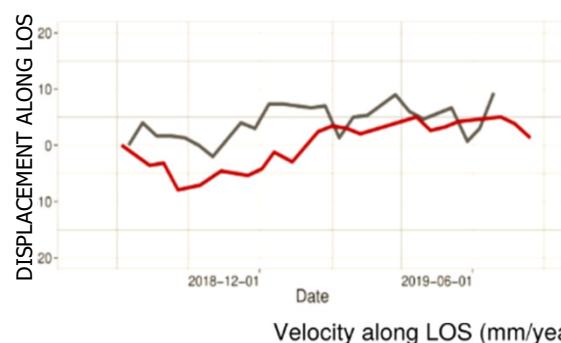
Particular attention was paid to the selection of the Ground Reference Area as a geologically stable site.

DInSAR analysis

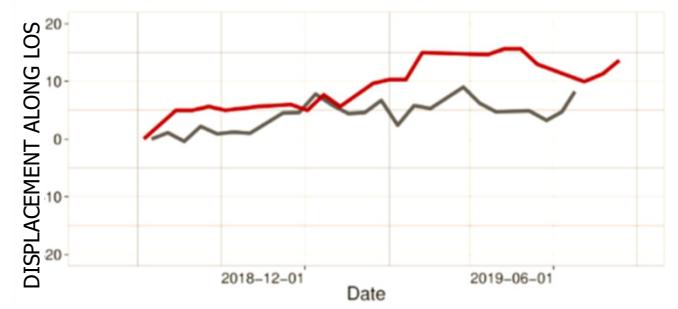
Forum – Twin Temples



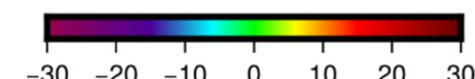
Santi Cosma e Damiano



Theater



■ Descending
● Ascending



-30 -20 -10 0 10 20 30

At the Forum-Temples-Church area, the PS highlight a weak movement upward and

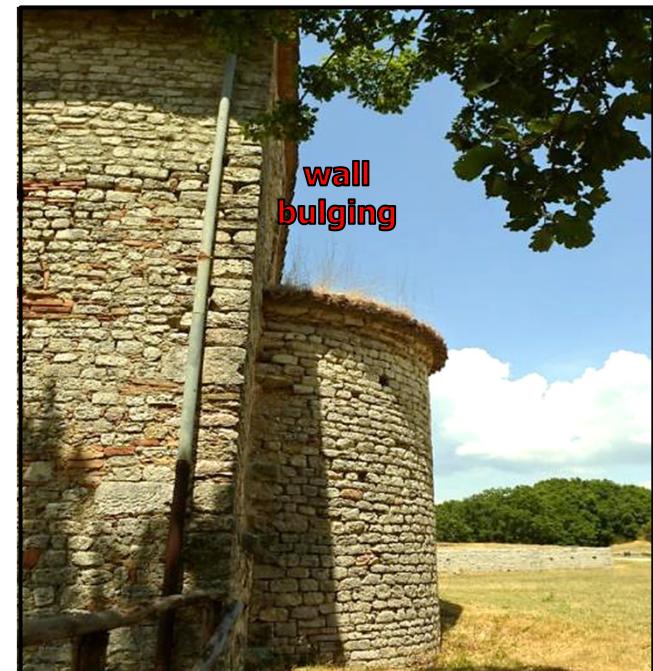
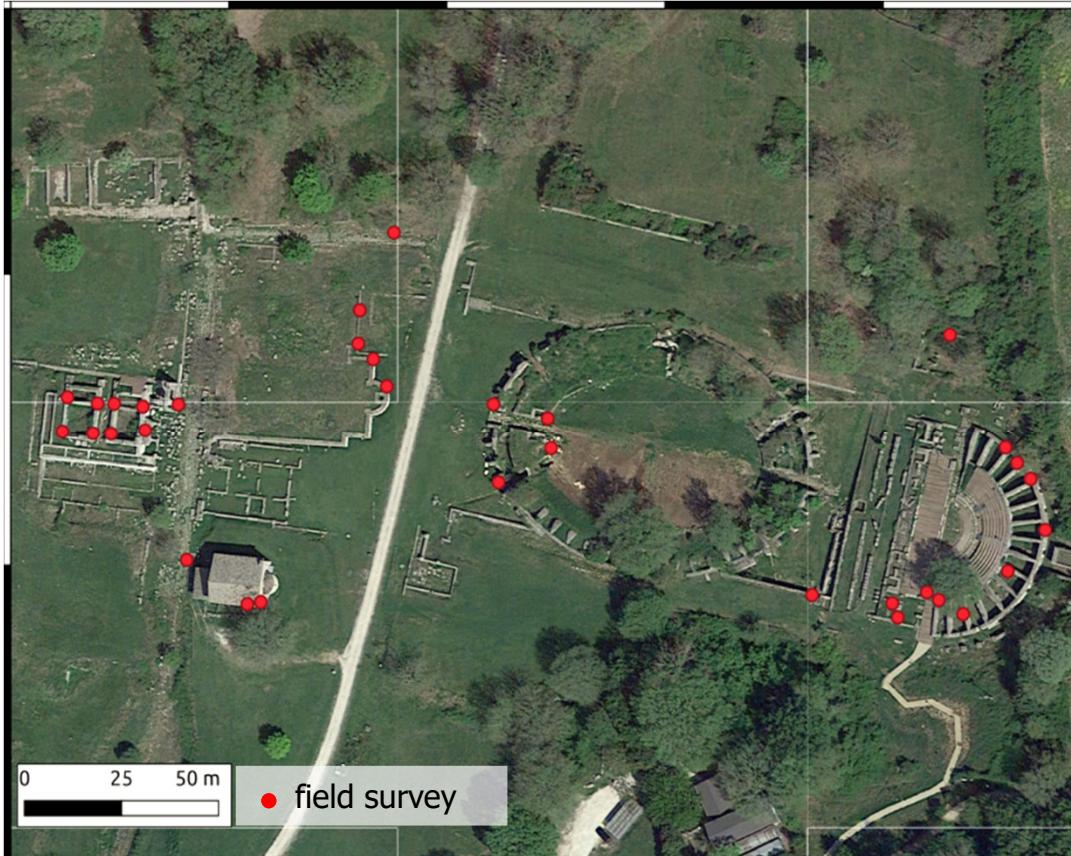
westward, by 5-10 mm during the fall period (Nov 2018 – Jan 2019), then stable until the end.

At the Theater the PS show a continuous trend downward.

Field survey

A field survey has been carried out on the archaeological remains to validate EO analysis, highlighting the absence of important damages, according with the overall ground stability of the site.
Although some useful results were

obtained, it is worth noting that the lack of coherence due to the rare natural or manmade reflectors and the availability of images limited to last year did not allow the complete exploitation of the technique.



Conclusions

- The availability from Copernicus Programme of open data, frequently acquired and of good resolution allows EO monitoring to support traditional in situ monitoring (topographic surveys, inclinometer, extensometer, crack gauge, etc.).
- SBAS technique applied on Sentinel-1 data allows the detection of millimetric vertical ground displacements every 2 weeks, by a spatial resolution of about 10 meters.
- This remote sensing survey covers at a same time a wide area without the installation and the maintenance on the walls of reflecting devices that could limit the function or the fruition of monuments.
- The automation of DInSAR analysis enables the site managers to monitor natural threats through an efficient and sustainable system, selecting proper alert and mitigation measures when critical displacements are reached.