

Space for Twin Cities Cultural Heritage

Exploring cultural assets protection, valorisation
and fruition through the use of (space) technologies
and derived data

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Observing the Earth: Cultural Heritage from Space

UNDERSTAND

- Subsidence, ground motion detection
- Urban sprawl monitoring
- Climate Change indicators
- Sites monitoring and detection (buried sites)

SECURE

- Monitoring of the destruction or looting of sites
- Air pollution monitoring
- Coastline monitoring (erosion)

BENEFIT

- Risk assessment/Land use change maps
- Preventive investigation for infrastructures realization
- Dissemination of culture awareness





G. Boni, 1898



A. Poidebard, 1928

Satellite data and Cultural Heritage: Historical background and modern techniques

EO data potentials for archaeological sites and cultural areas monitoring:

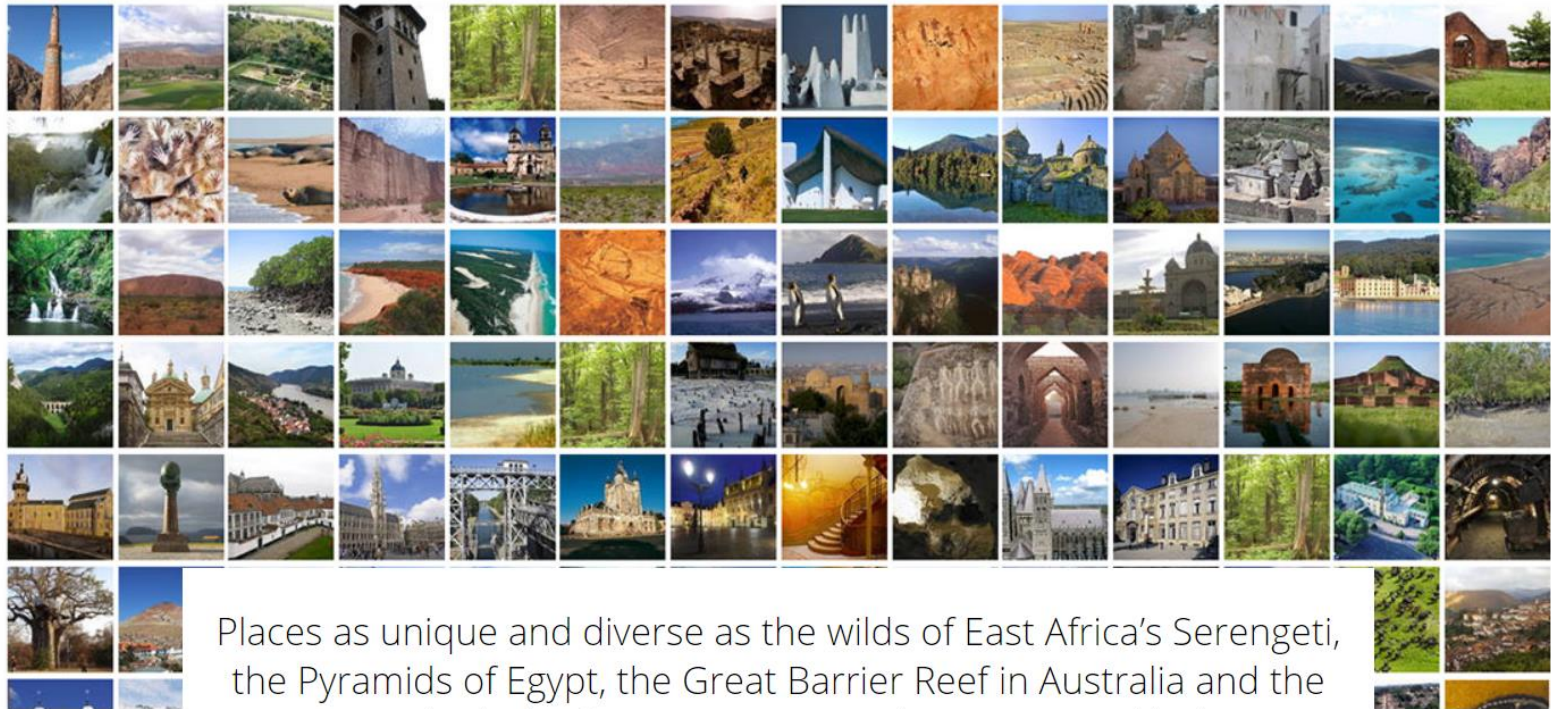
- Systematic observations for multitemporal analysis
- High resolution change detection and classification techniques
- Ground Penetrating Radar (GPR)
- GNSS and UAV (drones)
- Artificial Intelligence, Machine Learning and Deep Learning techniques
- Cartography and topographic information
- Multi-source data integration is essential to produce value-adding products (space-based and in situ observations)

UNESCO World Heritage and World Heritage in Danger



World Heritage

Heritage is our legacy from the past, what we live with today, and what we pass on to future generations. Our cultural and natural heritage are both irreplaceable sources of life and inspiration.

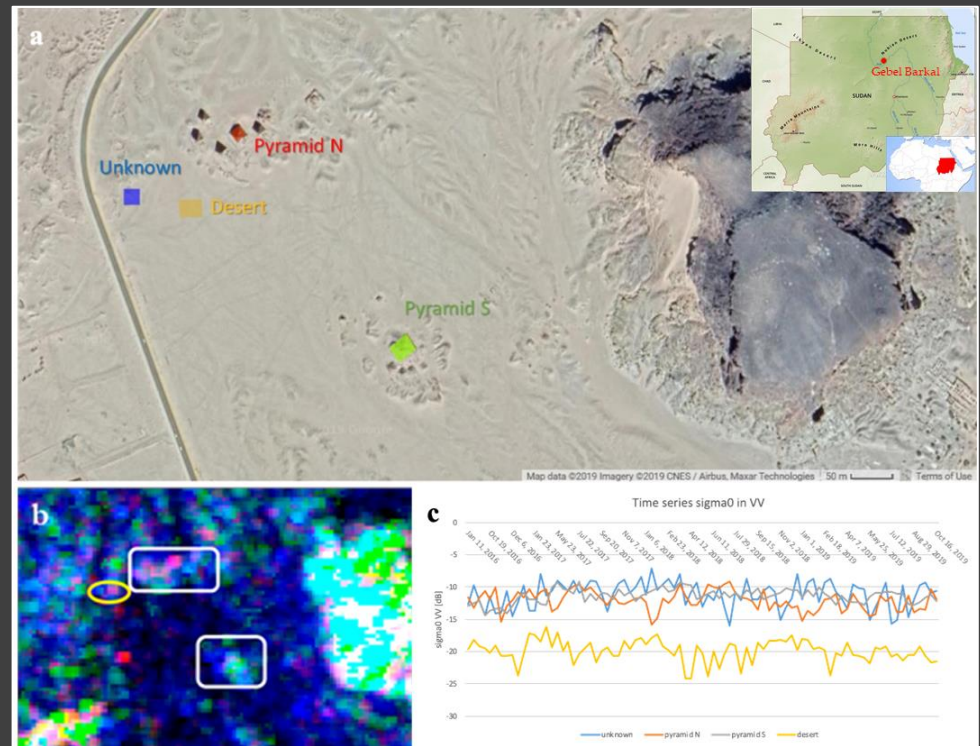
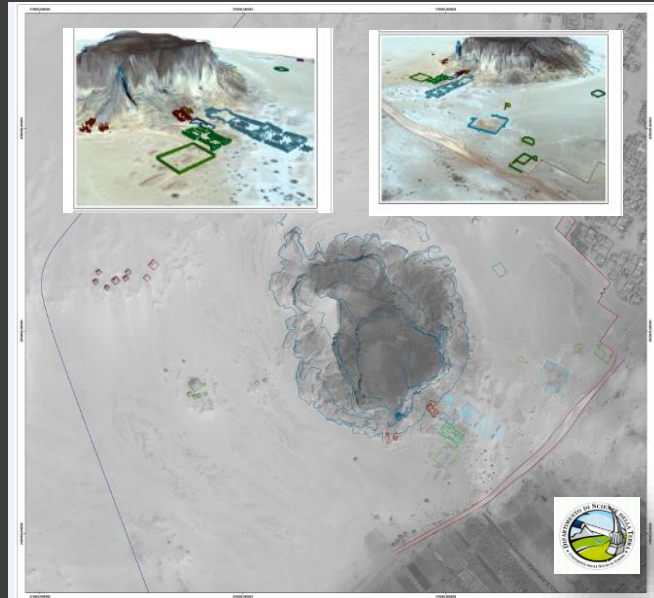


Places as unique and diverse as the wilds of East Africa's Serengeti, the Pyramids of Egypt, the Great Barrier Reef in Australia and the Baroque cathedrals of Latin America make up our world's heritage.

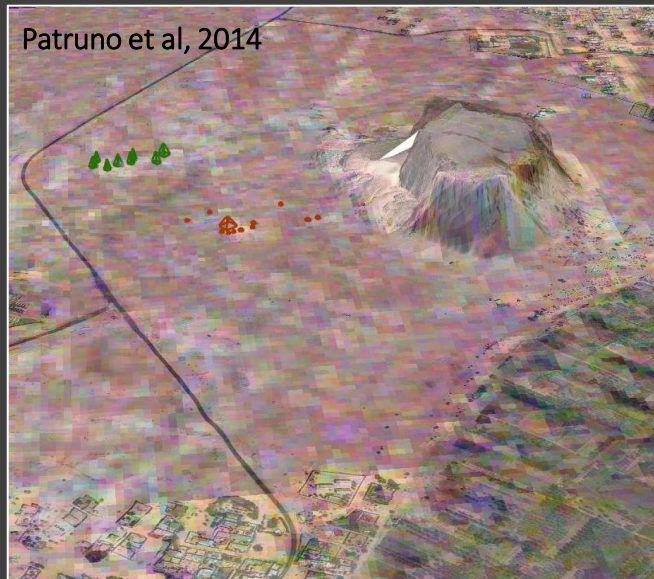
Sites monitoring, detection (buried sites)

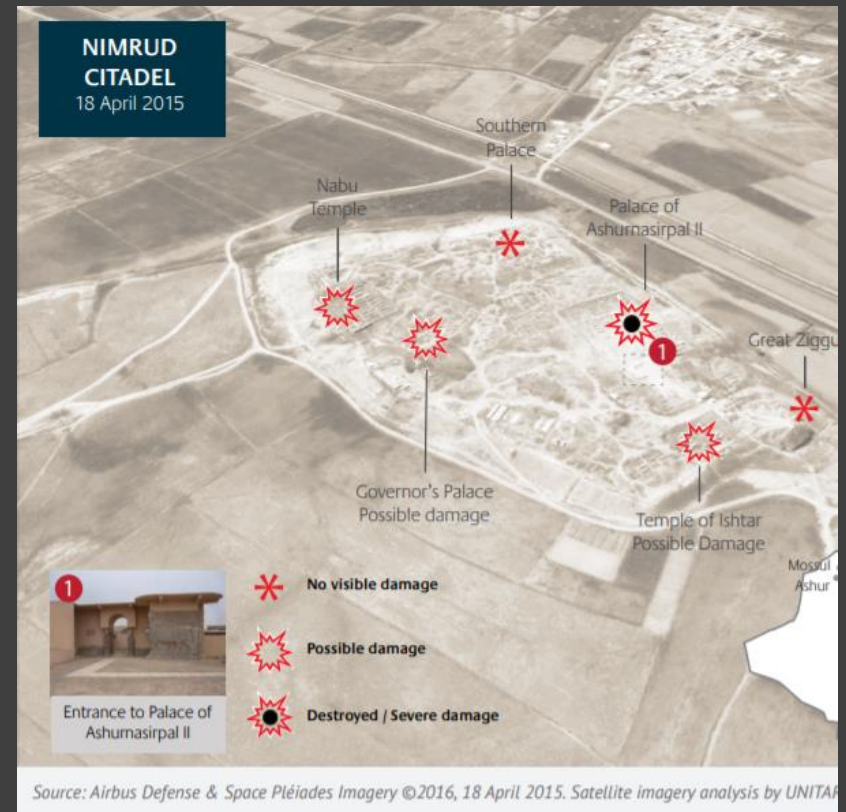
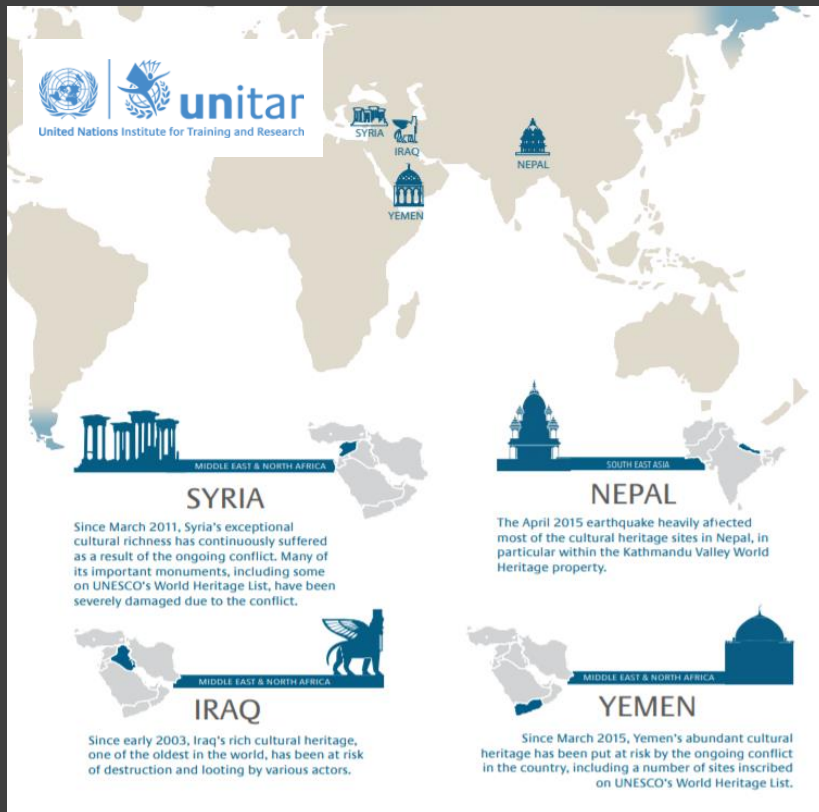
Geographic Information System

- 3D rendering of existing structures
- Cartography from Satellite data
- SAR multi frequency backscatter anomalies in dry environment



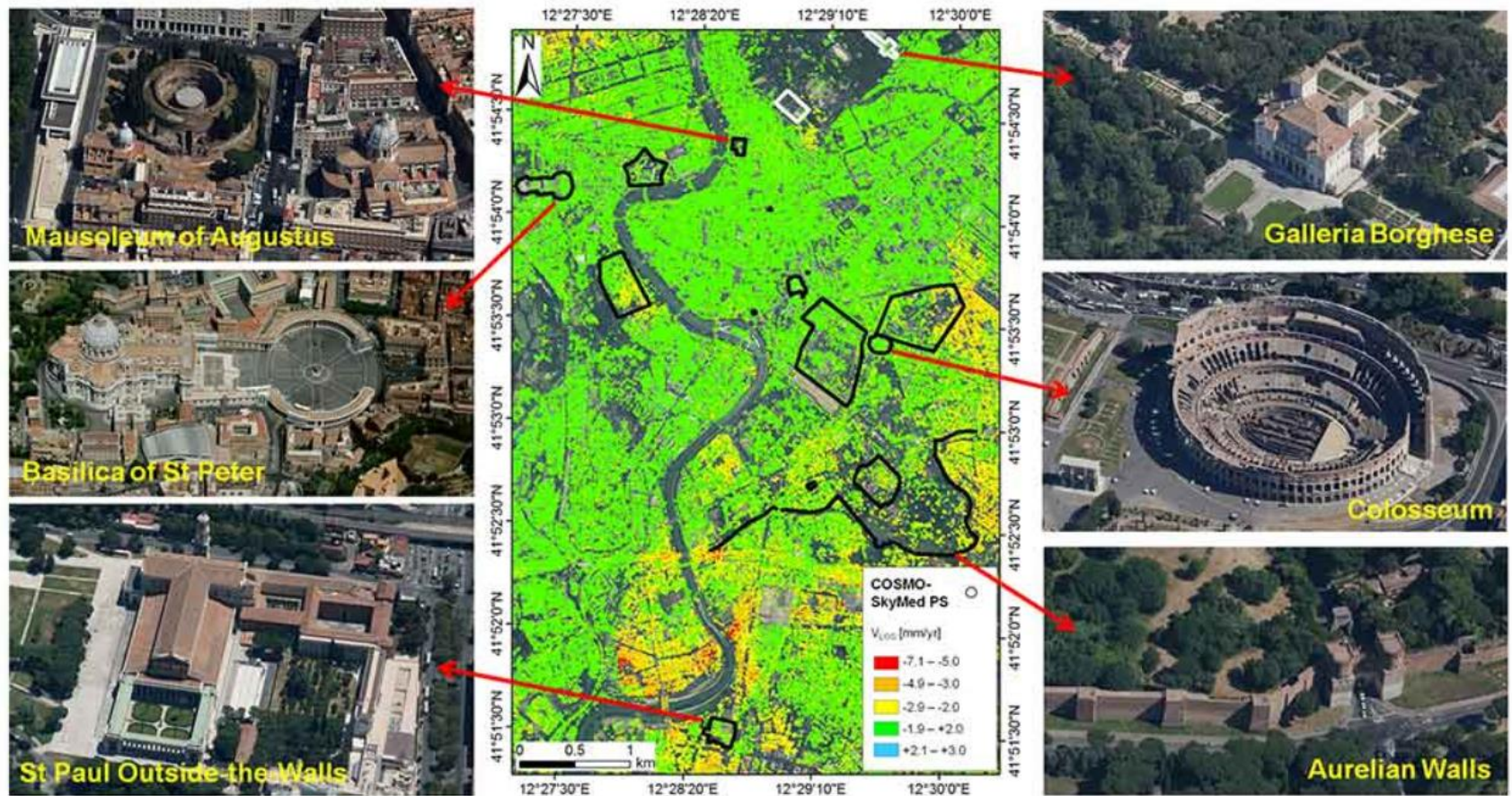
Patruno et al, 2019





Not accessible environments / crisis in cultural areas

- **Preparedness** (identification and analysis, assess the extent of the disaster)
- **Response** (Planning operations)
- **Recovery** (Monitoring of the scene of the disaster)



Cigna et al. 2014

Subsidence, ground motion detection InSAR analysis of ground motion in the Historic Centre of Rome

Contribution of EO services and products such as those from Copernicus and Contributing Missions in last years for Cultural Heritage

- Management of cultural heritage during emergencies (especially in the case of geo-hazards)
- Mapping, monitoring, preservation and management of cultural heritage become a daily routine



Copernicus Sentinel Data



**ESA and TPM Earth
Observation Data**



Explore our Missions

AWARENESS

Ad-hoc activities must be based on the usage of available Copernicus products in collaboration with the CH community in order to improve the knowledge about the Copernicus offering and potential.

Future perspective and way forward



Harbor of Trajan in Sentinel-1 acquisition. Pottier et al, 2016

Privilege preventive actions
than reactive ones:

High frequency of
observations

High and very-high
resolution imagery

Strengthen the communication and the synergies between EO experts and
Cultural Heritage management towards effective valorisation plans

Provide user-ready products (connection between the data providers and the
end-users - site managers)

Supporting the generation of processes and practices for technology and
Cultural Heritage

Space for Twin Cities - Cultural Heritage

Thank you

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