



Protection of European Cultural Heritage from geo – hazards: the PROTHEGO project.

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Tangible cultural heritage includes various categories of monuments and sites, from cultural landscapes and sacred sites to archaeological complexes, individual architectural or artistic monuments and historic urban centers. Such places are continuously impacted and weathered by several internal and external factors, both natural and human-induced, with rapid and/or slow onset, including natural hazards, such as earthquakes or extreme meteorological events, cumulative processes as well as the effects of humans, especially in conflict situations. A clear picture of endangered sites is not available. In particular, the list of List of World Heritage in danger mainly focuses on sites threaten by armed conflicts. New space technology based on radar interferometry (InSAR) is now capable to monitor, since 1992 and with mm precision, surface deformation for reflective targets named persistent scatterers, which consistently return stable signals to the radar satellites. Led by the Italian Institute for Environmental Protection and Research, and in collaboration with NERC British Geological Survey, Geological and Mining Institute of Spain, University of Milano-Bicocca and Cyprus University of Technology, the project PROTHEGO, co-funded in the framework of JPI on Cultural Heritage EU programme (2015-2018), will make an innovative contribution towards the analysis of geo-hazards in areas of cultural heritage in Europe. The project will apply novel InSAR techniques to monitor monuments and sites that are potentially unstable due to landslides, sinkholes, settlement, subsidence, active tectonics as well as structural deformation, all of which could be effected of climate change and human interaction. To magnify the impact of the project, the approach will be implemented in more than 400 sites on the UNESCO World Heritage List in geographical Europe. After the remote sensing investigation, detailed geological interpretation, hazard analysis, local-scale monitoring, advanced modeling and field surveying for the most critical sites will be carried out to discover cause and extent of the observed motions. PROTHEGO will enhance Cultural Heritage management at National level, reinforcing institutional support and governance through knowledge and innovation, identifying, assessing and monitoring risks, strengthening disaster preparedness at heritage properties in the future. PROTHEGO will provide a new remote sensing tool and a new methodological approach, for the safety management of cultural heritage, at low cost and covering monuments and sites located in Europe. The project will promote 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. The tools developed during the project (e.g. GIS platform, project web sites, European Hazards database assessment, Guidelines, best practices) will be useful to policy makers (public and private) in the field of cultural heritage to inform decision making based on the integrated risk assessment. The outcomes of PROTHEGO will support correct planning and rebalancing the contrast between endogenous (structural and materials decay, the societal development, the anthropogenic pressure) and surrounding exogenous forces (natural hazards acting on the heritage) which affecting the European cultural heritage