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The GEPATAR project: GEotechnical and Patrimonial Archives Toolbox for ARchitectural conservation in Belgium

Jan Walstra (1), Pierre-Yves Declercq (1), Christian Barbier (2), Leidy Bejarano-Urrego (3), Dominique Derauw (2), Anastasios Drougkas (3), Roald Hayen (4), Francois-Philippe Hocquet (4), Juan Lopez (5), Michal Shimoni (5), Koen Van Balen (3), and Els Verstrynge (3)

(1) Geological Survey of Belgium, Royal Belgian Institute of Natural Sciences, Brussels, Belgium (jan.walstra@naturalsciences.be), (2) Centre Spatial de Liège, Liège, Belgium, (3) Department of Civil Engineering, Katholieke Universiteit Leuven, Leuven, Belgium, (4) Royal Institute for Cultural Heritage, Brussels, Belgium, (5) Signal and Image Centre, Royal Military Academy, Brussels, Belgium

Belgium is well-known for its diverse collection of built heritage, visited every year by millions of people. Because of its cultural and economic importance, conservation is a priority at both federal and regional levels. Monuments may suffer from structural instabilities related to industrial and urban development, such as groundwater extraction, mining and excavation activities. Adequate protection and preservation requires an integrated analysis of environmental, architectural and historical parameters.

The aim of the GEPATAR project is to create an online interactive geo-information tool that integrates information about Belgian heritage buildings and the occurrence of ground movements. The toolbox will allow the user to view and be informed about buildings potentially at risk due to differential ground movements and thus help improving the management of built patrimony.

Countrywide deformation maps spanning nearly 25 years were produced by applying advanced multi-temporal InSAR techniques to time-series of SAR data. We used StaMPS (Stanford Method for Persistent Scatterers; Hooper et al. 2012) to process ERS-1/2 and Envisat archive data and MSBAS (Multidimensional Small Baseline Subsets; Samsonov & d'Oreye 2012) to combine both ascending and descending tracks of Sentinel-1. High-resolution deformation maps of selected urban centres were obtained by processing VHR SAR data (TerraSAR-X and CosmoSkyMed).

Within the GEPATAR toolbox, the country-scale deformation maps are integrated with other geo-data layers such as geology, land-use and the location of the built heritage; feature-based data fusion techniques and decision rules based on geomechanical expertise are combined to create ground movement risk maps. At the local scale the fusion process is more complicated due to the inclusion of non-spatial datasets, such as photographic and historical surveys, architectural and geotechnical data; at this scale decision rules are provided by engineering and architectural expertise. The output risk maps will be regularly updated with the availability of new SAR acquisitions.

Some selected case-studies will be investigated at high resolution by means of on-site monitoring techniques as well as stability analysis to evaluate the applied approaches.

References:
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