Overview of the ground movements highlighted by the Persistent Scatterer Technique (PSI) in Belgium

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GEPATAR
GEotechnical and Patrimonial Archives Toolbox for ARchitectural conservation in Belgium

Royal Belgian Institute of Natural Sciences, Geological Survey of Belgium

Royal Military Academy, Signal and Image Centre

University of Liège, Centre Spatial de Liège

Royal Institute for Cultural Heritage, Laboratories

KU Leuven, Raymond Lemaire International Centre for Conservation
Objectives: development of a toolbox to help identifying built heritage at risk, using advanced image processing (PS-InSAR) and integral analysis of the GSB and RICH archives
GEPATAR
GEotechnical and Patrimonial Archives Toolbox for ARchitectural conservation in Belgium
Ground movement hazards in Belgium:
- Compaction of soft sediments
- (Past) mining activities
- Groundwater extraction & recharge
- Landslides
ERS (1992-2001): PSI point density, 200 x 200 m grid
ENVISAT (2003-2010): tracks 466/423/380, 48/75/67 scenes, 1,653,202 PSI points
ENVISAT (2003-2010): PSI point density, 200 x 200 m grid
Ground subsidence in the Scheldt estuary
ERS1/2: 1992-2001

ENVISAT: 2003-2010

Mean velocity (mm/yr)
- < -4
- -4/-2
- -2/-1
- -1/-0.5
- -0.5/+0.5
- +0.5/+1
- +1/+2
- > +2
Spatial extent of soft Holocene deposits
Antwerp (Dutch synagogue): Geotechnical map
Antwerp (Dutch synagogue): ERS PSI points
Antwerp (Dutch synagogue): ENVISAT PSI points
Mining activities in the Campine coal basin
Mining activities in the Campine coal basin, Limburg:

ENVISAT PSI points (2003-2010) >
Concession areas are indicated

< ERS PSI points (1992-2000)
Mining activities in the Campine coal basin, Limburg:

After closure groundwater pumping activities were abandoned, recharge of aquifers leads to hydrostatic overpressure and elastic rebound (uplift). West and east are at different stages of recharge. (pumping stopped in 1986-1988 vs. 1991-1992)
Zolder: ERS mean velocity
Zolder (St-Vincentius’ Church): ERS PSI points
Zolder: ENVISAT mean velocity
Zolder (St-Vincentius’ Church): ENVISAT PSI points
Brussels on the rise
Brussels: ERS mean velocity
Brussels (Cathedral of Saint-Michael & Saint-Gudula): ERS PSI points
Brussels: ENVISAT mean velocity
Brussels (Cathedral of Saint-Michael & Saint-Gudula): ENVISAT PSI points
Since early 1980s: water demanding industries abandoned city centre, recharge of Cretaceous aquifer
Outlook

• Case-studies: stability analyses of built heritage at risk
• Processing of high-resolution SAR data
• Creation of risk maps at different scales
• Development of GEPATAR toolbox
The end..

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