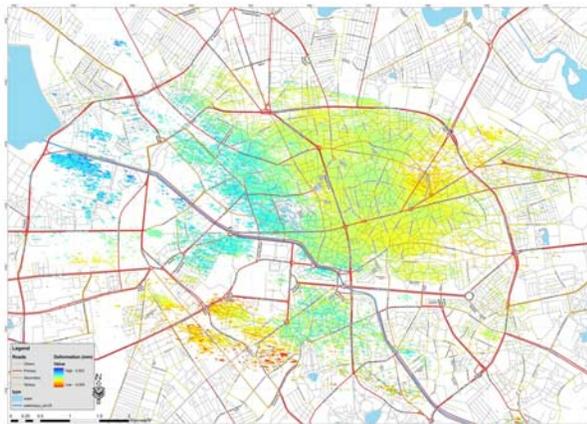


Introduction

Differential Synthetic Aperture Radar Interferometry (DInSAR) is a remote sensing technique used to detect ground displacements up to millimeters accuracy. This technique was applied in two different cases: to generate a deformation map for the urban site of Bucharest, Romania, and to investigate the ground stability around the Siriu water dam in Buzau County, Romania.

Urban site: Bucharest, Romania

Using DInSAR, from 43 ERS 1/2 images acquired between 1992 and 1999 (ESA Cat-1 project), a deformation map for Bucharest was obtained.

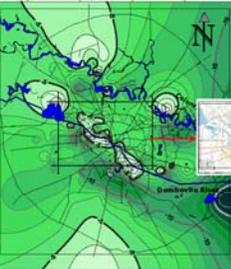


Deformation map of Bucharest obtained by differential interferograms stacking

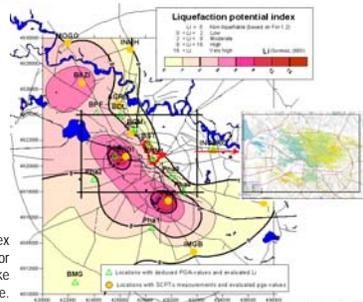
The ASRC deformation map was compared with the results obtained within the Collaborative Research Center - 461 Project "Strong Earthquakes: a Challenge for Geosciences and Civil Engineering", made by Karlsruhe Institute of Technology, Germany. Within the German project, data for the evaluation over the whole city area of Bucharest of the liquefaction probability during strong earthquakes was collected. Thus, higher deformations in the ASRC map correlate with areas of high groundwater level in Bucharest and with areas of high risk of liquefaction in Bucharest. Soil liquefaction is one of the most usual earthquake hazards in areas with near surface sandy layers and high groundwater levels. In Bucharest such areas are situated mainly in parts of the Dambovitza-River meadow.

Depth of groundwater level in the "Colentina" aquifer January 2004

Established at the University of Bucharest, Dept. of Applied Geology, Dr. D. Hanganu



Based on quasi-simultaneous groundwater level measurements within the Colentina aquifer in about 230 hydrogeologic boreholes, a map with contour lines of the groundwater level depths was obtained for the first time for the whole city area of Bucharest.

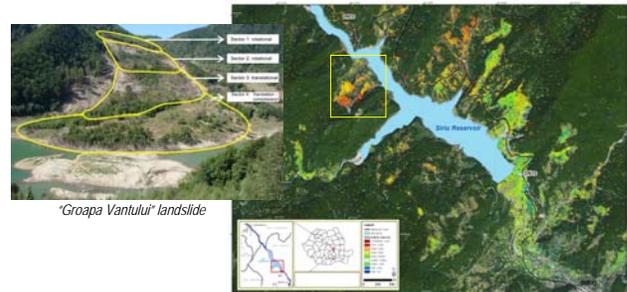


Contour lines of the liquefaction potential index show the liquefaction potential risk for Bucharest, for an earthquake like the 1977-Vrancea earthquake with a 7.2 magnitude.

Water dam site: Siriu, Romania

A deformation map from TerraSAR-X High Resolution Spotlight data for the area of Siriu water dam and surroundings was calculated and a number of 4 natural hazard sites were detected:

1. The landslide "Groapa Vantului" blocked the Siriu Reservoir cuvette in the spring of 2006, causing a major change in the sedimentation regime downstream. The landslide is still active today, as our analysis determined.



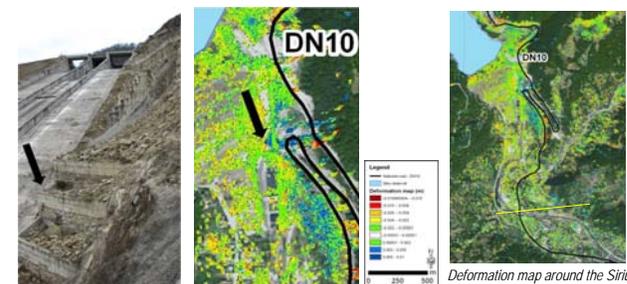
Deformation map around Siriu water dam, displayed over an optical image

2. A small and very active landslide on a steep slope, affecting a national road, was detected. From the deformation map, it can be seen that the landslide continues below the road, leading to the conclusion that the road itself suffers deformation.



East bank landslide affecting a national road (left - photographs, right - deformation map)

3. The water dam spillway channel was built at the base of the eastern slope of the mountain which proved to be unstable due to the rocks cleavage. In the deformation map, the triangular blue shape represents one of the three concrete reinforcements put in place to stabilize the slope. Actually, with DInSAR it can be proved that the concrete reinforcement is also moving along the slide, putting pressure on the spillway.



The spillway channel (left) and deformation map (right)

Deformation map around the Siriu water dam and village

4. The water dam suffers a slow motion away from the sensor (5-6 mm/11 days), as validated by the ground measurements. The motion of the entire Siriu colony block (the urban infrastructure extending about 500 m down the water dam) was also detected.

Acknowledgements

Some of the interferometric processing was performed with the DORIS software from Delft University of Technology, Netherlands. TerraSAR-X data was kindly provided by Infoterra GmbH, Germany.