Geophysical Research Abstracts
Vol. 15, EGU2013-8947, 2013
EGU General Assembly 2013

InSAR imagery pattern matching validation for landslide assessment

Manole-Stelian Serbulea (1), Radu Gogu (1), Delia Teleaga (2), Daniel Marcel Manoli (1), Adrian Priceputu (1), Dragos Stefan Gaitanaru (1), Constantin Ungureanu (1), Alexandra Anghel (1), Adrian Andronic (1), Alexandru Niculescu (1), and Adrian Liviu Bugea (1)

(1) Technical University of Civil Engineering Bucharest, Romania (mserbulea@gmail.com), (2) Advanced Studies and Research Center Bucharest, Romania (delia.teleaga@asrc.ro)

The need for identifying over large areas ongoing instability phenomena and spotting the old ones pushed the boundaries of geotechnical engineering from numerical modeling and point-wise in-situ measurements towards geodesic and geographic sciences.

Regardless of the ground-based monitoring techniques' precision and reliability, a larger scale monitoring is often useful to either better correlate the scattered results or to identify additional monitoring points. Using aerial ortho-photogrammetry and site visit recognition represent a good, yet costly method to obtain qualitative information about old inactive landslides. A more suitable approach is using ground-based or satellite radar interferometry (InSAR). The obvious disadvantage of the ground-based system is that the monitoring has to be carried out on a predetermined site while the space-borne system may be set to collect information from various sites in range by each successive passing. The quantitative results acquired through the means of InSAR provide a precise set of information regarding the soil surface displacement, with high accuracy and reliability. They provide a great means of identifying danger zones as well as a way of calibrating and augmenting the classical monitoring techniques.

This work describes the possibility of integrating the InSAR measurements with the ground monitoring techniques to identify landslide occurrence hazard and reveal the whole of affected areas even when minute symptoms develop. One of the objectives is to propose InSAR monitoring as a fast and efficient mapping tool to help authorities minimize the damage produced by landslides. It can also provide engineers and scientists additional information to further study landslides dynamics phenomena (such as propagation).

Interferometry on SAR data uses phase values from two radar images. When a point changes position, the distance between it and the sensor alters, modifying the phase of the signal. This change is used to quantify the point displacement.

The set of maps resulted from analysis show the displacement field of the landslides or the velocity-time diagrams, making this kind of information vital for early detection of changes in the landslide state of activity. Furthermore, the analysis of cumulative displacement maps in a quasi-continuous surface allows identification of a landslide characterized by different patterns, indicating partial activations or other site-specific surface processes. The research carried-out proposes calibrating pattern recognition algorithms by classical on-site monitoring such as topographical and inclinometrical surveys. The image processing provides information about the dynamics of vertical displacements of soil surface and can be used to identify both landslide type and horizontal geometry giving hints about the total displaced mass.

This work was supported by a grant of the Romanian National Authority for Scientific Research, Program for research – Space Technology and Advanced Research – STAR, project number 30/2012.