Geophysical Research Abstracts
Vol. 16, EGU2014-10702, 2014
EGU General Assembly 2014

Long term landslide monitoring with Ground Based SAR

Oriol Monserrat (1), Michele Crosetto (1), Guido Luzi (1), Josep Gili (2), Jose Moya (2), and Jordi Corominas (2)

(1) Geomatics Division, Centre Tecnologic de Telecomunicacions de Catalunya, Av. Carl Friedrich Gauss, 11, Castelldefels (Spain), (2) Dept. of Geotechnical Engineering and Geosciences, Technical University of Catalonia-BarcelonaTech, Barcelona, (Spain)

In the last decade, Ground-Based (GBSAR) has proven to be a reliable microwave Remote Sensing technique in several application fields, especially for unstable slopes monitoring. GBSAR can provide displacement measurements over few squared kilometres areas and with a very high spatial and temporal resolution.

This work is focused on the use of GBSAR technique for long term landslide monitoring based on a particular data acquisition configuration, which is called discontinuous GBSAR (D-GBSAR). In the most commonly used GBSAR configuration, the radar is left installed in situ, acquiring data periodically, e.g. every few minutes. Deformations are estimated by processing sets of GBSAR images acquired during several weeks or months, without moving the system. By contrast, in the D-GBSAR the radar is installed and dismounted at each measurement campaign, revisiting a given site periodically. This configuration is useful to monitor slow deformation phenomena.

In this work, two alternative ways for exploiting the D-GBSAR technique will be presented: the DInSAR technique and the Amplitude based Technique. The former is based on the exploitation of the phase component of the acquired SAR images and it allows providing millimetric precision on the deformation estimates. However, this technique presents several limitations like the reduction of measurable points with an increase in the period of observation, the ambiguous nature of the phase measurements, and the influence of the atmospheric phase component that can make it non applicable in some cases, specially when working in natural environments. The second approach, that is based on the use of the amplitude component of GB-SAR images combined with a image matching technique, will allow the estimation of the displacements over specific targets avoiding two of the limitations commented above: the phase unwrapping and atmosphere contribution but reducing the deformation measurement precision.

Two successful examples of D-GBSAR landslide monitoring will be analysed and discussed: the first example is based on DInSAR and concerns to an urban landslide located in Barberà de la Conca (Catalonia, Spain). This village has experienced deformations since 2011 that have caused cracks in the church and several buildings. The results of a one year and half monitoring will be shown. The second example is based on the amplitude based approach and concerns to the active landslide of Vallcebre (Eastern Pyrenees, Spain). For this site, the results of eight campaigns during a period of 19 months were performed. During this period displacements of up to 80 cm were measured.