

DInSAR vs. Wire Extensometer Calibration, and GBSAR First Survey at the Vallcebre Landslide (Spain)

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The Technical University of Catalonia (UPC) group collaborates in the Area 4 of the SAFELAND project. It is composed of researchers from the Geotechnical Engineering and Geosciences Dpt., the Signal Theory and Communications Dpt. and the Institute of Geomatics. The leaders of this group for SAFELAND are Prof. J. COROMINAS and Prof. E. ALONSO.

The work carried out by the UPC in Area 4 up to now has been presented by J.A. GILI on behalf of the group. We have some expertise in general DInSAR (Differential Radar Interferometry) monitoring with ENVISAT images that is currently extended to TerraSAR-X images. The Institute of Geomatics owns a GBSAR (Ground Based Synthetic Aperture Radar) system (IBIS-L model from Ingegneria Dei Sistemi – IDS; working in the Ku band, 17.1 GHz), and the Signal Theory and the Communications Dpt. have developed a R&D GBSAR prototype system that can work in the K, X and C bands, with polarimetric capabilities (PIPIA et al., 2009). We are in the initial steps for the application of both the DInSAR and the GBSAR techniques to landslide monitoring. As field sites for the SAFELAND project, we are considering the Vallcebre landslide (NE of Spain) and the Canillo landslide (Andorra).

DInSAR vs. Wire Extensometer Calibration

When possible, it is desirable to compare the modern and the classical techniques in order to calibrate their results and to validate the new methodologies as well. We have carried out a DInSAR versus wire extensometer calibration in the Vallcebre Landslide (Figure 1).

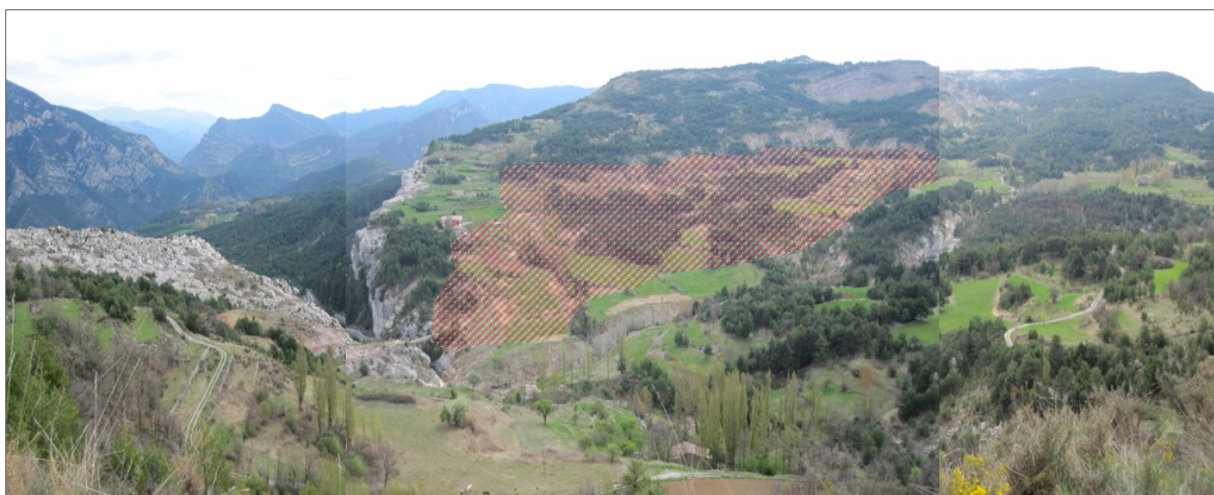


Fig. 1: The Vallcebre landslide (Eastern Pyrenees, Spain).

The Vallcebre landslide is a translational one where a 5–30 m layer of clayey limes and silts slide over a limestone rockbed. Its behaviour is closely related with the rain and the water presence and pressure inside the slope, registering velocities between 0.2 and 1.5 m per year. Since 1985, we have installed and used several monitoring systems there (surveying, piezometers, inclinometers, rain gauges, GPS, wire extensometers...). In November 2006, we installed seven corner reflectors to enhance the performance of DInSAR techniques (Figure 2). The cross-checking of the DInSAR results versus the displacements derived from the wire extensometers has been carried out in 2007 and 2008, and some preliminary results have been obtained (GILI et al., 2009).

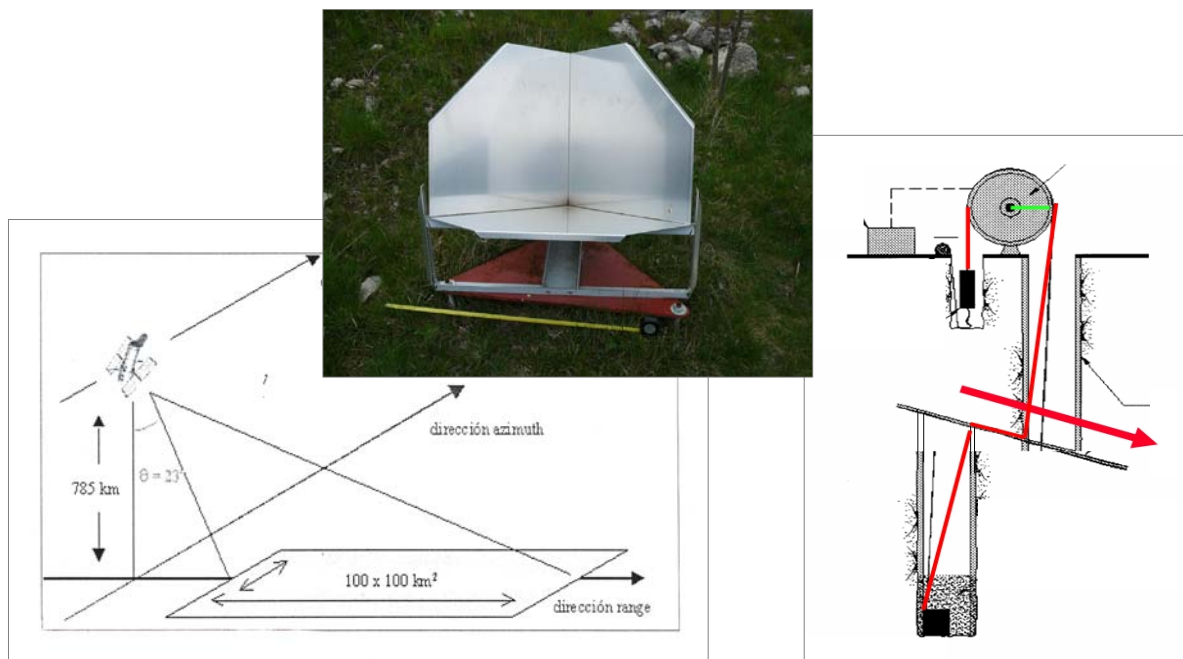


Fig. 2: The DInSAR technique (left, CROSETTO et al., 2009) has been calibrated in several corner reflectors (center) versus the wire extensometer displacement (right, COROMINAS et al., 2000).

GBSAR First Surveys

This winter has been quite harsh, which complicated the field works in the Pyrenees range. However, several preliminary GBSAR campaigns have been carried out in Canillo and Vallcebre (Figure 3) in order to prepare the real start of the GBSAR monitoring. This will help the SAFELAND project to assess the advantages and drawbacks of this technique as landslide monitoring and early warning system.



Fig. 3: The IBIS-L-IDS GBSAR system installed in front of the Vallcebre landslide by the Institute of Geomatics for the first tests. A number of mini-corners (right) were deployed in the scene.

References

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