Doctoral Thesis Title: Mass movement monitoring through the integration of GNSS solutions, multispectral, multitemporal and multiscale sensors.

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Abstract: Ecuador, due to its geographical location, has constant tectonic and volcanic activity, at the macro level, and landslides, at the micro level; the latter can result in the loss of human lives and affect important infrastructure (Avilés, Cañar, & Andrade, 2017).

One of the characteristics for geohazard risk analysis is the definition of where and with what magnitude a given geohazard is affecting a territory at different spatial scales, ranging from a single city to an entire region (Solari, et al., 2017).

It is thus that radar remote sensing techniques are particularly suitable for multiscale analysis of ground deformations (Fell, et al., 2008). Differential InSAR represents the first widely used technique to exploit the phase difference (interferogram) between two radar images to derive ground displacements with millimeter accuracy (Massonnet & Feigl, 1998).

The need to monitor and track slopes due to mass movements, being one of the most costly and fatal hazards and risks, requires the use of different data acquisition methods such as topographic surveys with Global Navigation Satellite Systems (GNSS) receivers, photogrammetric techniques and satellite imagery. Since DInSAR can be used to quantify surface displacement over large areas, it has application for mass movement monitoring, and has potential to be proposed as part of a monitoring plan (Wempen, 2019).

The Doctoral Thesis project aims to develop a monitoring methodology through the processing of satellite images, covering the multispectral part, as well as data from DInsar radar images, analyzing the data at different spatial resolution and scale; These data will be validated by means of different methods of geospatial information survey (GNSS, photogrammetry and remote sensing - RPAS -) in a sample of subsidence that allow using the large amount of data obtained, in order to detect the areas of deformation by mass movements that could be due to active subsidence in the study area of the Imbabura Geopark - Ecuador.

Available Means: Copernicus satellite images (free of charge), photogrammetric, remote sensing and modeling hardware and software available at the Department of Cartographic Engineering, Geodesy and Photogrammetry of the UPV.

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