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Using DInSAR as a tool to detect unstable terrain areas in an Andes region in Ecuador (South America)

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1. INTRODUCTION

Monitoring landslides is a mandatory task in charge on the National Institute of Geological Research (INIGEMM) in Ecuador. It is a small country, supposedly will be faster doing monitoring, but what about its geographic characteristics? Lamentably, due to human and financial resources is not possible to put monitoring systems in unstable terrain areas. However, getting ALOS data to accessible price and using open source software to produce interferograms, could be a first step to know steep areas covered by vegetation and where mass movements are not visible.

Under this statement, this study is part of the final research in a master study developed at CONAE during 2009-2011, with oral defense in August 2013.

As a new technique used in Ecuador, the study processed radar data from ERS-1/2 and ALOS sensor PALSAR for getting differential interferograms, using ROI_PAC software. Stacking DInSAR is applied to get an average of displacement that indicates uplift and subsidence in the whole radar scene that covers two provinces in the Andes region.

2. PROBLEM

Mass movements are present in the whole territory, independently of their magnitude and dynamic (slow or fast), they are a latent threat in winter season specially.

There are registers of monitoring, such as two GPS's campaigns and artisanal extensometers, which are used to contrast with DInSAR results. However, the campaigns are shorter and extensometers are no trust on all.

3. METHODOLOGY

Methodology has four phases of development: (1) Pre-processing of RAW data; (2) Processing of RAW data in ROI_PAC; (3) Post-processing for getting interferograms in units of cm per year; (4) Analysis of the results and comparison with ground truth.

Sandwell & Price (1998) proposed Stacking technique to increase the fringes and decrease errors due to the atmosphere, to average several interferograms. L band penetrates deeper into vegetation cover than C band (Raucoules et al., 2007). The study processed ERS with descending orbit and ALOS with ascending orbit, due to the availability of data. Ferretti et al. (2007) said that ERS looks to the right and a slope mainly oriented to the west could have foreshortening effect in ascending orbit.

Wei & Sandwell (2010) mention that ALOS in ascending orbit identifies vertical mass movements along fault systems; however, descending data has better geometry to measure mass movements. The study has fewer scenes in descending orbit. For further work, ALOS 2 will let to have more data in descending orbit.

4. CENTRAL CONCLUSIONS

For mass movement having high-resolution radar is the best option; however, this data is not useful on all due to cover vegetation.

Characterizing mass movements in Ecuador in necessary to put monitoring systems to avoid economic and human lost.

Processing ERS and ALOS data was very useful because penetration band results were clearly identified in coherence masks.

The result of Stacking DInSAR did not show clearly fringes, indeed the amount of interferograms were no enough for this technique.

Researching other DInSAR techniques is necessary due to the singular characteristics of Ecuador.

5. REFERENCES

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