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Título / Autores / Institución

TÍTULO DE LA PONENCIA

Application of the multi-interferogram method for measuring post-seismic deformation between 2014 and 2024 in the Eje Cafetero region

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Estilo preferido

ESTILO DE PRESENTACIÓN

- Poster

Categoría del resumen

ÁREA TEMÁTICA

Sistemas de información geográfica

LINEAS TEMÁTICAS SIG

Sensores remotos

Resumen

PALABRAS CLAVE

Interferometry, Synthetic Aperture Radar, PI-RATE, Multi-interferogram method, Surface deformation, Stacking map, Eje Cafetero, Colombia

CONTENIDO DEL RESUMEN

The interaction between the tectonic plates in Colombia (Nazca, Caribbean and South American) has caused a complex deformation of the crust throughout geologic time. This is particularly evident in the Eje Cafetero region where there is a wide development of geological structures, marked seismic activity and the presence of active volcanoes. Besides being a region classified with a Strong to Severe Expected Seismic Intensity (SGC, 2020), it has experienced high impact events such as the Armenia earthquake (Mw 6.1) in 1999. Since SAR images corresponding to the dates of that seismic event were not found, a post-seismic analysis was carried out to



evaluate the surface deformation accumulated after this event. This study presents a summary of the geological context of this region and the interferogram processing using PI-RATE (Poly-Interferogram Rate And Time-series Estimator) software (Wang et al., 2012), which is based on the multi-interferogram method (Biggs et al., 2007). This analysis was performed by processing a series of interferograms available between 2014 and 2024 (Wright et al., 2016; Lazecký et al., 2020), with the aim of estimating displacement rates and detecting possible post-seismic relaxation processes or residual deformation in the region. In total, 39 maps were obtained, including coherence, error and stacking maps for each trajectory. Sectors were identified that presented changes in the land surface, such as the area of greatest influx of volcanic foci in Los Nevados NP with an increase in topography due to volcanic activity. The reverse behavior of the Mulatos, Honda and Cambao faults was also identified on the edges of the Middle Magdalena Valley. However, for many geological structures in the study area, the interpretation of the values obtained near them was difficult due to the degree of uncertainty in the results as a consequence of topographic variability and abundant vegetation. On the other hand, to the south of the study area a subsidence was observed that does not appear to be related to any geological structure. Although no considerable deformation was identified that could represent a risk for the communities located in this region, it is still considered an area of intermediate to high seismic threat according to the Colombian Geological Service (Arcila et al., 2020), due to the volcanic and tectonic context in which it is located.

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CALI 2025



Meeting Abstracts, 2016, G23A-1037.