



Cities on Volcanoes 9
November 20-25, 2016
Puerto Varas, Chile

'Understanding volcanoes and society: the key for risk mitigation'



First assessment of volcanic surface deformation in Colombia with Sentinel-1 InSAR Data

Scott Henderson, Jill Pearse, Mario Angarita, Natalia Pardo, Nataly Ruiz, Helman Bohorquez, Jose Luis Herrera

¹Universidad de Los Andes

²Departamento de Geociencias, Bogota, Colombia

³Universidad Distrital, Departamento de Ingenieria, Bogota, Colombia

Keywords: InSAR, Volcano Deformation, Colombia, Sentinel-1

We present Interferometric Synthetic Aperture Radar (InSAR) observations of active volcanoes in Colombia since April 2015. The Sentinel 1 constellation is the first InSAR system with free data access and weekly acquisitions, but historically C-band measurements have been ineffective in Colombia due to dense vegetation. However, more frequent observations and new processing techniques have the potential to significantly improve InSAR coherence. In practice, are there clear bounds on temporal and spatial baselines for useful interferometry? Do we detect any deformation in the last year correlated to known volcanic activity? How can C-band InSAR augment monitoring of tropical volcanoes, where observing conditions may not be ideal, but where significant threats are posed to nearby population centers? We focus our analysis on the historically most active volcanoes in the Colombian Arc, including Nevado del Ruiz (VEI<3) and Galeras (VEI<2) stratocones, particularly active during the last decade. In addition, Nevado del Huila erupted several times between 02/2007 and 10/2008; Purace is characterized by vulcanian eruptions, the last one in March 1977; and Doña Juana, has experienced recent dome collapses and generation of block-and-ash flows, the last one between 1897 and 1906. However, we have not observed deformation at any volcano between 04/2015 and 08/2016. This is most surprising for Nevado del Ruiz, which has ongoing minor ash venting since April 2012, and a period of known broad uplift between 2012 and 2015. We have found that for conventional Sentinel interferometry a temporal separation of less than 4 months is required to produce useful deformation maps near the summits of active volcanoes in Colombia. Given the spatial extent of coherent regions and resolution of Sentinel-1, regular monitoring should be capable of detecting surface displacements over areas less than 100 km² with offsets of greater than 2 cm between observations.