Recent Deformation around Domuyo Volcano, Argentina Inferred from Time-series Analyses of InSAR Image

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Domuyo volcano, located in the southern Central Andes of Argentina (36°37’S-70°26’W), is a Plio-Pleistocene dome complex hosting at least 14 dacitic lava domes (https://volcano.si.edu/volcano.cfm?vn=357067) and other monogenetic basaltic centers (Astort et al., 2019). It occupies a retroarc position and can be found in the northernmost region of Cordillera del Viento (36°35’ to 36°45’S), a N-S trending basement block crossed and rise by the Cortaderas lineament which is believed to exert a major structural control for the Neogene-to-Quaternary tectonic processes of the area (Galleto et al., 2018).

With a height of 4,702 m the volcano constitutes the highest mountain in the Argentinian Patagonia and is related to an intense geothermal activity field that has been described as a fault controlled system associate with graben-like structures and shoshonitic volcanism developed under extensional regime during the Quaternary (Galleto et al., 2018). Without any historical eruption recorded this volcano was considered dormant, but the recent geophysical analysis has demonstrated unrest ongoing at the volcano. According to Astort et al. (2019), it has been growing at a rate of 12 cm/yr, calculated from the InSAR data. Along with seismic, gravimetric and morphometric data, they studied the deformation around the volcano using Sentinel-1 InSAR images from both ascending and descending orbits, within the 2014-2018 period of time. By applying a Bayesian geodetic inversion in support of the 3D density model inferred from Bouguer anomaly data, they proposed that an inflating subhorizontal sill reservoir at a depth between 4-7 km may be the source of the deformation.

We follow up on the recent deformation using an open-source InSAR time series analysis package, LiCSBAS developed by Morishita et al. (2020), which integrates with the automated Sentinel-1 InSAR processor, LiCSAR (González et al., 2016). It contains modified Copernicus Sentinel data from 2014 through 2020 analysed by the Centre for the Observation and Modelling of Earthquakes, Volcanoes and Tectonics (COMET) of the Natural Environment Research Council, UK, and uses JASMIN, the UK’s collaborative data analysis environment (http://jasmin.ac.uk). The results show the long-lived inflative deformation with the highest displacement rate of about 12 cm/yr at least until January, 2020 since 2014 (Lundgren et al., 2019), even though the rate looks slightly decreased in 2019. We examine potential source models of the deformation based on the Bayesian approach (Bagnardi et al., 2018).

It turns out that LiCSBAS is a powerful tool to perform InSAR time series analysis easily and efficiently without producing interferograms, thanks to the LiCSAR service, and thus it makes volcanologists to concentrate their efforts to monitoring, modeling, and so on.

References: Astort et al. (2019), Remote Sens., 11, 2175, doi:10.3390/rs11182175; Bagnardi et al. (2018), GGG, 19, 2194–2211, https://doi.org/10.1029/2018GC007585; Galleto et al. (2018), J. Struct. Geol., 114, 76-94; González et al. (2016), Abstract G23A-1037 presented at 2016 AGU Fall Meeting; Lundgren et al. (2019), Abstract G33C-0698 presented at 2019 AGU Fall Meeting; Morishita et al. (2020), Remote Sens. 12, 424, doi:10.3390/rs12030424.

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