InSAR data reveal superimposition of local flank instability and volcano-wide inflation at Lastarria volcano, Chile

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Lastarria volcano is located in the north Chilean Andes, at the northern part of Lazufre, an area of long-term and large-scale uplift. Lastarria volcano is characterized by long-lived fumarole activity, concentrating at its summit and the northern and western slopes of the volcano. Recent InSAR observations show that Lastarria is subject to inflation, starting around the year 2000. The inflation is attributed to a magmatic or hydrothermal source at a depth of 1 km that may have an effect on the volcano's flank stability.

Here we investigate ENVISAT time series data to identify regions of flank movements on the slopes of Lastarria volcano. We further analyze the dimension and spatiotemporal characteristics of areas affected by slow landslide motion using data collected by the TerraSAR-X satellite in High Resolution Spotlight mode. We aim to identify and analyze potential coupling of the different deformation processes at work, including (a) the volcano-wide inflation, (b) slow landslide movements, and (c) localized fumarole activity. Landslides and active fumaroles in particular are situated in close proximity or are overlapping so that the deformation signals associated with these processes interfere with each other. Using ground-based infrared camera observations we directly observe how locations of fumaroles and landslides are linked. We also discuss how these different deformation signals might be related to the inflation of the magmatic or hydrothermal source at depth, and infer mechanisms of process coupling.