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A study on the contribution of satellite Radar interferometry to analyse the activity of Aso volcano (Japan)

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Aso volcano (central part of the Kyushu island, Japan) stands out for its large caldera (18 km x 25 km) and intracaldera volcanic central cones younger than 0.1 Ma. Among 17 cones, the only crater which has been active for 80 years is Nakadake, composed by seven craterlets. In the considered time span (2007-2018), only few eruptions occurred. Despite the low intensity activity, ground displacements, detectable through different satellite sensors, can reflect the inflation-deflation cycles of the plumbing system below one of the main inactive crater (Kusasenri).
Using Small Baseline Subset (SBAS), an Advanced Differential Interferometric Synthetic Radar Aperture (A-DInSAR) technique, ALOS Palsar-1 from 2007 to 2011, Sentinel-1 from 2014 to 2018 and ALOS Palsar-2 from 2016 to 2018, Synthetic Aperture Radar (SAR) datasets have been integrated with Global Navigation Satellite System (GNSS) measurements. With the employment of SARscape software, for each time span, velocity maps and displacement time series have been generated to analyse and identify the motion related to the volcanic activity. An important seismic event occurred during the investigated time period: the Mw 7.0 April 16, 2016 Kumamoto earthquake, 60 km far from the caldera rim. Both in SAR and GPS time series, we excluded the coseismic effects to estimate the trend movement due to the Aso activity. The different SAR datasets were compared to each other considering the temporal evolution of deformations: the fluctuating trend detected by C-band Sentinel-1 can be associated with other factors as earthquakes, beyond the volcanic activity. In addition, during Aso volcano unrest periods, a prevalent subsidence of the caldera central part has been observed simultaneously with the degassing activity, as confirmed by L-band Palsar-1 and 2. In conclusion, the results show that, in case of short satellite revisiting time and wavelength, it is possible to detect smaller displacements related to low intensity activities. Nonetheless, sometimes longer revisiting time and wavelength increase the spatial information in vegetated area, as in the case of Aso caldera.