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The 2006-2012 deformation at Sakurajima stratovolcano (Japan) detected via spaceborne multisensor SAR Interferometry

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We analyze the evolution of the ground deformation at Sakurajima active stratovolcano located in the Aira caldera (Kagoshima prefecture Japan). This caldera, extending over more than 20 km, has been formed as a consequence of a huge eruption, occurred 22,000 years ago, that caused a magma chamber collapse.
The Sakurajima volcano is an andesitic cone formed by more recent activity within the caldera, beginning about 13,000 years ago. Its first historical recorded eruption occurred in 963 AD. Most eruptions are Strombolian and Vulcanian and affect only the summit area. The larger explosive (plinian) eruptions occurred in 1471–1476, 1779–1782 and 1914, each producing 1 – 2 km3 of lava and pyroclastic materials. Explosive eruptions of Vulcanian type, with ash emissions, have occurred intermittently from 1955 to 2002. From 2009 to December 2012, a strong and continuous period of volcanic activity has been recorded mainly at the Showa Crater producing plumes that reached altitudes of 1.8-3.5 km.
In order to analyze the active deformation processes of the volcano complex and its surrounding areas, we performed SAR Interferometry (InSAR) techniques by using COSMOSkyMed (X-band) and ALOS (L-band) data. The joint data analysis allowed us to increase the spatial coverage of InSAR measurements., we processed 19 descending and 25 ascending orbit SAR images acquired by ALOS satellite from 2008 to 2011 and 2006 to 2011, respectively; we computed 57 descending and 71 ascending interferograms which were subsequently inverted via SBAS-InSAR algorithm to obtain mean velocity maps and deformation time series. The X-band dataset consists of 20 images acquired only on descending orbits between 2011 and 2012; from this dataset we computed 44 interferograms.
The preliminary analysis of the mean deformation velocity reveals the presence of a consistent uplift signal in the North region of the Sakurajima Island that extends also to the North sector of Kagoshima bay. The corresponding deformation time series are characterized by a strong non linear behavior. More specifically, the general uplift trend is found, interrupted by low amplitude subsidence phenomena. Finally, we argue that the complexity of detected deformation time series could be interpreted as the effect of cyclical periods of inflation and deflation .
This research has been performed within the frame of Italian Space Agency (ASI) and Japan Aerospace Exploration Agency (JAXA) bilateral cooperation. SAR data have been provided by ASI and JAXA within the SAR4Volcanoes project (ASI agreement n. I/034/11/0).