



ID de Contribution: 77

Type: Talk

Towards near-real time monitoring of volcanic deformation and lava flow using Capella SAR images

jeudi 22 mai 2025 11:00 (15 minutes)

Syn-eruptive monitoring of volcanic deformation and surface changes is crucial for timely hazard assessment. Spaceborne Synthetic Aperture Radar (SAR) can reliably provide visually-interpretable images of volcanic edifices at high spatial resolution during day and night, regardless of the weather conditions. Yet, most traditional change detection methods only work between SAR images acquired by the same sensor with the same observation geometry, preventing revisit times of less than several days.

Here, we present a novel method for detecting and measuring syn-eruptive topographic changes on a sub-daily basis using (i) Capella Space high-resolution SAR images acquired with varying geometries during the eruption, that we compare with (ii) a high-resolution Digital Elevation Model acquired years before the eruption. The syn-eruptive SAR amplitude image is correlated against a synthetic image generated from a radiometric terrain model combining the knowledge of the SAR sensor geometry and pre-eruptive topography. The cross-correlation score is used for lava flow mapping, which enables to track the progress of lava flows over time with daily or even sub-daily temporal resolution. Estimated offsets between real and synthetic images provide two independent components of the ground displacement field (in the line-of-sight and in azimuth). Combining multiple images acquired with different viewing geometries gives access to the three components of the displacement field. We apply the method to the Piton de la Fournaise volcano, validating the results against ground-truth data from the OVPF observatory, including daily-resolved lava flow maps produced from traditional approaches and GNSS displacement vectors from permanent and campaign stations.

Speaker information

PhD 2nd year

Author: HAUCK, Arthur (IPGP - UPCité)

Co-auteurs: M. COSTA, Fidel (IPGP - UPCité); M. GRANDIN, Raphaël (IPGP - UPCité)

Orateur: HAUCK, Arthur (IPGP - UPCité)

Classification de Session: Exploring Surfaces and Skies: Planets, Moons, and Earth

Classification de thématique: Earth, Environment and Space Sciences: Remote Sensing