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'Understanding volcanoes and society: the key for risk mitigation'



A multi-scale method for estimating lava-field emplacement by remote sensing data

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On April 3, 2014, the new Sentinel-1 mission was successfully launched, and it started its operational life. Sentinel-1 is equipped with a new SAR instruments that is capable to acquire images of the Earth surface with an innovative mode: the Terrain Observation with Progressive Scan (TOPS) SAR. TOPSAR can take wide swath image of large areas (250 km wide) with medium-high spatial resolution (about 20 m per pixel). The Pico de Fogo (Cape Verde) volcano eruption was the first volcanic event monitored by Sentinel-1. Fogo volcano began its activity on November 23, 2014, after 19 years from the previous eruption. The volcano released a big amount of lava in the caldera. The houses and the unique connection road were destroyed by the lava, and about 1000 inhabitants were evacuated. We used a set of Sentinel-1 images, in TOPSAR mode, along ascending and descending orbit to monitor the lava flow from November 2014 to January 2015, by means of a change detection method. We propose a novel technique based on a multiscale tiling of the change detection images to identify regions with bimodal distribution of pixels values. On the base of the statistic of these tiled areas, the extraction of the lava extent is performed by using an automatic algorithm, which is a combination of distribution fitting, backscatter thresholding and region growing. Beside SAR data, we take the advantage of satellite optical imagery, too. We used images acquired by the multi-spectral sensors on board of Landsat-8, and EO-1 satellite missions. False color representations and change detection on thermal bands, gave additional insights on the dynamic behavior of the lava emplacement.