

X-Band SAR topography changes for pyroclastic density current volume estimation: the 2010 Merapi eruption case study

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Pyroclastic density current deposits remobilized by water during period of heavy rainfall trigger lahars (volcanic mudflows), affecting inhabited areas at considerable distance from volcanoes, even years after an eruption. Here we present an innovative approach to detect and estimate the volume of pyroclastic density current (PDC). We use an airborne Digital Surface Model (DSM) acquired in 2006 and compare it with a post eruption DSM retrieved by means of SAR interferometry (COSMO-SkyMed data) estimating the volume of PDC along the Gendol river (Kali Gendol, KG) deposited during the 2010 Merapi eruption. Results show PDC thicknesses of up to 75 m filling canyons and a volume of about 40×10^6 m³, mainly along KG, and at distances of up to 16 km from the volcano summit. This volume estimation corresponds to the possible volume of removable material along the KG due to the 2010 eruption. The PDC volume estimation is critical for volcanic hazard mitigation, especially for lahar occurrences during rainy season at Merapi. Our technique can also be applied at other active volcanoes to evaluate lahar hazards.