

Exploring a long-lasting volcanic eruption by means of in-soil radon measurements and seismic activity

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We analyze in-soil radon (Rn) emission and ambient parameters (barometric pressure and air temperature measurements) along with seismic activity during the longest flank eruption of this century at Mt. Etna, Italy. This eruption occurred between 14 May 2008 and 6 July 2009, from a N120-140°E eruptive fissure extending between 3050 and 2620 m above sea level. It was heralded by a short-lived (~5 hours) episode of lava fountaining three days before a dike-forming intrusion fed a lava emission, which affected the summit area of the volcano over ~15 months. The peculiar position of the station for the Rn measurement, which was at an altitude of 2950 m above sea level and near (~1 km) the summit active craters, offered us the uncommon chance: i) to explore the temporal development of the gas emission close (<2 km) to the 2008-2009 eruptive vents in the long term, and ii) to analyze the relationship between in-soil Rn fluxes and seismic signals (in particular, local earthquakes and volcanic tremor) during the uninterrupted lava emission. This approach reveals important details about the recharging phases characterizing the 2008-2009 eruption, which are not visible with other methods of investigation. Our study benefitted from the application of methods of pattern classification developed in the framework of the European MEDiterranean Supersite Volcanoes (MEDSUV) project.