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Shallow fluid circulation at Vulcano Island (Aeolian Islands, Italy): a possibile trigger for flank instability?

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The crater of "La Fossa" at Vulcano Island (Aeolian Islands, Italy) since the last eruption, occurred in 1890, is characterized by an intense fumarolic activity. The main fumarolic field is located on the north flank of the inner crater, whereas the release of water vapour from soil spans all over the entire vent, including the sea-facing slopes. The steepest slopes of La Fossa crater have been interested during the last 20 years by instability phenomena, the most important of which was a landslide detached from the sea-facing NE flank in 1988, during the most significant volcanic unrest that affected Vulcano Island in recent times. The search for a possible link between volcanic activity and landslides has been the object of several recent studies, carried out since 2004 within the research activities promoted by the Italian Civil Protection Department, mainly focused on the role played by space and time variability of the fumarolic activity as a possible trigger for flank instability. The triggering mechanisms should be linked to the circulation of water of volcanic origin, deriving from the underground condensation of vapour, able to modify the geo-technical parameters of the volcanic products and/or to create detachment surfaces over which or from which landslides could be generated. The spatial extension of the water vapour release from the soil, with specific reference to the slopes affected in the past by mass movements, has been reconstructed by ground-based and airborne remote-sensed thermal surveys. Once located, a network of continuous monitoring stations has been installed on the main soil thermal anomalies, collecting data of temperature at different depths and suction,

with the aim of ascertaining the existence of variations in the water content of the soil due to endogenous sources. The preliminary data acquired show a good correlation between soil temperature and suction, highlighting how their variations seems to be directly linked to the activity level of the volcanic system and, at least, confirming the possible role of water deriving from condensation of volcanic vapour as a trigger for slope instability.