Evaluation of rockslide hazard on the Vulcano Island

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The island of Vulcano belongs to the Aeolian Islands archipelago in Italy. The main active volcano in Vulcano is La Fossa cone. The island is exposed to many natural hazards, including landslides. Several phenomena such as volcanic eruptions, earthquakes, fumarolic activity and intense rainfall can generate landslides. The northern and eastern parts of la Fossa cone are the most prone to landslide hazard.

In 1988, a rockslide occurred on the northeast flank of La Fossa cone, which generated a small tsunami and was probably triggered by the increase of fumarolic and seismic activity. The volume of rocks involved in this event has been estimated around 200000 m3 by pre- and post- event modeling studies. Present investigations on the field lead to an estimation of the volume of the 1988 landslide closer to 100'000 m3 and they have allowed identifying a residual unstable rock volume, comprised in the existing scar, of around 39000 m3 that could be mobilized as rockslide. No current fumarolic activity was observed near the unstable volume.

The northern flank of the La Fossa cone is located above a populated area, the village of Porto. The survey of this area has allowed the identification of four unstable zones. We have specially focused on the cliff overhanging the Forgie craters because of the potential risk for the village below. Strong fumarolic alterations and open fractures characterize the studied area. The instable volume identified in this area could be mobilized by toppling or sliding. Three blocks of about 75 m3 have been located on this flank, which are partly detached from the adjacent side and could be involved in toppling. A larger area could be also involved in rockfalls and rockslides. Three different scenarios have been considered with different volumes. The worst-case scenario estimates a volume of around 8000 m3 and a series of numerical simulation has been carried out with the 2D discrete element code WinMimes developed at the Massachusetts Institute of Technology. The resulting outcomes have allowed us to also compile a propagation map.