



## **A multidisciplinary study for the definition of lahars probabilistic hazard maps at Vesuvius**

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Volcanic mudflows generated by the remobilization of pyroclastic material, commonly known as lahars, pose a high threat to population and infrastructure in the circumvesuvian plains and in the adjacent Apennine valleys. The deposits most affected by heavy rain mobilization are both fallout and pyroclastic flows, mainly related to recent plinian and sub-plinian eruptions of Vesuvius. The assessment of the hazard associated with lahar must consider several aspects that include i) the identification of potential areas of origin, ii) heavy or persistent rain events able to generate deposit mobilization, iii) the extension and the characteristics of the potential flow, iv) the ability to modify the flow properties along the path related to water content, erosion and solid load deposition (which can alter the topography), v) the frequency of such events in the past. We present the results of a multidisciplinary effort to tackle these points for the Vesuvian area. Field studies have shown that areas involved in the deposition of lahar associated with past eruptions are much wider than those directly affected by the deposition of primary products of the eruptions. Field and laboratory investigations allowed, for selected cases, the characterization of the source and the invasion areas, the lithological and sedimentological properties of the mobilized deposits and their interactions with the pre-existing topography. Particular attention has been paid to the syneruptive lahars of the 472 AD eruption, characterized by the greatest areal distribution in the northern plain and Apennine valleys. Field and laboratory data analysis were used to calibrate and define the source area for an ad hoc numerical model based on the shallow layer approach. The model has been first validated with analytical solutions, then used to perform a sensitivity study and finally to produce probabilistic hazard maps in the circumvesuvian area.

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