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The engineering-geology model of the M.Pacì rock-avalanche (Scilla, southern Italy), triggered by the 1783 Calabria earthquake

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The Monte Pacì rock-avalanche (Calabria, Italy) was triggered by the 6^{th} March 1783 "Terremoto delle Calabrie" earthquake.

The results of the submarine geophysical investigation (Bosman et al., 2006) coupled with the geomorphological analysis of the subaerial slope supported by the historical documentation (Bozzano et al., 2006) allowed us to recognise a complex large subaerial and submarine slope movement: the estimated detached volume is of about 3 Mm^3 in the submarine part and of about 5 Mm^3 in the sub-aerial one. It is largely accepted by the scientific community that the seismically induced landslide was responsible for the well known 1783 Scilla tsunami (Bosman et al., 2006; Bozzano et al., 2006; Gerardi et al., 2006; Graziani et al., 2006a; Graziani et al., 2006b).

This paper deals with the reconstruction of the subaerial part of the slope movements by means of the interpretation of more detailed geological and geomechanical data collected by in situ surveys: 45 geomechanical scanlines, 2 boreholes as well as point load and ultrasonic lab-tests on gneiss block-samples have been performed.

Gneiss rock mass, which has been related to the Scilla Metamorphic Unit, widely outcrop, over the slope. White gneiss breccias, cemented by a calcitic matrix, are associated to the main normal faults, circa parallel to the coast lines. Intensely foliated gneiss were observed northward to the landslide scarp.

The left flank of the landslide corresponds to one of the main fault which bounds westward the M.Pacì-M.Bova horst structure. Moreover the landslide slope is intensely dis-

lodged by normal faults, circa parallel to the coastline: one of these faults corresponds to the main scarp of the landslide while another one produces a clear morphological evidence in the submarine DEM. The holocene activity of this fault system is quoted by Antonioli et al, 2006.

The structural setting of the M.Pacì slope strongly affects the jointing conditions of the outcropping rock mass. As a consequence, both the volumetric joint number (Jv) and the average rock block dimension (Ib) values respectively increase and decrease in correspondence to the main fault zones.

A map of the rock mass classes was obtained by using the recorded geomechanical indexes. Three different equivalent continuum approaches, by Priest (1993), Sitharam et al. (2001) and Zhang and Einstein (2004) were applied in order to obtain the distribution of the jointed rock mass stiffness, taking into account the in site depth-dependent stresses.

Thus a 3D engineering-geology model of the M.Pacì landslide was obtained for the sub-aerial landslide slope; the model shows a very intensely jointed rock mass in the left flank portion of the slope, which is strictly related to the horst-boundary normal fault system, as well as two wide mylonitic zones, respectively close to the crown of the landslide and to the coastal areas.

The geometry of the 1783 M.Pacì landslide results to be strongly constrained by structural elements: the initial slope failure can be regarded as a wedge-detachment rock slide and its propagation as a rock avalanche (Hungr et al., 2001).

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