



Recent debris flows involving weathered gneiss in the tyrrhenian coastal area between Bagnara Calabria and Scilla (Calabria, southern Italy)

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During the last 2001-2005 years the coastal slopes between Bagnara Calabria and Scilla villages, close to the Strait of Messina (Calabria, southern Italy), have been affected by debris-flow events which were responsible for damage to both the national coastal road and the highway, to the railway and to the national gas-pipeline.

The susceptibility of these coastal slopes to debris flow events was analysed on the basis of geological and geomechanical field investigations. All over the slopes, metamorphic gneiss rocks widely outcrop, locally covered by plio-pleistocene transgressive sandstones and quaternary coarse deposits of marine terraces. All the collected data pointed out the fundamental role of the rock mass weathering as well as of its jointing conditions, which produces a transition from intact rock conditions to softened debris up to a silty-sandy soil.

A good correspondence between intensely weathered rock mass and fault zones has been observed; as a consequence, a strong correlation between weathering vertical profile and local structural setting, characterised by normal faults circa parallel to the coast, can be assumed.

All the occurred events were triggered by very intense vernal rainfalls and started as earth slide of about 1000m³ at the top of deep and very steep coastal valleys. Very low safety factors have been evaluated for the weathered rock masses by 3D stability back analyses, assuming full saturation conditions. Nevertheless, the uncontrolled drainage of sheet waters along the man made tracks results as a fundamental triggering factor.

The computed volume of the involved rock mass, of the water content in the saturated soils and of the incoming sheet waters from the man-made tracks allow to classify the events as “debris flows”.

As the occurred debris flows did not involve all the coastal valleys, a susceptibility analysis has been performed in order to localise the future events: the combined occurrence of top of the steep valleys, fault-lines and man-made tracks was regarded as the highest susceptibility condition for the considered debris-flow events.