



Hydrological condition leading landslide initiation during January-February 2003, South-Eastern sector of Italy

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On 24-26th January 2003 a heavy storm struck the South-Eastern sector of the Italian peninsula, causing severe damage to agriculture and roads of the Abruzzo, Molise, Campania and Puglia regions. The areas involved are characterised by hilly morphology, up to 900 m a.s.l. inland, and are made up of mainly argillaceous sequences of Flysch and foredeep deposits of the Apennine chain.

Thousands of landslides occurred along hilly areas, generally characterised by shallow movements which ceased after some metres; deep seated landslides also occurred and with reactivations of previous instabilities. Flood phenomena occurred in several places, mainly along the high-order drainage lines.

The area is known to fall within a Mediterranean climate, with a long, hot “dry season” between June and September and a temperate-wet season between October and May. Thus, the 24÷26 January 2003 storm occurred in the mid-wet season, during winter; moreover, neither solid precipitation nor snow-melt phenomena occurred.

Hydrological data show that the 24-26th January 2003 storm was the maximum in the historical series of some rain gauges: return time of 24-hour and 2-day cumulative rainfall reach values exceeding 200 years, computed by usual distribution function (Gumbel, GEV, Lognormal). The storm occurred after a wet period, characterised by previous storms, which most likely caused the reaching of field capacity of the soil. All shallow landslides occurred during or immediately after this storm and, thus, were most likely caused by positive pore pressure development.

At least 10 continuous rainy days after the storm (until 6th February 2003) were recorded, though they were characterised by low rainfall; it is important to highlight that it was mainly during these rainy days that some deep seated landslides were reactivated.

On the bases of historical hydrological data and landslide activity, this study analyses the possible relation between rainfall and landslides in the area, applying different models. In particular, hydrological thresholds for shallow landslides are outlined and deep-seated reactivations in relation to rainfall are also discussed.