Geophysical Research Abstracts
Vol. 17, EGU2015-7227-2, 2015
EGU General Assembly 2015

Post failure behaviour of landslide bodies: the large Montescaglioso landslide of 2013 dec

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After a period of intense rains, on 3 December 2013, already from the day before preceded by several warning signals, a landslide of about 800 m in length, 700 m wide, maximum depth of 40 m, with a total surface area of the first detachment body of 500,000 square meters (50 ha) and volume of about 3 million cubic meters was mobilized from the slopes south of Montescaglioso (MT, Italy). The body was moved towards the south of about 20 m, stopping against the opposite bank of a deep ditch. The distension caused by this movement triggered the movement of additional plates in the upper part of the slope, extending the total surface interested by the instability phenomenon. Despite the extensive damage to houses and commercial buildings, no casualties occurred.
The studies and monitoring of sensible parameters, carried out after the landslide movement, revealed numerous specificities prodromal to the landslide phenomenon: a stratigraphic context, even if simple, but disrupted by late-Pleistocene tectonics and by the eustatic deepening of the base level of the hydrography; a widespread aquifer over the entire surface of the landslide body inside the sandy and conglomeratic covering layers; the groundwater flow which revealed the same direction of the landslide displacement; finally, a river network strongly deformed from its natural configuration, with reduced efficiency compared to outflow and increased compared to the process of infiltration.
In the distribution of the points of weakness, whose coalescence enveloped the large surface of the landslide, are to be recorded: processes of loss of cementation by sandy and conglomeratic soils; loss of soil matrix operated by groundwater flow in the stretch near the clayey bedrock; interaction of the stiff blue clays with low salinity fluids at the foot of the landslide and elsewhere.
The result was a rapid movement of a rigid body, which allowed to recognize a process of progressive failure. The mean shear strength mobilized shortly after the failure has been derived by modeling an energy balance. The particularly low values of the computed shear strengths are the result of the processes of chemical destructuring of sands and clays in contact with low salinity flushing fluid, rather than the resizing of soils at residual shear strength under previous instability phenomena.