Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06907, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06907
EGU General Assembly 2008

Slope stability change in forested areas after a wildfire

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Wildfires are recognized to increase hillslope instability phenomena (soil erosion, landslides and debris flow) and flood occurrence. Wildfires, in fact, damage the vegetation and alter the soil properties with consequences both on mechanical and hydrological characteristics of hillslopes.

Burnt vegetation (trees, shrubs and grass) can die or in any case falls in a suffering state, with serious consequences on root system health and strength. The soil reinforcement due to roots, as consequence, declines over the time until new roots sprout out from damaged or new plants. During the period of root strength low values, shallow landslides can occur with a greater probability.

Into the soil, moreover, wildfire can originate a water resistant layer, which limits the infiltration rate. As consequence, the shallower layer of soil can be easily saturated and prone to erosion also during moderate intensity precipitations.

The increase of overland flow over the hillslopes causes greater discharge values in small headwater channels, where the debris coming from soil erosion and shallow landslides can then be mobilised as debris flow phenomena.

In the present paper the consequences of a wildfire occurred in March 2005 in a forested area of the Municipality of Cerete (val Seriana, Northern Italy) are considered at different time after the fire.

From the hydrological perspective, in order to verify the presence of a hydrophobic layer into the soil, permeability has been evaluated by means of laboratory tests on undisturbed samples taken both from burnt and unburnt soils.

From the mechanical point of view, root cohesion has been estimated, for each of the

species surveyed in the area, by means of the Wu and Waldron model, which account for root density and root strength. Root density distribution with depth, in terms of root area ratio, has been obtained at three-five sites inside and outside the burnt area, by the trench wall method. Root strength has been obtained by tensile strength test in laboratory.

The obtained results contribute to highlight the behaviour of burnt vegetated terrain in terms of slope stability.