Geophysical Research Abstracts, Vol. 8, 06413, 2006
SRef-ID: 1607-7962/gra/EGU06-A-06413

Integrated geophysical techniques and geomorphological approach to investigate the snowmelt-triggered landslide of Bosco Piccolo (Basilicata region, southern Italy)

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The greatest part of southern Apennines thrust belt (southern Italy) and, in particular, of the Basilicata region are characterized by landsliding events often developed on clayey-marly geological formations. A lot of these events have been historically triggered by extreme rainfall or snowmelt occurrences which cause the slope heaviness and deep erosion due to water seepage.

One of these calamitous landslide events and, perhaps, the more important happened during last fifty years on territory of Potenza town (Basilicata region), occurred between the end of February and the beginning of March 2005 on Bosco Piccolo countryside at 5 km from Potenza town. Bosco Piccolo landslide developed subsequentely to rapid snowmelt occurred during short periods of high temperatures alternate to intence and continuous snowfalls. This landslide of complex type (rotational and mudflow) reached a maximum depth of 20 meters and induced wide damages and collapses on many buildings of the village (80%) involving on the whole about 4 hectares of surface.

An integrated multidisciplinary approach has been adopted to study the Bosco Piccolo complex landslide. A preliminary multitemporal aerophotointerpretation and detail geomorphological survey has been carried out on landslide area.

To investigate and monitoring the landslide body have been combined electrical resistivity (ERT) tomography and self potential (SP) measurements calibrated with bore holes stratigraphy. The main aims of the electrical resistivity methods have been to characterize and delineate the area affected by the mass movement, to identify the sliding cut-surface and to estimate the thickness of the mobilized material.

The self potential method, which is sensitive to groundwater flow, gave us indications on groundwater flow and more particularly to the infiltration water recharge and runoff areas that are mainly dependant on the drainage works.

These results illustrate the benefits of such an integrated approach to characterize the area involved in the movement and the groundwater flow responsible to the landslide. This integrated approach seems to constitute also a promising tool, especially if the geophysical methods are used in time-lapse, to evaluate and monitor the geometry, volume and dynamic of the sliding mass.