Geophysical Research Abstracts, Vol. 9, 03766, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-03766

Scenario modelling of present and future shallow landslide probability

C. Melchiorre (1), P. Frattini (2), K. Stalsberg (1), G. Crosta (2), L.H. Blirka (3) and O. Hoydal (4)

(1) NGU/ICG, 7491 Trondheim, Norway, (2) Dipartimento di Scienze Geologiche e Geotecnologiche, Università degli Studi di Milano–Bicocca, 20126 Milan, Italy, (3) ICG, Trondheim, Norway, (4) NGI, 0806 Oslo, Norway

(caterina.melchiorre@ngu.no / telephone 004722021007- 004773904114)

The present work was carried out as part of the Norwegian research project GeoExtreme (Geohazards, Climate Change and Extreme Weather Events), that aims at assessing landslide hazard for the next decades in selected regions of Norway based on future climate scenarios and their corresponding socio-economic costs. This contribution focuses on the calibration of physically-based models under the present precipitation conditions in order to develop a tool for soil slip-debris flow hazard assessment with changed climate conditions.

The basic idea of the work is to compare results of a coupled hydrologic-slope stability model under different meteorological conditions, in order to assess the effect of climate change on the probability of landslides.

Our study area in central south Norway is located at the junction between the N – S trending Gudbrandsdalen valley and the E – W trending Otta tributary valley. Both valleys have been glacially carved out through recurrent glaciations, and present steep valley sides are covered by thick silt to sand till deposits. Exposed schist bedrock is heavily weathered and acts as a source for soil development and rock fall deposits. The area has experienced some shallow landsliding events affecting both the weathered and the glacial material.

In order to evaluate the probability of shallow landslides, we coupled the diffusivity hydrological model [1] with the infinite slope-stability analysis to evaluate how the increase of pressure head during precipitation events affects the stability of the slopes.

Taking into consideration the uncertainty of the data and the difficulty to calibrate the model with actual events, we have introduced the theory of random sets in the model to handle available data in the form of sets of intervals.

The results of the model highlight a non linear increase in the probability of landsliding with an increase in future precipitations as estimated by low resolution climatic models. Those preliminary outcomes confirm the necessity to evaluate the increase in unstable areas as consequences of an increase of extreme events by using the precipitation scenarios coming from high resolution meteorological models as input.

[1] Iverson, R.M., 2000. Landslide triggering by rain infiltration. Water Resources Research, 36(7), 1897-1910