Geophysical Research Abstracts, Vol. 8, 00125, 2006
SRef-ID: 1607-7962/gra/EGU06-A-00125

Seismic microzonation of slopes susceptible to landsliding : Use of Ambient noise and Earthquake Ground Motion Measurements

H.B. Havenith (1), I. Torgoev (2), S. Alvarez (1), G. Danneels (3)

(1) SED-ETHZ, Switzerland, (2) Institute of Rock Physics and Mechanics, Kyrgyzstan, (3) University of Liege, Belgium (havenith@sed.ethz.ch / Phone: +41-44-6333380)

This paper presents case studies of several slope sites in the Kyrgyz Tien Shan, Central Asia. These slopes present various types of instability: partial failure, surface rupturing or continuous slow movements. Related risk is high since developing mass movements could either directly affect the local population (schools or part of villages are located in the potential runout zone) or indirectly by forming a landslide dam (risk related to upstream and downstream flooding). In some cases, catastrophic failure of adjacent slopes could be attributed to seismic shaking, in others, seismic effects upon slope stability are known from continuous monitoring of mass movements. In all cases, however, earthquake ground motions predicted by attenuation models must have been relatively low ($<$0.05g for magnitudes less than 5 with epicentral distances larger than 40 km), unlikely to trigger slope failure. Therefore, we think that local amplification effects must have contributed to the destabilization of the slope.

In order to prove this hypothesis, a seismological-geophysical survey had been carried out in summer 2005. Since amplification effects are primarily dependent on the geometry and seismic velocities (Vs in particular) of the underground, our survey was focused on the characterization of these parameters: we carried out refraction tomography and geoelectric profiles, ambient noise measurements using the array method (with inversion of surface waves) and the H/V single station method. Along the slopes, earthquake ground motions were recorded to directly determine site amplification effects. Preliminary results show that some parts are affected by significant amplification up to a factor of 10 in a frequency range between 1-5 Hz. The relative contribution of geology and morphology (and maybe also the earthquake source type) to the strong

shaking effects is now being evaluated through numerical simulation. In future we will also study how these shaking effects interact with groundwater pressures (the presence of ground water within the potential landslide body is shown by the geoelectric profiles), which certainly contributed to failure as well (liquefaction processes?).

The relevance of the different factors for landslide susceptibility is also studied at regional scale using remote sensing techniques – this work will be presented in a parallel session.