

# **A review of recent case studies of landslides investigated in the Tien Shan using microseismic and other geophysical methods**

**Hans-Balder HAVENITH**

*Georisks and Environment, Department of Geology, University of Liege, 4000 Liege, Belgium*

**Abstract.** This paper reviews recent case studies completed on mass movements (and landslide dams) with probable (post-) seismic origin or susceptible to seismic failure in the Tien Shan, Central Asia. Geophysical investigations and seismological and microseismic surveys presented here were carried out on the Kainama earthflow in the Southern Kyrgyz Tien Shan, on loess landslides in Tajikistan as well as on unstable slopes and a landslide dam in the Central Kyrgyz Tien Shan. The latter investigations were completed in summer 2011 using electrical tomography combined with seismic refraction and microseismic measurements as well as earthquake recordings. For all sites complex 3D models were built (with the GOCAD software). For some sites 2D numerical modelling of seismic slope stability allowed us to make accurate assessment of their susceptibility to seismic failure.

Modelling of the seismic amplification potential of various slopes confirmed the results obtained from the seismological surveys: strongest amplifications generally affect the upper parts of the slope close to the crest of the mountains – not only due to topographic effects but also due to the presence of weaker rocks or thicker soft deposits in these areas. The results of the dynamic modelling further show that a combination of seismic and hydrologic factors (pore pressure build-up during the seismic shaking and post-seismic rise of groundwater level) was necessary to trigger the failure.

**Keywords.** Tien Shan, landslides, microseismic methods, electrical tomography, loess.