



Slide quake generation at softrock-landslides

M. Walter and M. Joswig

Universität Stuttgart, Institute for Geophysics, Stuttgart, Germany

We observed slide quake generation by passive seismic monitoring approaches at two softrock-landslides, the creeping Heumoes slope, Austrian Alps, and the mudslide in Super-Sauze, French Alps. Our observations fit to the first discovery of slide quakes at the Slumgullion landslide, San Juan Mountains, Colorado, USA by Gomberg et al (Geology, 1995). In all cases, deformation is controlled by the respective bedrock topography, or lateral boundaries.

The Heumoes slope moves up to 10 cm/yr, in contrast to some m/yr at Super-Sauze and Slumgullion. At Heumoes slope, 100+ slide quakes were observed during field campaigns from 2005 and permanent monitoring from 2009 to 2011 clustered in the mid-part of the slope with lowest surface displacement. This area exhibits a dominated rise of bedrock topography, orientated perpendicular to the mass movement. At Super-Sauze, we observed 34 slidequakes during a 10-day field campaign in July 2008. The majority of events is located in slope regions with highest surface velocities. The bedrock topography is characterized by in-situ crests covered by sliding material, and orientated in direction of slope movement. At Slumgullion slide quakes occurred at both lateral boundaries of the landslide with no events in between. The bedrock topography exhibits a more or less planar surface.

Each slope differentiates into seismic and aseismic parts. Slide quakes occur in areas showing significant changes of bedrock topography and/or lateral boundaries. At Slumgullion slide quakes are linked to side-bounding strike-slip faults. At Super-Sauze the in-situ crests along the bedrock surface channel slope movement and led to slide quake generation, while slope movement along the basal surface in gullies between the crests is aseismic. The slide quakes at Heumoes occur in areas with horizontal bedrock increase considered as movement barriers, while no slide quakes were observed in the basin structures. We conclude that slide quake generation is comparable to seismicity at crustal- and plate-scale boundaries.