High resolution monitoring and analysis of the rock slope collapse of the Eiger (Switzerland)

T. Oppikofer (1), M. Jaboyedoff (1), H.-R. Keusen (2)

(1) Institute of Geomatics and Risk Analysis (IGAR), University of Lausanne, Switzerland, (2) Geotest AG, Zollikofen, Switzerland (thierry.oppikofer@unil.ch / +41216923542)

A large spur on the northeastern flank of the Eiger mountain in the Bernese Alps (Central Switzerland) started to slide down end of May 2006 and led to frequent rockfalls. On July 13th 2006 a large part of the 270 meters high and 250 meters large Jurassic limestone mass collapsed in a single event. The slide of this is made possible by the retreat of the Lower Grindelwald glacier. In the 19th century the glacier was at its last maximum and its top reached the back scar of the present landslide. After the removal of its buttress, the rock spur started to fatigue before movement initiated.

High resolution digital elevation models obtained from terrestrial laser scanner images (Lidar) were used to monitor this spur. Sequential images taken in July (5 acquisitions), as well as September and December 2006 (one acquisition each) allow for the analysis of movement directions and speeds, determination of total displacements and the calculation of the fallen volumes. These precise 3D data open new perspectives in the prediction of mass wasting events and in the deduction of their mechanism.

The mass is divided in two main masses, with a rear block moving downwards (mean direction: 012/71; mean velocity: 65 cm/day (summer 2006), 11 cm/day (fall 2006)) and a front block sliding to the front (mean direction: 041/35; mean velocity: 22 cm/day (summer 2006), 4 cm/day (fall 2006)). Based on these movement vectors the mechanism of the rock slide can be determined.

The measurements also allowed for the prediction of the large event of July 13th 2006 with high movement rates in the right part of the spur and afterwards the determination of the collapsed volume (460'000 m^3).