Geophysical Research Abstracts
Vol. 16, EGU2014-14251, 2014
EGU General Assembly 2014

High-resolution seismic monitoring of rockslide activity in the Illgraben, Switzerland

Arnaud Burtin (1), Niels Hovius (1), Michael Dietze (1), and Brian McArdell (2)

(1) GeoForschungsZentrum, Helmholtz Centre Potsdam, Potsdam, Germany (burtin@gfz-potsdam.de), (2) Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Birmensdorf, Switzerland

Rockfalls and rockslides are important geomorphic processes in landscape dynamics. They contribute to the evolution of slopes and supply rock materials to channels, enabling fluvial incision. Hillslope processes are also a natural hazard that we need to quantify and, if possible, predict. For these reasons, it is necessary to determine the triggering conditions and mechanisms involved in rockfalls. Rainfall is a well-known contributor since water, through soil moisture or pore pressure, may lead to the inception and propagation of cracks and can induce slope failure. Water can also affect slope stability through effects of climatic conditions such as the fluctuations of temperature around the freezing point. During the winter of 2012, we have recorded with a seismic array of 8 instruments substantial rockslide activity that affected a gully in the Illgraben catchment in the Swiss Alps. Three stations were positioned directly around the gully with a nearest distance of 400 m. The period of intense activity did not start during a rainstorm as it is common in summer but during a period of oscillation of temperatures around the freezing point. The activity did not occur in a single event but lasted about a week with a decay in time of the event frequency. Many individual events had two distinct seismic signals, with first, a short duration phase of about 10 s at frequencies below 5 Hz that we interpret as a slope failure signature, followed by a second long duration signal of $>$ 60 s at frequencies above 10 Hz that we attribute to the propagation of rock debris down the slope. Thanks to the array of seismic sensors, we can study the fine details of this rockslide sequence by locating the different events, determining their distribution in time, and systematic quantification of seismic metrics (energy, duration, intensity…). These observations are compared to independent meteorological constrains and laser scan data to obtain an estimate of the volume mobilized by the event.