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Infrasound Monitoring of Debris Flow at Lattenbach, Austria

A. Kogelnig and J. Hübl

Institute of Mountain Risk Engineering, Civil Engineering and Natural Hazards, Vienna, Austria
(arnold.kogelnig@boku.ac.at, +43 1 476544390)

Rapid mass movements such as debris flow, rock fall and avalanches are sources of sub-audible sounds in the low frequency infrasonic spectrum. Recent studies indicated that debris flow generated noise is of significant amplitude and occupies a relatively noise free band in the infrasonic spectrum (5-15Hz). Low frequency infrasound signals have the ability to propagate kilometers from the source of a mass movement and provide a basis for the development of wide area automated monitoring systems which can operate in locations unaffected by the process activity.

This study focuses on infrasound produced by a debris flow event at the Lattenbach torrent, Tirol, Austria. The catchment area of Lattenbach is prone to debris flows due to the geological situation, that the tectonic border between Silvrettakristallin and the Northern Limestone Alps is crossing the area. In September 2009 a viscous debris flow event with a flow depth of approximately 3.5 m and a peak discharge of 380 m^3/s occurred. The data was monitored with a standard infrasound measuring microphone from a German Company. Contemporary ultrasonic height measurements and seismic signal recording took place for validation of the infrasonic signals. The infrasonic sensor detected the debris flow before the geophone and the signals could be correlated with the other measurements. Infrasonic debris flow signals are nonlinear and non-stationary they are analysed using digital filtering, frequency analysis and adopting the HHT approach in comparison to the conventional FFT method. The final goal is the development of an automatic passive warning system for debris flows.