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A new debris-flow monitoring system in an Alpine catchment

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Monitoring of debris flows in instrumented catchments permits collection of data on these phenomena and provides a valuable link with geomorphological and topographical observations of erosion, sediment supply and channel-bed evolution. Numerous sites recently instrumented in various geographical regions show that field monitoring is receiving increasing attention in debris-flow research worldwide.

The poster presents a novel installation for debris-flow monitoring in the Gadria catchment (Eastern Alps, Northern Italy). The Gadria basin has been chosen mainly because of the relatively high frequency of debris flows (on average 1-2 per year). The Gadria catchment has a drainage area of 6.3 km^2 and ranges in elevation from 1394 m to 2945 m. An important bedload tributary (Strimm, drainage area 8.5 km^2, minimum elevation 1394 m, maximum elevation 3197 m) joins the Gadria channel close to a filter check dam located near the alluvial fan apex, which has been set as the outlet of both basins.

Sensors have been installed both in the Gadria and in the Strimm basins. The monitoring equipment consists of rain gauges, radar sensors for flow depth, geophones for ground vibrations, and videocameras with spotlights. Two radar sensors, four geophones and three videocameras have been installed in the lower reach of the Gadria channel just upstream of the previously mentioned filter check dam. A further monitoring station will be installed approximately 500 m upstream along the main channel. Rain gauges and pressure transducers for monitoring flow stage have been installed in the Strimm basin. Six water pore pressure sensors, 28 spatially-distributed soil moisture probes (at 10 cm and 50 cm depth) and six piezometric wells equipped with pressure transducers have been installed in the sediment source areas in the upper portion of the Gadria catchment in order to describe and understand the main hydrological controls connected to the debris-flow triggering and sediment mobilization.

A small-magnitude debris flow, which occurred on August 5, 2011, has represented a first test for the monitoring equipment. Debris-flow hydrograph, flow velocity and frames of different phases of the debris flow recorded by the videocameras are illustrated in the poster.