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Hydrometeorological analysis of a major debris flow in the Central Italian Alps

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On 1 August 2005 an intense isolated thunderstorm affected a small catchment in the Anterselva River basin, in the Central Italian Alps, with duration of 75 minutes and rainfall accumulations up to 70 mm. The storms triggered an extreme debris flow, with a volume of about 100000 m^3. Rainfall and geomorphic impacts were concentrated in the ungauged 1.9 km^2 headwater catchment of Val Gole. The debris flow was triggered in a hollow draining a small steep rock basin. As such it exemplifies the characteristics of common debris flow events in the Central and Eastern Alps.

Detailed geomorphological field surveys and the application of a distributed hydrological model have made it possible to evaluate erosion processes and sediment supply to the channel network and to quantify water runoff and sediment volumes. The analysis of the rainstorm has been based on rainfall estimates from radar observations and data recorded by raingauge stations. Field surveys have permitted to assess the volume of eroded debris and to determine the space distribution of the sources of sediment. The accounts of eye-witnesses have provided useful elements for reconstructing the time evolution of the debris flow.

The objectives of this study are:

1. to identify the aspects of storm structure, motion and evolution and its interaction with the impermeable portions of the headwater catchment that control the spatial and temporal distribution of extreme rainfall and runoff production;

2. to compare the precipitation intensity-duration characteristics of the storm with existing debris flow triggering intensity-duration thresholds available for the Dolomites and surrounding regions;

3. to explore the viability of using ground-based meteorological radar to examine geomorphic processes triggered by specific combination of high intensity rainfall cells and ground characteristics (distribution of rocky outcrops).