Geophysical Research Abstracts
Vol. 14, EGU2012-7207-2, 2012
EGU General Assembly 2012

Merging field survey and LiDAR technology for the analysis of debris-flow erosion

G. Bertoldi, M. Reginato, and V. D'Agostino
University of Padova, TeSAF, Padova, Italy (bertoldigabriele.tn@gmail.com)

Hazardous debris flows are usually triggered by rainfall or snowmelt on steep mountainside and might increase due to an erosive self-feeding from channel bed and banks. While trigger and deposition mechanisms might be more directly investigated in terms of sediment volumes in play, channel network erosions are quantitatively more complex particularly if a continuous detailed trend of the phenomenon is researched. In fact, data on debris-flow channel erosion are quite rare and often contradictory. In the last decade the increase of remotely sensed technologies such laser scanners has improved the quality and the detail of terrain information, thus providing a suitable tool for earth surface processes analysis. In this work the topic of debris-flow erosion has been analyzed through intensive field surveys and high resolution topography (before and after event) of two adjacent catchments, where an extreme rainfall event was recorded. Debris flows occurred on the 15th of August 2010 in the 'Rio Val Molinara' and 'Rio Val del Lago' torrents (Baselga di Pinè, Trento, Italy) seriously damaging the village of Campolongo. Event magnitudes were estimated equal to 40.000 and 10.000 m3 respectively and were almost completely generated by channel and bank erosion. The two catchments have a drainage area of about 1 km2 and are characterized by porphyritic lithology and a dominant cover of conifer forest. Both basins were considered as sediment supply limited before the event and this evaluation was corroborated by more than 150 years of inactivity resulting from historical sources.
Field surveys have been carried out in summer 2011, providing geomorphic estimation of type of process (debris flow/debris flood), removed volumes, post-event sediment availability, local peak discharges and flow velocities of 150 homogeneous reaches subdivided into 200 cross sections. Field data were then compared with pre and post-event using high resolution DTMs (1 m grid cell size) derived from airborne laser scanner.
Statistical data analysis has shown that channel slope affects indirectly the erosion depths because it reduces the sediment storage before the event and favors the bedrock outcropping. The maximum flow velocity, rather than the peak discharge or the drainage area, is strongly connected to the erosion extent indicating that flow turbulence prevails on the volumetric debris-flow size. Channel morphology causes also evident effects: erosion decreases for wider channel beds and for lower confinement (flow width to depth ratios).