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Occurred debris flows in North-Eastern Italian Alps: documentation and modeling

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Four occurred events of debris flows are documented and modeled by back-analysis. The four debris flows events are those occurred at Rio Lazer on the 4th of November 1966, at Fiames on the 5th of July 2006, at Rovina di Cancia on the 18th of July 2009 and at Baselga di Pinè on the 15th of August 2010. All the four sites are located in the North-Eastern Italian Alps. In all the events, runoff entrained sediments present on natural channels and formed a solid-liquid wave that routed downstream. The first event concerns the routing of debris flow on an inhabited fan. Map of deposition pattern of sediments is built by using post-events photos through stereoscopy techniques. The second event concerns the routing of debris flow along the main channel descending from Pomagagnon Fork. Due to the obstruction of the cross-section debris flow deviated from the original path on the left side and routed downstream by cutting a new channel on the fan. It dispersed in multiple paths when met the wooden area. Map of erosion and deposition depths is built after using a combination of LiDAR and GPS data. The third event concerns the routing of debris flow in the Rovina di Cancia channel that filled the reservoir built at the end of the channel and locally overtopped the retaining wall on the left side. A wave of mud and debris inundated the area downstream the overtopping point. Map of erosion and deposition depths is obtained by subtracting two GPS surveys, pre and post event. The fourth event is that of debris flow occurred along Rio Val Molinara where runoff entrained bed sediments and routed downstream flooding the village of Baselga di Pinè. The map of erosion and deposition depths of Rio Val Molinara is obtained after comparing two LiDAR data corresponding to the pre and post situation while the map of deposition depth of the village is built through carefully analysis of the photo taken after the event with field measurements.
All the four occurred debris flows are simulated by modeling runoff that entrained debris flow for determining the solid-liquid hydrograph downstream the triggering areas. The routing of the solid-liquid hydrograph is simulated by a bi-phase cell model based on the kinematic approach. The comparison between simulated and measured erosion and deposition depths is satisfactory. Nearly the same parameters for computing erosion and deposition are used for all the four occurred events.