Geophysical Research Abstracts
Vol. 16, EGU2014-5446-2, 2014
EGU General Assembly 2014

Sediment Budget Analysis and Hazard Assessment in the Peynin, a Small Alpine Catchment (Upper Guil River, Southern Alps, France)

Benoit Carlier (1), Gilles Arnaud-Fassetta (1), Monique Fort (1), Fanny Bouccara (1), Grégoire Sourdot (1), Adrien Tassel (1), Candide Lissak (1), François Betard (1), Etienne Cossart (2), Malika Madelin (1), Vincent Viel (1), Bérengère Charnay (3), and Xavier Bletterie (3)

(1) Université Paris Diderot, Sorbonne-Paris-Cité, UMR 8586 PRODIG CNRS, GHSS, Case 7001, Paris Cedex 13, France, (2) Université 1 Panthéon-Sorbonne, UMR 8586 PRODIG CNRS, France, (3) Parc Naturel Régional du Queyras, Arvieux (Hautes-Alpes), France

The upper Guil catchment (Southern Alps) is prone to hydro-geomorphic hazards. Major hazards are related to catastrophic floods, with an amplification of their impacts due to strong hillslope-channel connectivity as observed in 1957 and 2000. In both cases, the rainfall intensity, aggravated by the pre-existing saturated soils, explained the instantaneous response of the fluvial system, such as destabilisation of slopes, high sediment discharge, and subsequent damages to exposed structures and settlements present in the floodplain and at confluence sites. The Peynin junction with the Guil River is one of these sites, where significant land-use change during the last decades in relation to the development of handicraft and tourism economy has increased debris flow threat to population.
Here, we adopt a sediment budget analysis aimed at better understanding the functioning of this small sub-catchment. This latter offers a combination of factors that favour torrential and gravitational activity. It receives abundant and intense rainfall during "Lombarde" events (moist air mass from Mediterranean Sea). Its elongated shape and small surface area (15 km^2) together with asymmetric slopes (counter dip slope on the left bank) accelerate runoff on a short response time. In addition highly tectonised shaly schists supply a large volume of debris (mostly platy clasts and fine, micaceous sediment).
The objectives of this study, carried out in the frame of SAMCO (ANR) project, are threefold: Identify the different sediment storages; Characterise the processes that put sediment into motion; Quantify volumes of sediment storages. We produced a geomorphic map using topographic surveys and aerial photos in order to locate the different sediment storage types and associated processes. This analysis was made with respect to geomorphic coupling and sediment flux activity. In terms of surface area, the dominant landforms in the valley were found to be mass wasting, talus slopes and alluvial fans and plains. Most of these forms are relict landforms, decoupled from the present geomorphic system. Notable sediment transport is limited to avalanche tracks, debris flows, and along floodplains. Sediment volumes were calculated using a combination of polynomial functions of cross sections and GIS modelling. We calculated the overall sediment volume of the valley fill deposits to be 1.05 km3. This corresponds to a mean sediment thickness of 90.2 m. Landslides appear as the major sediment storage, representing more than 35% of the sediment volume stored in the Peynin subcatchment. For some locations, the polynomial-generated cross sections resulted in overestimations of sediment thickness, therefore, these results have to be considered as an order of magnitude. Future investigations will include seismic refraction profiles that may provide bedrock depth, hence a better control on sediment thickness (estimates generated thanks to GIS). Eventually, we expect our results to be used to better model, hence prevent future debris-flow events at the confluence of Peynin stream with the Guil River.