Geophysical Research Abstracts
Vol. 19, EGU2017-3685, 2017
EGU General Assembly 2017

Volumes of sediment stored in an Alpine catchment using geological, geomorphological and geophysical expertise: Peynin catchment (Queyras, Southern French Alps)

Benoît Carlier (1), Gabriel Carlier (2), Candide Lissak (3), Julien Gance (4), Jean-Philippe Malet (5), Kevin Graff (3), Vincent Viel (1), Gilles Arnaud-Fassetta (1), Monique Fort (1), François Bétard (1), and Malika Madelin (1)

(1) Université Paris Diderot, UMR 8586 PRODIG CNRS, GHSS, Case 7001, Paris Cedex 13, France (carlierbenoit@hotmail.fr) , (2) Muséum National d'Histoire Naturelle, Direction des Collections, 57 rue Cuvier, 75231 Paris Cedex 05, (3) Université Caen Normandie, LETG Caen Geophen - UMR6554, Esplanade de la Paix 14032 Caen Cedex 5, (4) IRIS-Instruments, 1 avenue Buffon, 45100 Orléans, (5) École et Observatoire des Sciences de la Terre - Université de Strasbourg and CNRS, 5, rue René Descartes, 67084 Strasbourg Cedex

The combination of predisposing factors (schist bedrock supplying abundant debris, high slope gradient and strong hillslope-channel connectivity), makes the Upper Guil catchment particularly prone to torrential hazards such as floods or debris flows. The occurrence of "Lombarde easterlies" episodes may generate intense rainfall over short time periods (320 mm in 8 days in June 1957). During such events, the observed damages are mainly related to the sediment transport (fine sediments and metric boulders) in the torrential streams, as in 1946 and 1957, and more recently in 2000, 2008 and 2010. In order to evaluate mountainous hazards in a Global Change context (i.e. climatic and socio-economic), the French funded ANR project SAMCO put the emphasis on the hydrogeomorphological functioning of the Upper Guil catchment. In this context, a sedimentary budget analysis at the Holocene timescale was elaborated for the active Peynin catchment ($\approx$ 15 km^2). The volumes of sediments stored on the slopes and in the channels are evaluated using geophysical and geomorphological investigations in order to establish the amount of material potentially mobilized during low frequency/high magnitude flood events. On the basis of intensive fieldwork and GIS mapping (geology and geomorphology), two models of sediment thickness are proposed. The first one, inspired by the work of Schrott et al. (2003), is based on the modelling of the supposed bedrock roof using polynomial functions and GIS modelling (high estimate). The second model is field based and results from a geological and geomorphological analysis of 46 topographic and geologic cross sections (low estimate). To reduce the error margins in sediment thickness estimates, three seismic refraction profiles made in summer 2014 have been interpreted and integrated to these models. The volumes of sediments stored in the Peynin catchment were respectively estimated to 0.423 km3 (high estimate) and 0.171 km3 (low estimate). This corresponds to a mean sediment thickness of 28.15 m and 4.71 m. In both cases, old landslides material appears as the major sediment storage, representing more than 80% of the sediment volume stored in the Peynin catchment. Mostly present on the right bank hillslopes of the Peynin stream, these storages are decoupled from the present geomorphic system. Actually, effective sediment transport is limited to avalanche tracks, debris flows supplied by left bank tributaries, and along the Peynin stream. Therefore, sediment volume potentially evacuated during a flood event will be less important in the upstream part of the Peynin catchment than in its downstream part where debris flows and avalanche tracks are still very active.