Secteur des Sciences et Technologies

Invitation à la soutenance publique de thèse de

Monsieur François CLAPUYT

Master en sciences géographiques

Pour l'obtention du grade de Docteur en sciences

« Constraining spatio-temporal sediment dynamics in landslide-prone mountainous catchments. From UAV-SfM-based earthflow reconstructions to long-term catchment-scale sediment fluxes »

qui se déroulera

le jeudi 29 novembre 2018 à 16h15

Salle Jean-Baptiste Carnoy

Place Croix du Sud, 4-5

1348 Louvain-la-Neuve

Membres du jury :

The examining board is composed of the following members:
Prof. Veerle Vanacker (UCLouvain), supervisor
Prof. Kristof Van Oost (UCLouvain), supervisor
Prof. Marie-Laurence De Keersmaecker (UCLouvain), chairperson
Prof. Bas van Wesemael (UCLouvain), secretary
Prof. Fritz Schlunegger (Universität Bern, Switzerland)
Prof. Matthias Vanmaercke (Université de Liège, Belgium)

UCLouvain

The movement of sediment from mountainous uplands to continental margins, i.e. the sediment cascade, modifies the terrestrial surface and eventually drives the rate of topographic evolution. Understanding the pattern and rates of geomorphic mechanisms involved in the sediment cascade is of crucial importance to constrain biogeochemical cycles, long-term landscape evolution and potential feedbacks between tectonics, erosion and climate. Sediment cascading systems are still poorly constrained, as sediment budgets and connectivity can be highly variable in space and time due to the stochastic character of geomorphic processes.

In an effort to improve our quantitative understanding of the sediment cascade in landslide-prone environments, this doctoral dissertation aims at constraining spatio-temporal sediment dynamics over annual to millennial time scales. We applied state-of-the-art geomorphic techniques to constrain sediment budgets and connectivity for a mountainous catchment located in the foothills of the Central Swiss Alps. At the annual time scale, we monitored topographic changes using 3D topographic reconstructions derived from aerial pictures acquired by a drone, and at the millennial time scale, we quantified catchment-scale denudation rates using in-situ produced cosmogenic radionuclides.

By integrating sediment fluxes over different temporal scales, it becomes clear that geomorphic process rates in landslide-prone terrain are highly variable in space and time. Periods of sediment remobilisation by landsliding on the hillslopes do not necessarily coincide with sediment pulses in the river network. Only when hillslopes are geomorphically connected to the river channels, the sediment mobilised by landsliding on the slopes is effectively transferred to the channel network. Therefore, phases of low or high geomorphic activity in upland catchments are not necessarily indicative for the long-term sediment fluxes of mountainous catchments. Their spatio-temporal sediment dynamics are rather driven by the magnitude and frequency of the geomorphic coupling between hillslopes and channels, and not so much by episodic sediment pulses generated by individual landslides at annual or decadal time scale.