Geophysical Research Abstracts
Vol. 19, EGU2017-15524, 2017
EGU General Assembly 2017

Generalization of the Khi-analysis of landscapes to channel-hillslope systems

Stephane Bonnet (1) and Philippe Davy (2)

(1) Université Toulouse III - Paul Sabatier, GET, Toulouse, France (stephane.bonnet@get.omp.eu), (2) Geosciences Rennes, Rennes, France (philippe.davy@univ-rennes1.fr)

The Khi-analysis of river profiles (Perron and Royden, 2012) is a powerful method to highlight geomorphic disequilibrium in river networks. Recent studies (e.g. Willett et al., 2014) demonstrated how this proxy can be used to infer reorganization of river networks in response to processes such as fluvial captures of horizontal migration of drainage divides. Rapid river adjustments to such perturbations may however limit the use of this approach (Whipple et al., 2017) Because hillslopes have potentially longer response times than channels, they likely have the capability to record geomorphic disequilibrium over longer time-scales than channels. We consequently present here a generalization of the Khi-analysis to the entire landscape, i.e. to the channel-hillslope system. We will first present a theoretical formulation of the Khi-analysis to the full hillslope-channel system by considering the continuity of the slope-area relationship at the hillslope-channel transition. We will then show how this generalized Khi-analysis allows to linearize the entire channel-hillslope longitudinal profiles taken from synthetic numerical and laboratory-scale topographies at steady-state. We fill finally illustrate the use of generalized Khi-analysis to infer geomorphic disequilibrium in some natural case studies.