Geophysical Research Abstracts
Vol. 18, EGU2016-15860, 2016
EGU General Assembly 2016

Mountain Rivers and Climate Change: Analysis of hazardous events in torrents of small alpine watersheds

Silke Lutzmann and Oliver Sass
University of Graz, Department of Geography and Regional Science, Graz, Austria (silke.lutzmann@uni-graz.at)

Torrential processes like flooding, heavy bedload transport or debris flows in steep mountain channels emerge during intense, highly localized rainfall events. They pose a serious risk on the densely populated Alpine region. Hydrogeomorphic hazards are profoundly nonlinear, threshold mediated phenomena frequently causing costly damage to infrastructure and people. Thus, in the context of climate change, there is an ever rising interest in whether sediment cascades of small alpine catchments react to changing precipitation patterns and how the climate signal is propagated through the fluvial system. We intend to answer the following research questions: (i) What are critical meteorological characteristics triggering torrential events in the Eastern Alps of Austria? (ii) The effect of external triggers is strongly mediated by the internal disposition of catchments to respond. Which factors control the internal susceptibility? (iii) Do torrential processes show an increase in magnitude and frequency or a shift in seasonality in the recent past? (iv) Which future changes can be expected under different climate scenarios?
Quantifications of bedload transport in small alpine catchments are rare and often associated with high uncertainties. Detailed knowledge though exists for the Schöttlbach catchment, a 71 km2 study area in Styria in the Eastern Alps. The torrent is monitored since a heavy precipitation event resulted in a disastrous flood in July 2011. Sediment mobilisation from slopes as well as within-channel storage and fluxes are regularly measured by photogrammetric methods and sediment impact sensors (SIS). The associated hydro-meteorological conditions are known from a dense station network. Changing states of connectivity can thus be related to precipitation and internal dynamics (sediment availability, cut-and-fill cycles). The site-specific insights are then conceptualized for application to a broader scale. Therefore, a Styria wide database of torrential events dating back several decades is analysed. Precipitation thresholds varying in space and time are established using highly resolved INCA data of the Austrian weather service. Parameters possibly controlling the basic susceptibility of catchments are evaluated in a regional GIS analysis (vegetation, geology, topography, stream network, proxies for sediment availability). Similarity measures are then used to group catchments into sensitivity classes. Applying different climate scenarios, the spatiotemporal distribution of catchments sensitive towards heavier and more frequent precipitation can be determined giving valuable advice for planning and managing mountain protection zones.