Geophysical Research Abstracts
Vol. 20, EGU2018-6349-3, 2018
EGU General Assembly 2018

Detecting landslide-induced paleolakes and their impact on river course

Anne-Laure Argentin (1), Günther Prasicek (1,2), Jörg Robl (1), Daniel Hölbling (3), and Barbara Friedl (3)

(1) University of Salzburg, Department of Geography and Geology, Hellbrunner Strasse 34, 5020 Salzburg, Austria (anne-lauremarine.argentin@sbg.ac.at), (2) University of Lausanne, Institute of Earth Surface Dynamics (IDYST), Quartier UNIL-Mouline, Bâtiment Géopolis, 1015 Lausanne, Switzerland, (3) University of Salzburg, Department of Geoinformatics — Z_GIS, Schillerstrasse 30, 5020 Salzburg, Austria

Landslides are well-recognized as extreme events, which significantly contribute to hillslope erosion. They can interfere with the drainage network, dam rivers or suddenly change their sediment load. This can alter the flow dynamics of the rivers, leading to width modification, avulsion, riverbank erosion and flooding of adjacent and even distant terrain. In this way, landslides interfering with river courses can affect locations at large distances, upstream or downstream, from the initial event. Thus, landslides play an important role in drainage network evolution. They can initialize cascades of geomorphic events in river courses and jeopardize human lives and infrastructures in low-lying terrain.

Although landslide-induced changes to river dynamics can be sudden and very destructive, related event cascades are not well understood. The different kinds of drainage network perturbations, their persistence and the involved processes are still understudied. The geometric characterization and classification of landslide-induced river changes has been studied to some extent, but the methods are not automatic and the results were not analyzed from a cascade perspective.

We wanted to know for how long a landslide-induced cascade could alter the landscape. We aimed to recognize landforms which are the remnants of past landslides. In a first attempt we focused on detecting landslide-induced paleolakes. A paleolake landform is here assumed to be characterized by a wide valley floor and a low channel gradient due to sediment deposition upstream of the landslide dam. To automatically detect these features we analyze landscape geometry based on SRTM data at a resolution of 1 arc-second. Our method extracts the drainage system topology and analyzes the characteristic basin and channel geometry of different segments of the flow path. Each river network branch can then be compared to other branches of similar catchment size to look for significant attribute differences that could be asociated to the past landslide. Finally, a paleolake probability is computed from the derived statistics.

We applied our method to the Llanz and Val-de-Travers paleolakes in Switzerland and the Ching-Shui river paleolakes in Taiwan. First results show that the proposed method allows a better insight into how much landslides impact the river course at the hydrographic network scale.