Geophysical Research Abstracts
Vol. 16, EGU2014-6720, 2014
EGU General Assembly 2014

Sediment connectivity evolution on an alpine catchment undergoing glacier retreat

Beatrice Goldin (1,2), Benjamin Rudaz (3), and Eric Bardou (4)

(1) National Research Council, Research Institute for Geo-Hydrological Protection, Padova, Italy (beatrice.goldin@irpi.cnr.it), (2) University of Padua, Department of Land and Agroforest Environments, Legnaro (PD), Italy, (3) University of Lausanne, Institute of Geomatics and Risk Analysis, Lausanne, Switzerland, (4) Research Center on Alpine Environment, Sion, Switzerland

Climate changes can result in a wide range of variations of natural environment including retreating glaciers. Melting from glaciers will have a significant impact on the sediment transport characteristics of glacierized alpine catchments that can affect downstream channel network. Sediment connectivity assessment, i.e. the degree of connections that controls sediment fluxes between different segments of a landscape, can be useful in order to address management activity on sediment fluxes changes of alpine streams. Through the spatial characterization of the connectivity patterns of a catchment and its potential evolution it is possible to both define sediment transport pathways and estimate different contributions of the sub-catchment as sediment sources.

In this study, a topography based index (Cavalli *et al.*, 2013) has been applied to assess spatial sediment connectivity in the Navisence catchment (35 km^2), an alpine basin located in the southern Walliser Alps (Switzerland) characterized by a complex glacier system with well-developed lateral moraines on glacier margins already crossed by several lateral channels. Glacier retreat of the main glacial edifice will provide a new connectivity pattern. At present the glacier disconnects lateral slopes from the main talweg: it is expected that its retreat will experience an increased connectivity. In order to study this evolution, two high resolution (2 m) digital terrain models (DTMs) describing respectively the terrain before and after glacier retreat have been analyzed. The current DTM was obtained from high resolution photogrammetry (2 m resolution). The future DTM was derived from application of the sloping local base level (SLBL) routine (Jaboyedoff *et al.*, 2004) on the current glacier system, allowing to remove the ice body by reconstituting a U-shaped polynomial bedrock surface. From this new surface a coherent river network was drawn and slight random noise was added. Finally the river network was burned into the rough surface of the SLBL results.

The impact of sediment dynamic changes on the study catchment due to glacier retreat has been assessed by comparing predictions deriving from model application on different scenarios. Simulations allowed the analysis of sediment connectivity evolution over decade scales suggesting an increase of potential sediment transfer and connections in areas close to the main channel network.

References:

Cavalli, M., Trevisani, S., Comiti, F., Marchi, L., 2013. Geomorphometric assessment of spatial sediment connectivity in small Alpine catchments. Geomorphology 188, 31–41.

Jaboyedoff M., Bardou E., Derron M.-H. 2004. Sloping local base level: a tool to estimate potential erodible volume and infilling alluvial sediment of glacial valleys. Swiss Geo-Scientists meeting, November 2004, Lausanne.