Geophysical Research Abstracts
Vol. 17, EGU2015-9527, 2015
EGU General Assembly 2015

Spatio-temporal variability in tracer signature of snow, ice and stream water in a glacierized catchment of the Ortles-Cevedale (Eastern Italian Alps)

Giulia Zuecco (1), Luca Carturan (1), Fabrizio De Blasi (1), Roberto Seppi (2), Thomas Zanoner (3), Marco Borga (1), and Giancarlo Dalla Fontana (1)

(1) Department of Land, Environment, Agriculture and Forestry, University of Padova, Legnaro (PD), Italy (giulia.zuecco@unipd.it), (2) Department of Earth and Environmental Sciences, University of Pavia, Pavia, Italy, (3) Department of Geosciences, University of Padova, Padova, Italy

Glacierized catchments are fundamental sources of fresh water and hydropower in the Alps. The quantification of glacier melt contribution to stream runoff represents a crucial issue for Alpine catchments affected by rapid glacier decay. Few studies have introduced a hydrochemical tracer approach to determine the contribution of different water sources to stream runoff in glacierized catchments. Furthermore, an investigation of the spatial and temporal variability in the tracer signature of snow, ice and stream water samples is still lacking and, consequently, there is high uncertainty in the quantification of glacier melt contribution to stream runoff. Therefore, this study aims to i) investigate the spatial and temporal variability in the isotopic composition (^{2}H and ^{18}O) of snow and ice samples collected from a glacier of the Eastern Italian Alps in relation to topography and meteorological conditions and ii) inspect the role of meltwater on the seasonal stream runoff.

Field surveys took place during summer and early autumn of 2013 and 2014 in the Noce Bianco catchment (8.42 km^2, Ortles-Cevedale massif, Eastern Italian Alps). The elevation range is 2298-3769 m a.s.l. and the area covered by the glacier is 42%. Samples for isotopic analyses were taken from rainfall at the outlet in 2013 and 2014 and from glacier snow, ice and meltwater at different elevations in 2014. Stream water samples were taken manually and by an automatic sampler at the outlet in 2013 and 2014. Isotopic composition of the water samples was determined by laser absorption spectroscopy. Electrical conductivity (EC) of water samples was measured by a portable meter and recorded continuously in the stream in summer 2014.

Results show that the tracer signature of glacier ice and snow is characterized by high spatial and temporal variability. Snow accumulated during winter was more depleted in heavy isotopes than snow accumulated during summer. However, residual winter snow became more enriched in heavy isotopes during the season due to evaporation and mixing with summer snowmelt percolating through the snowpack. During summer, stream water tended to become more enriched in heavy isotopes probably reflecting the signature of the meltwater. Stream runoff decreased progressively from late August and stream water EC increased more rapidly suggesting the major role of groundwater compared to glacier meltwater in this part of the season. These preliminary results indicate that the large temporal and spatial variability in the isotopic composition of glacier meltwater could represent a major cause of uncertainty in the identification of the main contributors to stream runoff at the daily scale, based only on the stable isotopes of water.

Keywords: stable isotopes of water; electrical conductivity; spatio-temporal variability; snow; glacierized catchment