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Hydrograph Separation based on Oxygen Isotopes Analyses in a small alpine Catchment

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For small catchments with highly responsive storm-hydrographs, the analysis of Oxygen isotope fractioning for the two-component hydrograph separation is a simple and powerful tool to get an insight into the stream flow generation.

Isotope response, analyzed with regard to time, helps in understanding the influence of different catchment processes on catchment hydrologic response.

For catchments with little surface water, it is reliable to assume that the return-flow component of the storm hydrograph consists almost completely of pre-event water stored in soil; this enable the calculation of the direct contribution to the hydrograph, due to rainfall water running over saturated areas.

This conceptualization allows the calibration of balance terms in conceptual models in which subsurface flow and overland flow are represented with different conceptual units.

In this work, fractions of Oxygen isotopes are measured during the whole duration of a single storm event, occurred in Summer 2003 in the Rio Vauz Catchment (1,9 km^2), a small alpine catchment sited on the Eastern Dolomites in Italy.

The water samples, to be analyzed, were collected with a temporal resolution proportional to the stream discharge (15 minutes during peak, 2 hours during baseflow). Also samples of pre-event water and precipitation were analized, showing great differences in Oxygen isotope partitioning. Deuterium portions were measured to check the consistency with Local Meteoric Weather Line for Northern Italy (Longinelli, 2003).

Results of the two component hydrograph separation, obtained trough isotopic analyses, were then used to test a simple hydrologic model (based on TOPMODEL), by

means of calibration of parameters influencing the balance terms relative respectively to subsurface flow and overland direct runoff.