Hydrological and isotopic response of a small forested catchment to short-term climatic variation

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**Abstract.** Long-term monitoring of the main hydro-meteorological variables, as well as of the isotopic composition of the various water sources in a catchment can help to gain new insights on how the hydrological response will be affected by climate change. In this study, we used hydrometric and stable isotope data from the 2-ha Ressi forested catchment in the Italian pre-Alps to i) investigate trends in the meteorological forcings and in the hydrological response, ii) determine whether a significant temporal trend in air temperature affected the isotopic composition of the various water sources, and iii) estimate the young water fraction (i.e., the fraction of water in a stream younger than about 2-3 months) and assess how it will be affected by significant trends in the isotopic composition of the water sources.

Precipitation, air temperature, streamflow, soil moisture and groundwater levels have been monitored in the catchment since August 2012. Soil moisture has been measured at 0-30 cm depth at four locations along a riparian-hillslope transect. Depth to water table has been measured in a piezometer installed in the riparian zone. Water samples for isotopic analysis were taken monthly from bulk precipitation and approximately biweekly from stream water, shallow groundwater, and soil water. Isotopic analyses were carried out by laser spectroscopy. Young water fraction was computed as the ratio between the amplitudes of the sine curves fitted to the isotopic composition of stream water and precipitation. The fitting of the sine curves was performed on the complete time series and on 2-year time windows.

Preliminary results show that monthly air temperature had a significant positive temporal trend, whereas monthly precipitation, soil moisture and streamflow had a decrease. The isotopic composition of the water sources (particularly in precipitation and stream water) showed a significant positive trend, which was correlated to the increase in air temperature. The estimated young water fraction varied between 52% and 68% depending on the methodological approach. Our results suggest that the combined trend in temperature and precipitation has a considerable effect on soil moisture and streamflow, and the climatic variation should be considered for the estimation of the young water fraction.

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