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Controls on ecohydrological dynamics of riparian zones in Alpine catchments: A comparison study of two rivers in the Eastern Italian Alps

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In recent decades, restauration actions have been implemented in mountain rivers to face widespread morphological changes. Such natural and anthropogenic modifications can have relevant impacts on the ecological and ecohydrological functioning of riparian vegetation. Understanding the water sources used by riparian vegetation is important for the implementation of effective river restoration initiatives. Therefore, more ecohydrological research is needed to quantify the complex interactions between hydrology and vegetation in different alpine river systems.

In this study we used water stable isotopes and electrical conductivity (EC) as tracers to better understand the hydrological and ecohydrological relationship between the riparian vegetation and the river bed of alpine river systems. We choose two catchments, Ahr/Aurino River and Mareit/Ridanna River catchments (South Tyrol, Italy) as study sites. In both catchments, we selected two sites comprising a younger ($<$ 5 years) and an older ($>$ 10 years) alder (*Alnus incana*) stand.

At each site, soil moisture at different depths and groundwater levels were monitored. Suction lysimeters were installed at the same depths than the soil moisture sensors. Samples for tracer analysis were collected since June 2016 on a bi-weekly or monthly basis from precipitation, soil water, groundwater and stream water. EC was continuously measured in a piezometer at the Mareit River. In addition, we extracted sap water for isotopic analysis from alder trees. First results show that all water types sampled in both catchments fell along the global meteoric water line showing no evaporative enrichments. Sap samples are expected to deviate from the meteoric line but they have not been analysed yet. At both sites in the Ahr catchment, soil water seemed to be more variable and isotopically more enriched at 10 cm depth (δ^2H: - 34 to -69 ‰) than at 50 cm (δ^2H: -45 to -71 ‰), indicating a decreasing influence of precipitation with increasing soil depth. In contrast, soil water at Mareit River seemed to depend stronger on the topographical location of the site than on the soil depth. Groundwater in the Ahr catchment at the end of July 2016 showed isotopic depletion (δ^2H: -89 ‰), which occurred about one month later than the isotopic depletion observed in the stream (δ^2H: -96 ‰). This may indicate a stream-groundwater connectivity with a specific time lag. These observations may provide a first insight into the main controls on the complex interactions between stream and vegetation in the riparian zone.

Keywords: stable isotopes of water; sap; alpine rivers; riparian zone connectivity; ecohydrology