



Spatio-temporal variability of stable isotopes (^{18}O and ^2H) in soil and xylem waters under Mediterranean conditions.

Pilar Llorens (1), Carles Cayuela (1), Elisenda Sánchez-Costa (1), Antonio J. Molina (1), Francesc Gallart (1), Delphis F. Levia (2), and Jérôme Latron (1)

(1) Institute of Environmental Assessment and Water Research (IDÆA)-CSIC, Barcelona, Spain (pilar.llorens@idaea.csic.es),
(2) Departments of Geography and Plant & Soil Sciences, University of Delaware, Newark, USA

Soil profiles and trees twigs were sampled in the Can Vila Mediterranean catchment (0.56 km²; Vallcebre Research catchments, NE Spain) to evaluate the spatial variability of the isotopic signature (^{18}O and ^2H) of xylem and bulk soil waters at the plot scale and between different locations within the catchment.

During two one day sampling campaigns with different antecedent soil moisture conditions, soil samples (0-10, 10-20, 20-30, 40-50 and 90-100 cm) and xylem samples (3 trees per plot) were collected in six Scots pine stands distributed throughout the catchment. Moreover, the water stable isotopes analysed were collected in rainfall, groundwater and streamwater at the catchment outlet during and between the sampling campaigns. Water from soil and xylem samples was extracted by cryogenic vacuum distillation and isotope analyses were obtained by infrared spectroscopy.

Stable isotopes ratios of bulk soil water and xylem water fell below the local meteoric water line (LMWL) in both sampling campaigns. In contrast, groundwater ratios fell along the LMWL, being well mixed with stream water. A marked vertical variation in soil water isotopes was observed for the dry campaign in all profiles, with enriched shallow horizons indicating evaporation. This variation was not observed for the wet campaign. Moreover, the spatial variation across the catchment was much greater for the dry campaign compared to the wet campaign. A marked variability in the xylem isotopic signature among trees of the same plot was observed for both sampling campaigns. Finally, in some plots and for both campaigns, the isotopic signature of xylem water was more evaporated than that of bulk soil water.

There was no clear pattern relating the topographic index, as an indicator of saturation conditions of the sampling location within the catchment, with soil water isotopic signature. Nor was there a clear relationship found between the isotopic signature of pines' xylem and tree characteristics, such as DBH, height, or tree competition index.