

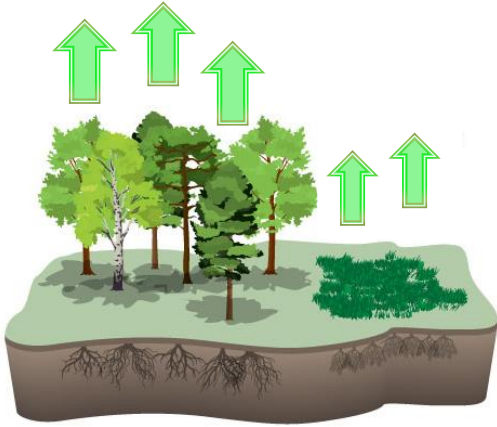


# ORIGIN OF THE WATERS SOURCED BY TREES IN A PRE-ALPINE FORESTED CATCHMENT

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# Motivation and objectives



Stable isotopes are used to determine the **origin** of waters taken up by **plants**, quantify the **relative contributions** of water sources to **stream runoff** and investigate **water flow paths**. However, the presence of different water pools in a catchment and soil water allocation complicates the understanding of water cycling, and calls for research on processes governing soil water movement and storage, as well as interactions between soil and plants.



Therefore, our research study aims to:

- investigate the **spatial** and **temporal variability** of the isotopic signature of various water sources
- determine which **waters** are used by **beech** and **chestnut** trees in a small experimental catchment in the Italian pre-Alps



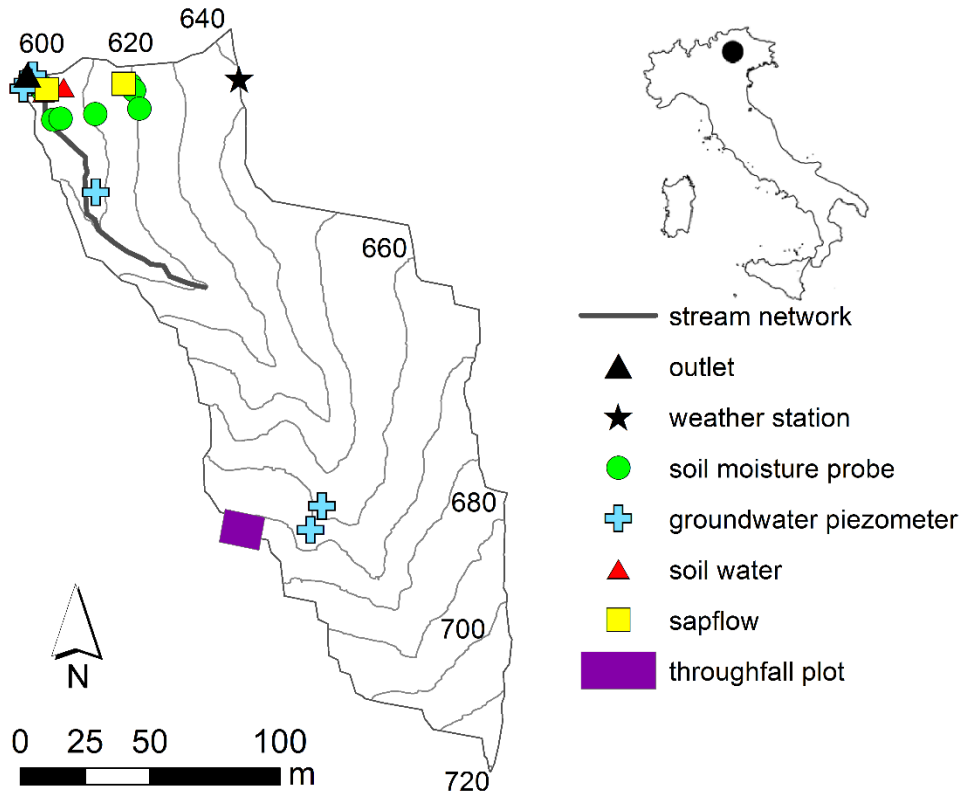
# Study area: Rio Ressi catchment



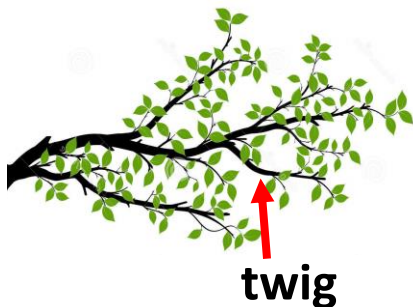
Area (km <sup>2</sup> )	0.02
Elevation (m a.s.l.)	598-721
Mean slope (°)	31

Mean annual precipitation (mm)	1695
Mean annual temperature (°C)	9.7

# Tracer and ecohydrological monitoring



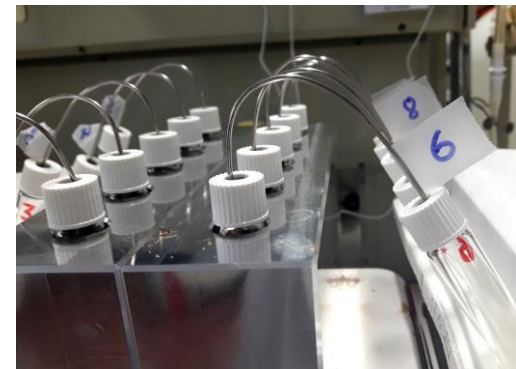
- stream network
- ▲ outlet
- ★ weather station
- soil moisture probe
- + groundwater piezometer
- ▲ soil water
- sapflow
- throughfall plot



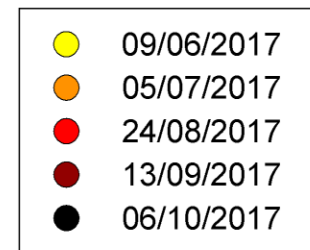
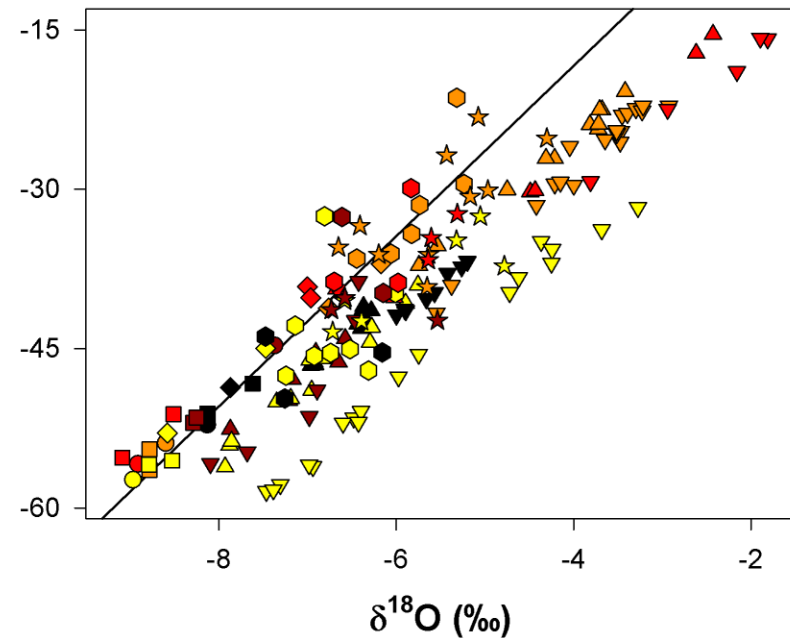
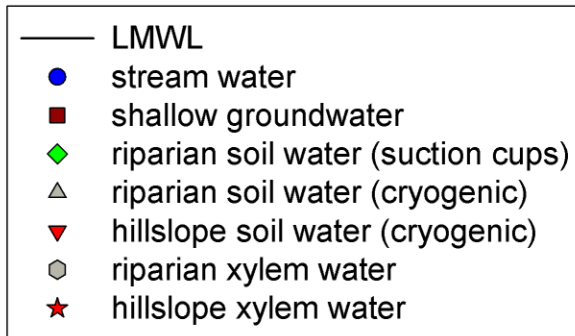
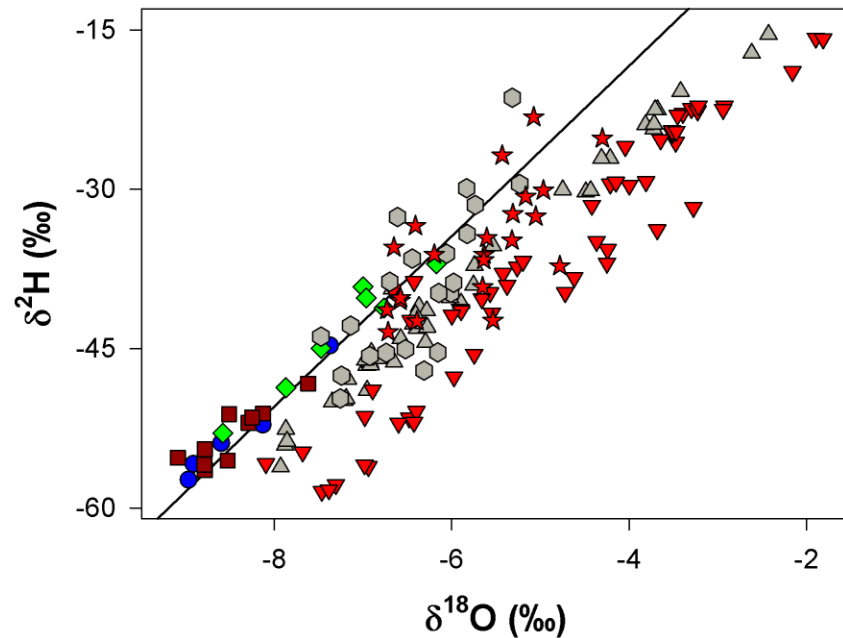
**Samplings:** precipitation, stream water, shallow groundwater, soil water, xylem water

**Water extraction:** cryogenic vacuum distillation (Koeniger et al., 2011)

**Tracers:** stable isotopes ( $^2\text{H}$  and  $^{18}\text{O}$ ) → laser spectroscopy and mass spectrometry

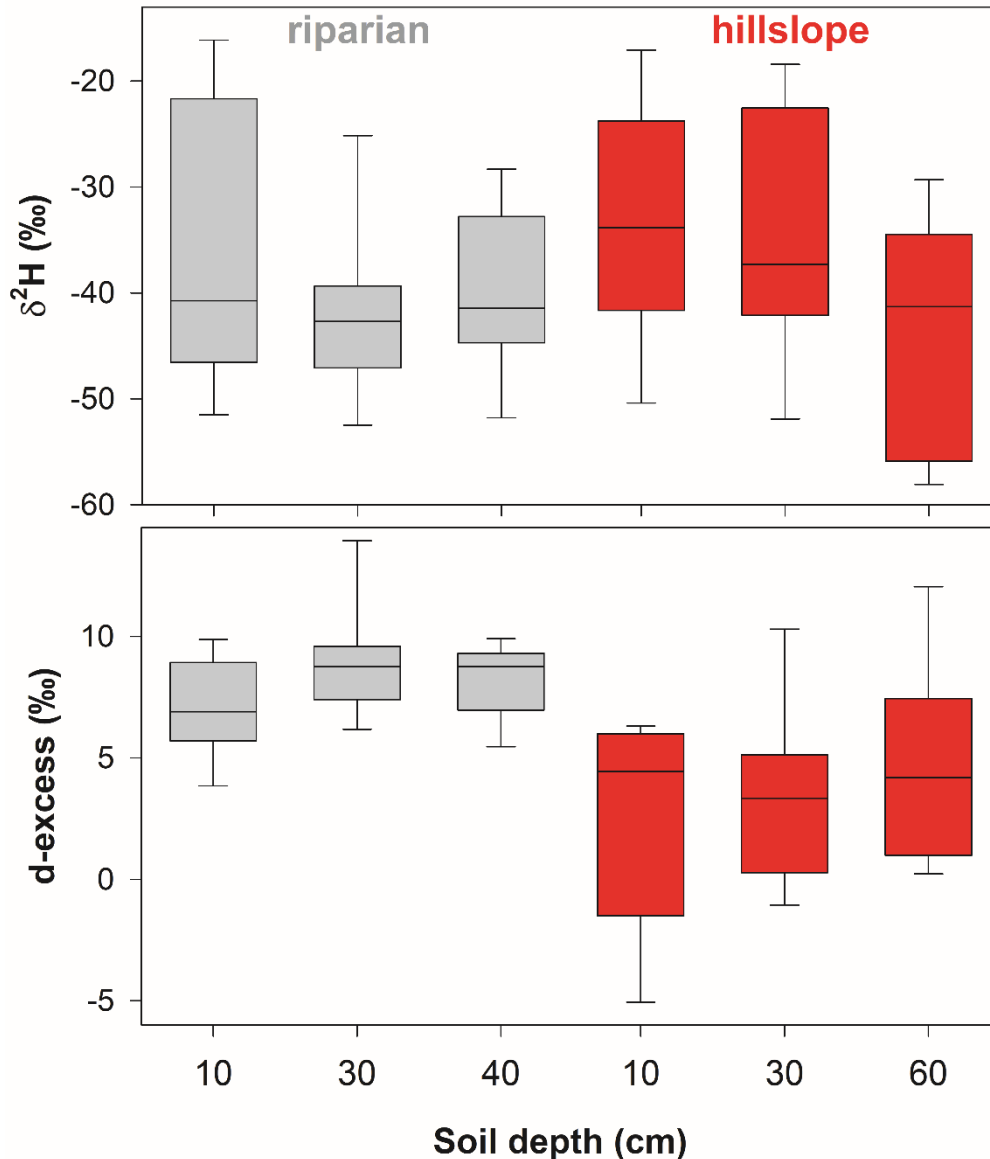


# Variability in the isotopic composition of the water sources



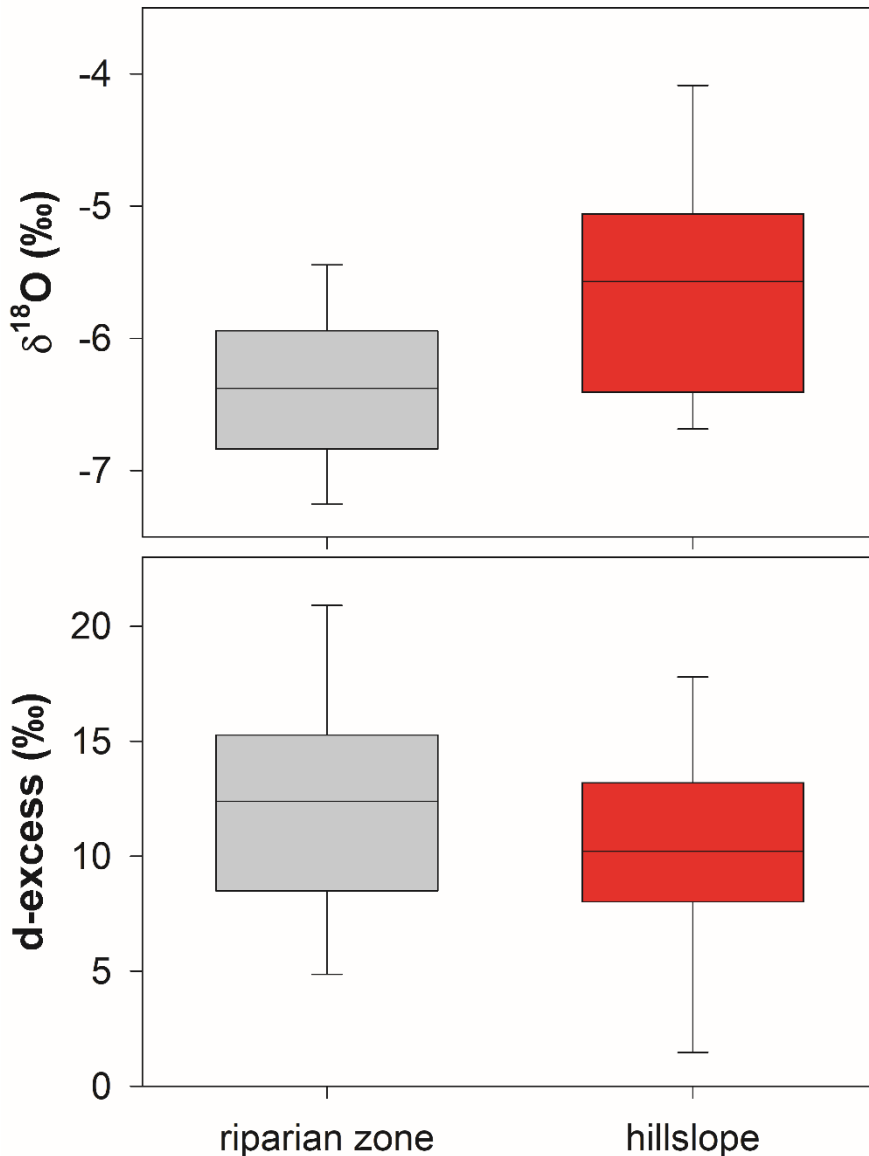
Stream water, groundwater and soil water extracted by suction lysimeters were isotopically similar to precipitation and aligned to the LMWL

# Soil water isotopic composition



- Soil water obtained by cryogenic distillation showed an evaporation signature, especially on the hillslope where soil moisture was lower and soil water could be extracted by suction cups only during or just after a large rainfall event
- Hillslopes tend to store less mobile soil water compared to the riparian zone

# Xylem water isotopic composition



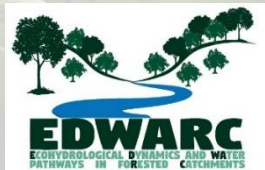
- Isotopic composition of xylem water plotted close to soil water obtained by cryogenic distillation
- Xylem water collected from beech and chestnut trees located in the hillslope was more enriched in heavy isotopes compared to xylem water obtained from trees in the riparian zone



## Concluding remarks

- Xylem water and soil water extracted by cryogenic vacuum distillation differ isotopically from, and are more evaporated than stream water, groundwater and more mobile soil water extracted by suction cups
- Hillslope soil and xylem water display a more evaporated isotopic signature compared to riparian soil and xylem water obtained by cryogenic vacuum distillation

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