

## Session title

Isotopic studies from precipitation to groundwater

## Description

The isotopic composition of water molecules is a powerful tool for tracing hydrological processes and the water cycle as a whole. Variations in stable isotopes ( $^{16}\text{O}$ ,  $^{17}\text{O}$ ,  $^{18}\text{O}$ ,  $^1\text{H}$ ,  $^2\text{H}$ ) and radioactive isotopes ( $^3\text{H}$ ) record shifts in recharge conditions, precipitation inputs, evaporation, and mixing, helping to distinguish deep and shallow groundwater components and to quantify their interaction across aquifers. Applied in various subsurface environments (e.g. karstic systems), isotope hydrology can reveal rapid flow paths, storage and transit times, and the processes that control recharge from the surface to the subsurface. Within this session, we highlight next-generation monitoring strategies and solutions that combine isotope observations with hydro(geo)logical data to identify the drivers of change and to track evolving groundwater dynamics. Climate-change adaptation is also in the focus, i.e. assessing how extreme events alter recharge and groundwater quality/availability, and how sustained monitoring can support resilient water-resource management from local to regional scales.

## Keywords

stable water isotopes, tritium, transit time, groundwater recharge, residence time

## Session Chair

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