

Using soil water isotope signature obtained from liquid-vapor equilibration and cryogenic extraction to investigate mobile vs immobile soil water signatures

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For almost 60 years, water stable isotopes have been used as natural tracer to study the rate of water movement in the vadose zone. Over the years, a variety of in-situ and lab-based techniques have been established to analyse the isotopic composition of soil pore water. These techniques can be categorized into two settings : extraction techniques and direct equilibration techniques. Comparative studies analysing soil water isotopic signature by different sampling methods showed deviations. These deviations could reflect the presence of more or less mobile pools of soil water that are collected in different proportions by each method. Sprenger et al., 2015, reviewed the soil water pools that each method allows to measure. They highlighted that a thorough comparison between $H_2O_{(liquid)}-H_2O_{(vapor)}$ pore water equilibration method and the cryogenic vacuum extraction method is yet missing. Recently, it was shown that measurements of a sample with the two methods give different values depending on the soil water content. These results raise the question about the isotopic signature of the different soil water pools. Here, based on laboratory experiments, we try to understand the isotopic signature of mobile, less mobile and immobile water reservoirs. This allows us to discuss on which soil water pool is measured by each method.

Sprenger, M., B. Herbstritt and M. Weiler (2015). "Established methods and new opportunities for pore water stable isotope analysis." *Hydrological Processes* **29**(25): 5174-5192.