



Investigation of groundwater recharge through unsaturated zone studies in arid regions

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Unsaturated zone processes play a key role in groundwater recharge as the thickness of the unsaturated zone in arid areas may reach several tenths of meters. In principle, the water trapped in the unsaturated zone represents a historic record of infiltration events potentially enabling a quantification of present and past groundwater recharge. We here present an approach for the investigation of the unsaturated zone through a combination of field techniques. Unsaturated zone experiments are carried out at selected field sites in the Kingdom of Saudi Arabia, representing different potential groundwater recharge scenarios in arid regions.

Volumetric soil water content within the unsaturated zone is continuously monitored in-situ using Time Domain Reflectometry (TDR). The in-situ investigation of the unsaturated zone is complemented by the determination of high resolution temperature profiles. Additionally, multilevel soil sampling for the extraction of the containing pore water is applied for the dating of the groundwater age through the determination of its isotopic composition ($\delta^{18}\text{O}$, $\delta^2\text{H}$, and ^{36}Cl). Installation of equipment and the retrieval of undisturbed soil samples is enabled by using direct push technologies.

It is expected, that the combination of the above mentioned techniques will result in an accurate quantification of present and historic groundwater recharge in arid environments.