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# Vegetation induced diel signal and its meaning in recharge and discharge regions

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Afforestation, promoted by the European Union is planned in Hungary in the next decades. One of the most important region for afforestation is the Hungarian Great Plain where the precipitation is far below potential ET so forests can not survive without significant water uptake from shallow groundwater.
Diel fluctuations of hydrological variables (e.g., soil moisture, shallow groundwater level, streamflow rate) are rarely investigated in the hydrologic literature although these short-term fluctuations may incorporate useful information (like groundwater uptake) about hydro-ecological systems in shallow groundwater areas. Vegetation induced diel fluctuations are rarely compared under varying hydrologic conditions (such as recharge and discharge zones).
In this study, the data of soil moisture and shallow groundwater monitoring under different surface covers (forest and neighboring agricultural plots) in discharge and recharge regions were analyzed to gain a better understanding of the vegetation hydrological impact or water uptake in changing climate. The pilot areas of the study are located in Hungarian Great Plain and in Western Hungary.
The water table under the forest displayed a typical night-time recovery in the discharge region, indicating a significant groundwater supply. Certainly, the root system of the forest was able to tap the groundwater in depths measuring a few metres, while the shallower roots of the herbaceous vegetation generally did not reach the groundwater reservoir at these depths. In the recharge zone the water table under the forest showed step-like diel pattern that refer to a lack of additional groundwater supply from below. The low groundwater evapotranspiration of the forest in the recharge zone was due to the lack of the groundwater supply in the recharge area. Similar patterns can be detected in the soil moisture of recharge and discharge zones as well.
Our results suggest that local estimations of groundwater evapotranspiration from water table or soil moisture measurements can only be achieved by understanding the different hydrological characteristics of recharge and discharge zones. In the context of climate change higher temperature and longer dry periods induced higher evapotranspiration constrain will probably reduce the groundwater level and so the spatial extent of shallow groundwater areas (reachable groundwater resources for vegetation). Therefore the better understanding of hydrological impact of different surface covers in shallow groundwater areas in changing climate is crucial, not only from water resources management point of view, but also from the viewpoint of agricultural and forest production or survival of forests with high water demand.

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