



## **Integrative assessment of structures and processes: Recharge, flow systems and interactions in a forested groundwater dominated lake system**

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Investigating hydrological processes in a groundwater dominated lake district is a challenge due to the fact that a) most of these processes happen in the subsurface and b) we are not looking at a single process but a complex interplay of structures, controls and boundary conditions. Groundwater recharge for example is controlled by rainfall dynamics, evaporation, tree water uptake, interception and stem flow. Subsurface structures determine the subsurface catchment itself as well as the connectivity between catchment and lake. These interactions of lake and groundwater are the result of processes and structures which can be highly variable in space and time. Focus area of this study is the catchment of Lake Hinnensee, situated in the lake district north of Berlin in Germany. The lake is a seepage lake with no surface inflows or outflows.

The interconnected processes described above are currently investigated with an integrative study which allows for a tight coupling of the experimental work: Tree water uptake is investigated with sapflow sensors in 3 different tree species. For these same species interception, stemflow and the resulting soil moisture dynamics are determined with high spatial and temporal resolution. Subsurface structures and their influence on groundwater flow are investigated using invasive, non-invasive and modeling approaches. Groundwater-surface water interactions on the other hand are determined with high spatial resolution, using both piezometer transects and heat transport modeling approaches. Vertical hydraulic gradients along the lake shore are measured with high accuracy and high temporal resolution.

Instrumentation started in 2012 and is part of the Terrestrial Environmental Observatory TERENO funded by the Helmholtz Association. The integrative experimental approach, the applied modeling techniques and first results are presented.