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Observed evaporation dynamics from a large lowland reservoir during a hot summer

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In the past, most field studies on evaporation have focussed on land-atmosphere interactions, while the turbulent exchange above inland water surfaces have remained underexposed. However, due to the differences in characteristics of a land surface and a water body there are other driving mechanisms underlying the process of evaporation. This results in a difference in dynamics of surface evaporation between the land use types and consequently should lead to a different parameterization in hydrological models. Especially in a changing climate the importance of having an understanding of the driving mechanisms of open water evaporation (E_{water}) becomes more crucial to better predict to what extent the quantity and dynamics of E_{water} could change in the future. This is essential to improve the parameterization of E_{water} in operational hydrological models and therefore to optimize water management now and in the future. For this purpose, we set-up a long-term measurement campaign to measure E_{water} and related meteorological variables over a large lowland reservoir in the Netherlands.

During the hot summer of 2019 two eddy-covariance systems were operational around lake IJsselmeer in the Netherlands. These high-temporal measurements are used to study the dynamics and to identify the forcing mechanisms of E_{water}. We present the turbulent heat flux dynamics at several temporal scales over the summer season of 2019 and show how they are related to potential drivers and parameters. From this we develop a simple data based model for estimating hourly E_{water} rates. Additionally, we compare E_{water} resulting from the direct measurements to E_{water} derived from commonly used evaporation models. Furthermore, we investigate and discuss the effect of including spatial variability on the total water loss of the IJsselmeer through E_{water}. We achieve this by using the skin water temperature, which is considered an important predictor in the estimation of E_{water}. Therefore, we use satellite products containing this information to extrapolate the in-situ observations towards spatially distributed rates of E_{water}.