



## **Quantification and estimation of nighttime evapotranspiration for two distinct grassland ecosystems**

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Increasing evidence suggests that significant amounts of water are lost from the land surface into the atmosphere during night by transpiration and/or evaporation processes. Investigations, which were conducted under arid to semi-humid climate conditions, have reported that water loss during night can represent up to 55 % of the daytime evapotranspiration (ET). This raised the questions of whether 1) nighttime ET is an important contributor for the total ET of two distinct grassland ecosystems, 2) which drivers control night- and daytime ET, 3) can we use meteorological variables to predict nighttime ET, and 4) to what extent is nighttime ET increased during heat waves.

Precision lysimeter data (2013 – 2016) at two sites in western Germany were used to determine ET of a forest meadow and an extensively used grassland ecosystem during different nighttime periods (dusk, dawn, nocturnal). The annual nighttime ET ranged between 3 - 10% of daytime water losses. Nearly 75% of the total nighttime ET occurred during nocturnal periods and were mainly driven by wind. Nighttime ET could be predicted based on the Penman-Monteith model, when we assumed that the nighttime surface resistance parameter equals to values used for daytime calculations. The occurrence of heat waves showed the potential to substantially increase nighttime ET. Overall, those findings indicate that nighttime ET significantly contributes to the terrestrial water cycle of grassland ecosystems in a humid temperate climate.