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Diurnal Course of Evaporation from the Dead Sea in Summer: A Distinct Double Peak Induced by Solar Radiation and Night Sea Breeze

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Diurnal Course of Evaporation from the Dead Sea in Summer: A Distinct Double Peak Induced by Solar Radiation and Night Sea Breeze

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Abstract

Partitioning between the relative effects of the radiative and aerodynamic components of the atmospheric forcing on evaporation is challenging since diurnal distributions of wind speed and solar radiation typically overlap. The Dead Sea is located about a 100 km off the Eastern Mediterranean coast, and the Mediterranean Sea breeze front reaches it after sunset. Therefore, in the Dead Sea the peaks of solar radiation and wind speed diurnal cycles in the Dead Sea are distinctly separated in time, offering a unique opportunity to distinguish between their relative impacts on evaporation. We present mid-summer eddy covariance and meteorological measurements of evaporation rate and surface energy fluxes over the Dead Sea. The evaporation rate is characterized by a clear diurnal cycle with a daytime peak, few hours after solar radiation peak, and a nighttime peak coincident with wind speed peak. Evaporation rate is minimum during sunrise and sunset. Measurements of evaporation rate from two other water bodies that are closer to the Mediterranean coast, Eshkol Reservoir, and Lake Kinneret, present a single afternoon peak, synchronous with the sea breeze. The inland diurnal evaporation rate cycle varies with the distance from the Mediterranean coast, following the propagation of sea breeze front: near the coast, wind speed, and radiation peaks are close and consequently a single daily evaporation peak appears in the afternoon; at the Dead Sea, about a 100 km inland, the sea breeze front arrives at sunset, resulting in a diurnal evaporation cycle characterized by a distinct double peak.