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# Partitioning evapotranspiration observations using unobserved component models

A. Jarvis

Lancaster Environment Centre, Lancaster University, UK

a.jarvis@lancaster.ac.uk

Plant canopies get wet when it rains and dry out afterwards. As obvious as it sounds this wet/dry transition causes evapotranspiration to vary between wet evaporation and dry transpiration end member conditions, with the blend at any time depending on the wetness of the canopy. Evaporation and transpiration differ in their response characteristics due to the additional resistance element in the flux pathway introduced by stomata. As a result, surface wetting and drying induced by discrete rainfall events cause behavioral changes in latent heat flux which can be exploited to partition observations into their evaporation and transpiration components. This work presents a methodology that trades on the wet/dry nature of evapotranspiration in order to partition eddy covariance latent heat observations into their component canopy-scale fluxes. The methodology is comprised of two coupled unobserved component models for potential evaporation and transpiration, with the later utilising simultaneous observations of canopy $CO_2$ uptake. The coupling of these elements is achieved by specifying fractional surface wetness using a grey box, first order wetness storage element. The resultant partitioning is evaluated on a synthetic data set where the relative contributions of evaporation and transpiration are know in addition to a number of FLUXNET eddy covariance data sets.