Geophysical Research Abstracts
Vol. 20, EGU2018-7539, 2018
EGU General Assembly 2018

Surface evaporation capacitance – soil type and rainfall characteristics provide an upper bound for soil evaporation

Dani Or and Peter Lehmann

ETH Zurich, IBP, Dept. Environmental Systems Science, Zurich, Switzerland (dani.or@env.ethz.ch)

The separation of evapotranspiration (ET) to evaporation (E) and transpiration (T) components for linking the water-carbon cycle, water resource management and hydrologic isotope fractionation remains a challenge. Regional estimates of soil evaporation often rely on plant-based (Penman-Monteith) ET estimates in which E is deduced as a residual or a fraction of potential evaporation. We propose a novel method for estimating E from soil properties and regional rainfall characteristics by accounting for concurrent internal drainage that shelters soil water from evaporation (without relying on PM formulation). A soil-dependent evaporative characteristic length defines a soil depth below which soil water cannot be pulled by capillarity to the surface - it determines the maximal soil evaporative capacitance (SEC). The site specific soil "capacitor" is recharged by local rainfall sequences and subsequently emptied at a rate determined by competition between drainage and surface evaporation (canopy interception and evaporation are considered). The SEC was tested for several field experiments, lysimeters and case studies spanning different soil types and climates and was then applied to delineate a global map (limited to ±60[U+F0B0] latitude) of soil evaporation. Surprisingly, the ratio of surface evaporation (E) to potential evapotranspiration (ET0) is relatively constant across soil types and climates with E/ET0 $\sim$ 0.1 for 75% of terrestrial surfaces. Latitudinal comparisons of E with existing models suggest an important role for soil type in determining this component of the hydrological cycle.