Geophysical Research Abstracts
Vol. 21, EGU2019-11799, 2019
EGU General Assembly 2019

Global surface evaporation – insights and opportunities

Peter Lehmann, Samuel Bickel, and Dani Or
ETH Zurich, Soil and Terrestrial Environmental Physics, Zurich, Switzerland (peter.lehmann@env.ethz.ch)

Hydrologic and climate models require reliable estimates of evapotranspiration (ET) and its components (E) surface evaporation and (T) plant transpiration for linking the carbon and water cycles and for attribution of water balance and surface fluxes. Some land surface models estimate ET and T using variants of the Penman-Monteith model with empirically-derived expressions for stomatal conductance with E estimated from E=ET-T. We present a method for direct estimation of E based on soil properties and rainfall patterns using the concept of soil evaporation capacitor (SEC). We show that soil type affects surface evaporation by: (1) defining the depth of evaporation effects, (2) controlling the rate of drainage that shelters water from evaporation and (3) determining the resistance to surface evaporation. The SEC is sensitive to local rainfall pattern, soil type and potential evaporation (ET0). Global estimates of E/ET0 vary between 0.05 in dry and hot regions to 0.25 in cool regions and show good agreement with flux tower measurements across soil types and biomes. We capitalize on the remarkably constant ratio T/ET=0.7 found in diverse biomes where vegetation is in equilibrium with local climate (non-agricultural areas) to use soil-based E to estimate annual ET for different regions. Values of climatic ET based on this crude estimate are in remarkable agreement with most advanced global ET product (ERA-interim) highlighting the importance of surface evaporation in determining available soil water for transpiration by vegetation.