

Ecosystem Water Use Efficiency of Major World Biomes

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Brief Summary

Water use efficiency (WUE) has been widely used and studied at the leaf level through chamber and carbon isotopic measurements, and at regional scales through modeling (Schulze, Elheringer, Farquar, Schimel, and many others). In this study, we propose a new concept -- ecosystem water-use efficiency (Λ) defined as net ecosystem exchange relative to the evapotranspiration of an ecosystem (NEE_c/ET). This approach provides an improved estimate of ecosystem WUE because both above and below ground processes are inherently included. We focus on Λ differences of among biomes and climates through analysis of direct measurements of NEP and ET within the FLUXNET database which provides a valuable opportunity to understand Λ on major ecosystems at global scale (e.g., evergreen and deciduous forested ecosystems, and savanna, grassland, wetland, and agricultural ecosystems). We propose to examine the variations in Λ responses relative to precipitation and temperature, as well as regional patterns or latitudinal/longitudinal gradients. The relationship of ecosystem age and soil type might also be examined. The overall goal of this study is to define potential biome patterns in ecosystem water use efficiency, which may confirm or refute patterns in vegetation-based WUE that have been proposed previously.