Geophysical Research Abstracts
Vol. 16, EGU2014-13303-1, 2014
EGU General Assembly 2014

Development of an Improved Surface Conductance Scheme for Penman-Monteith using FLUXNET

Nathaniel W. Chaney and Eric F. Wood
(nchaney@princeton.edu)

Land surface evapotranspiration plays a central role in the water, energy, and carbon cycles. A failure to accurately model ET leads to errors in numerical weather prediction, seasonal forecasting, and climate modeling. One of the persistent challenges in ET models is accurately representing the response of vegetation and bare soil to atmospheric and subsurface conditions via the surface conductance. In an effort to improve model performance, an updated surface conductance scheme for Penman-Monteith is implemented, optimized, and validated using the FLUXNET database.
The FLUXNET network of eddy covariance towers provides an invaluable source of in-situ data that allows for the development of the improved surface conductance scheme. At each of the 86 towers used in this study, the observed surface conductance is obtained by inverting the Penman-Monteith equation using the measured energy fluxes and surface meteorology. Additional quality control is applied at each tower to minimize uncertainties due to energy budget closure issues, wind advection, and outliers.
The development of the improved surface conductance scheme includes testing a coupled bare soil and canopy evaporation scheme and multiple canopy conductance schemes. The lack of observed heat roughness height leads us to also test different kB^{-1} models. After a parameter sensitivity analysis, each resulting surface conductance parameterization is optimized at each eddy covariance tower.
Ultimately, the optimized parameters from each scheme are used to train an artificial neural network to relate the scheme's parameters to each tower's climate and land cover type. The new parameterization and corresponding parameter estimation scheme are validated using the FLUXNET stations that were not used in the development. The resulting optimal scheme and its corresponding strengths and weaknesses will be discussed.