

Proposal for FLUXNET synthesis

Title: Analyzing long-term FLUXNET measurements for reliable ET values across ecosystems types and across climatic regions

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Outline:

Water fluxes are equally important outputs at FLUXNET sites, as they relate to surface climate and atmospheric boundary layer development, as well as water and energy partitioning at the surface. Finally, evapotranspiration (ET) influences carbon fluxes as CO₂ and H₂O share pathways and resistances, which is especially important for ecosystems types in drought prone areas. Also, tall vegetation (like forests) is rarely covered by existing lysimeter measurements that concentrate on arable lands. By EC (eddy covariance) FLUXNET closes this existing gap in ET data.

The paper addresses alternate approaches to arrive at ET fluxes: (i) direct eddy covariance (by close and open path analyzers), (ii) energy balance residual (available energy minus sensible heat flux), and (iii) re-partitioning of available energy by the Bowen ratio of the EC fluxes. Along with these engineering approaches physical reasoning is used to check for energy balance closure effects or effects of dew formation on the ET totals. The resulting ET values are separated in dry and wet episodes (by inverse Penman-Monteith conductance threshold) and precipitation in snow or rain (by temperature). Evaporative ratios of available energy and precipitation will be analyzed across sites (functional types) and across climatic regions, as well as crop coefficients calculated relative to grass reference ET (based on Allan's FAO model). An uncertainty estimate will be calculated for the ensemble mean of the various methods. Statistical relations to radiation, length of vegetation period, LAI and grass reference ET will be tested for a general application to calculate ET across functional types.

Data on total evapotranspiration, evaporative fractions, and estimates of uncertainties will be produced and act as input to the proposal by Köstner et al.

Sites involved: all sites with at least one year of measurements and required ancillary data