Title:

Spatially Distributed CO_2, Sensible, and Latent Heat Fluxes over the Southern Great Plains

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Abstract:

Vegetation strongly influences the spatial distribution of sensible and latent heat fluxes, and also controls the ecosystem to atmosphere CO_2 exchanges. We describe here a methodology to estimate surface energy fluxes and Net Ecosystem Exchange (NEE) of CO_2 continuously over the Southern Great Plains, using (1) data from the Atmospheric Radiation Measurement (ARM) program in Oklahoma and Kansas; (2) meteorological forcing data from Mesonet facilities; (3) USGS soil database; (4) MODIS NDVI; and (5) a tested carbon and isotope land-surface model (ISOLSM). The need for distributed ecosystem modeling was demonstrated by the large spatial variability in CO_2 fluxes across the region, which is typically modeled as homogeneous cropland. Comparisons were good between interpolated and independently measured meteorology (using four portable meteorological stations). We compare site-level modeled NEE to measurements made with (1) four portable eddy correlation flux systems located in the dominant vegetation covers and (2) ten permanent eddy correlation sites distributed throughout the Southern Great Plains domain. Predicted CO_2, latent heat, and sensible heat fluxes were in good agreement with measurements. We also performed a sensitivity analysis for NEE varying spatial and temporal resolution of land cover description and meteorological inputs. Our approach will allow us to estimate fluxes in periods and areas where meteorological forcing data are unavailable.