MULTI-SCALE ESTIMATIONS OF EVAPOTRANSPIRATION IN A COMPLEX TREE-GRASS ECOSYSTEM USING A THERMAL-BASED ENERGY BALANCE MODEL

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RESUMEN

Evapotranspiration (ET), the combined flux of water from evaporation of the surface (E) and transpiration of vegetation (T), is a key, yet difficult to measure, component of the water and energy budgets of ecosystems. This process has important implications for agriculture, hydrology and to evaluate biogeochemical changes. ET is a complex phenomenon that stems from the interaction of numerous variables related to the characteristics of the soil-surface, atmosphere and vegetation, resulting in large spatial and temporal variability. Often traditional modeling methods assume a ‘single big leaf’ surface, which results in greater uncertainties in surfaces with multiple and/or more complex vegetated features. This work aims to evaluate and adapt the Two-Source Energy Balance (TSEB) model [1] to predict ET for a complex tree-grass ecosystem by combining both optical and thermal infrared remote sensing data. Modeling analyses were conducted at different spatial and temporal scales ranging from using in-situ ground data, high resolution hyperspectral airborne images (<5m pixel size) and medium-to-coarse resolution satellite images (20-1000m pixel size). Results indicate that phenology and seasonal dynamics have a very important role in controlling water fluxes, with the model being sensitive to vegetation structural properties, and where grass and tree species have very distinct seasonal contributions to total water fluxes. In addition, the spatial resolution of input data proved to have significant influence on model uncertainty where different vegetation features (i.e. trees and grasses), which have different radiometric and physical properties, may not be separated at the medium spatial resolution (i.e. 20-1000m).

[1] Norman, J. M., Kustas, W. P., & Humes, K. S. (1995). Source approach for estimating soil and vegetation energy fluxes in observations of directional radiometric surface temperature. *Agricultural and Forest Meteorology*, *77*(3–4), 263–293

PALABRAS CLAVE

Evapotranspiration, energy fluxes, Two-Source Energy Balance model, tree-grass ecosystem