Estimating LAI and evapotranspiration rates using a distributed hydrological-agricultural model and remote sensing data

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Abstract:

A distributed hydrological model (MIKE SHE) is coupled to an advanced land-surface scheme (Daisy) for the simulation of water and nitrogen dynamics incl. plant growth in an agricultural area of Denmark. The model is applied to an area of 10 km^2 which is characterized by large differences in ground water level (0-30 m). An existing soil map ws used as a basis for collecting representative soil samples in order to assign hydraulic parameters to different soil types. Farmers were interviewed to achieve exact information on crop types and management schedules. In addition, satellite observations (Landsat TM) were used to extend the this knowledge to produce a land cover map comprising bare soil, meadow, and 13 different types of crop fields. The vegetation response functions of the major crops were previously parameterized (van der Keur et al., 2001). The model is run for two years and the simulated leaf area index and evapotranspiration rates are compared to field data and satellite based image products. The tmeporal results agree well with eddy-covariance measurements of latent heat fluxes. Remote sensing based maps of LAI were produced from the NDVI (Normalized Difference Vegetation Index) and evapotranspiration rates were calculated using remote sensing based estimates of net radiation and surface temperature (Boegh et al., 2002). The spatially distributed model simulations of LAI and evapotranspiration rates compare well with the remote sensing based products.

Boegh, E., Soegaard, H. and Thomsen, A. (2002). Evaluating evapotranspiration rates and surface conditions usig Landsat TM to estimate atmospheric resistance and surface resistance. Remote Sensing of Environment 79: 329-343.

Van der Keur, P., Hansen, S., Schelde, K. and Thomsen, A. (2001). Modifications of DAISY SVAT model for potential use of remotely sensed data. Agricultural and Forest Meteorology 106: 215-231.