A MULTI-SCALE REMOTE SENSING-BASED MODELING SYSTEM FOR ESTIMATING FIELD TO REGIONAL SCALE FLUX

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Objective of the study

An effective flux-upscaling scheme must be able to bridge the gap between the field scale of interest to agricultural and resource managers (~100 m) and the regional scale (~10-100 km) the resolution of operational climate and weather forecast models. An approach with operational capabilities for upscaling is described, which employs a targeted flux disaggregation strategy. Fluxes can be mapped over regional or continental scales in the U.S. at 5-10 km resolution each day using coarse-scale remote sensing imagery from a geostationary platform such as Geostationary Operational Environmental Satellite (GOES). These coarse-scale flux estimates can then be spatially disaggregated to finer scales at sites and times of particular interest (e.g., around a flux tower/field site, an aircraft flightline, or a field experiment site) using higher resolution imagery from satellite sensors such as the Advanced Space-borne Thermal Emission Reflectance Radiometer (ASTER), or the Moderate Resolution Imaging Spectroradiometer (MODIS) whenever such imagery is available (as determined by the satellite overpass schedule and cloud conditions). In this way, the temporal sampling power of the geostationary satellites (images every 15 minutes) can be combined with the spatial resolution of polar orbiters (15m – 1km). The disaggregation process serves both as a means for quantitatively validating the regional flux predictions and for examining complex landscapes having a diverse mixture of land use and crop cover types that exist in many agricultural regions around the globe. Examples of the application of this modelling framework will be presented.