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Distributed modelling of evapotranspiration using high-resolution NDVI maps over cropland in South-West France

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Distributed hydrological modelling in cropland areas requires an accurate estimation of evapotranspiration (ET). Remotely sensed data can support ET computation by providing valuable information on the vegetation condition. Here, we assessed the potential of high-resolution satellite imagery to monitor crop evapotranspiration over a small rural catchment area of South-West France (3.35 km2). We used a series of 88 Normalized Difference Vegetation Index (NDVI) maps spanning 2006-2009 derived from Formosat-2 images (8-m spatial resolution) to drive a dual crop coefficient model (SAMIR model). This model is based on the FAO-56 method and includes a conceptual soil module to account for soil water storage and drainage. The model was first applied at the plot scale (i.e. in 1-D mode) over a research site located in the watershed, which is instrumented with an eddy covariance system and soil moisture probes. This comparison enabled to identify the most critical model parameters and to adjust them to match the observed daily ET rates. In particular this analysis allowed the calibration of the linear relationship between the basal crop coefficient (Kcb) and the NDVI for winter wheat, rapeseed and sunflower. The model performance was also found to depend on the initial soil water content. At this stage good model performances were achieved (annual R2 ranging from 0.7 to 0.8, bias 5% to 15%). Further validation of the simulated soil water content indicated acceptable results without calibration. Then, the model was run at the catchment-scale using the calibrated Kcb, the NDVI images and a high-resolution land cover map for every year to predict the annual catchment evapotranspiration. We will present the result of the catchment-scale model validation based on the river discharge measurements.