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## Influence of Multi-Temporal High Resolution Remote Sensing Products on Simulated Hydrometeorological Variables in the south-west of France

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# Influence of Multi-Temporal High Resolution Remote Sensing Products on Simulated Hydrometeorological Variables in the south-west of France

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## Abstract:

Agricultural landscapes are often a patchwork of crop fields whose seasonal evolution depends on specific crop rotation and phenologies. This temporal and spatial heterogeneity have an impact on surface hydrometeorological processes. Accurately evaluating its effect remains a challenge for water management agencies in a context of drought and irrigation supply. The satellite remote sensing products from the Sentinel-2 mission will allow the monitoring of the land cover and the vegetation dynamics. The unprecedented spatial-temporal resolution (5 days, 20m) is fully compatible with heterogeneous agricultural landscapes. In our study we proposed to evaluate the contribution of these remote sensing data on a water and energy fluxes simulation with a distributed version of the ISBA-SURFEX land surface model. The study area is a 24 km by 24 km agricultural zone in the south-west of France. A first reference simulation was carried out by using the ECOCLIMAP-II database. This global numerical land ecosystem database is at 1km resolution and includes an ecosystem classification with a coherent set of land surface parameters needed by the model like the Leaf Area Index and the albedo. The Leaf Area Index (LAI) of ECOCLIMAP is derived from an analysis between 2000 and 2005 of the MODIS satellite products. This low resolution induces that a pixel can mix several vegetation covers in a model cell. The climatic construction of the dynamics of LAI also means that there is no interannual variability in the vegetation cycle. To improve the temporal and spatial description of the vegetation, we did a second simulation where we forced the model with high-resolution (8m) annual cover maps and monthly time series of LAI derived from a 2006 to 2010 time series of Formosat-2 multispectral images. Both simulations were done at the field scale (i.e. a computation unit is a homogeneous crop field or a forest patch, etc.). They were compared with in-situ eddy covariance tower measurements but also with each other. We conclude that using the Formosat data leads to improvements on the description of the actual temporal LAI dynamic and consequently improves the evapotranspiration cycle realism. This conclusion is mainly true for the summer crops. It induces a significant impact on the dynamic of the Soil Water Content and consequently the drainage to the deep soil. The impact on the annual volume remains small but significant, the increase of the drainage with Formosat-2 data in comparison to the reference simulation representing 5% of the annual precipitation.

**Keywords:** Remote Sensing; Hydrometeorology; Leaf Area Index; Evapotranspiration; Drainage; Soil Water Content; High-Resolution; SVAT Model