EMS Annual Meeting Abstracts
Vol. 16, EMS2019-197, 2019

Implementation of a new irrigation scheme in the ISBA Land Surface Model

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Improving the representation of agricultural practices and water use in land surface models (LSMs) has become necessary to assess the impact of irrigation on the terrestrial water and vegetation cycles as well as their impacts on the surrounding environment. In the ISBA LSM, ECOCLIMAP-SG, a new vegetation description has recently been implemented (from the ESA-CCI land cover map, amongst other maps), with an increase in the spatial resolution (up to 300m) as well as in the number of vegetation types considered (20 different types without irrigation). It also includes new databases describing tree height and yearly cycles of the Leaf Area Index (LAI) and albedo. A new irrigation scheme and the associated fraction map have been implemented as well. The principle of the new irrigation is to allow a fraction of each vegetation type to be irrigated (as a function of the irrigation map), with different configurations, such as the irrigation type (sprinkler, flood or drip) or the triggering thresholds, amounts, etc. Taking into account different constraints imposed by the user, the model triggers irrigation based on the stress factor (computed considering the difference between soil water content and the wilting point along the root profile).
This new implementation enables an increased spatial resolution in the simulation, making it possible to assess the regional impact of irrigation. In this study, we present the new irrigation scheme and associated agricultural practices such as seeding and reaping dates. Their impact on (i) vegetation using satellite-derived observations of the LAI, (ii) the hydrological cycle and (iii) other model variables like local surface temperature will also be presented.