Simulating carbon and water fluxes over croplands with ORCHIDEE-STICS model : Multi-site evaluation and sensitivity to management drivers

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Cropland ecosystem is one of the most uncertain components of the terrestrial Carbon budget at European scale. In this context, a dual effort has been initiated within the CarboEurope-IP project named as the Cropland Synthesis Activity that aims 1) to monitor and analyse C flux over crop sites and 2) to develop and refine crop model's simulations from site to continental scale.

Here, we will present the results obtained with the ORCHIDEE-STICS model within the frame of this activity. In this coupled model, the agronomy-oriented model STICS provides its calculated Leaf Area Index (LAI) to the dynamic global vegetation model ORCHIDEE in order to better calculate the Growth Primary Production (GPP) and related C fluxes for crop ecosystem. With this model we performed simulations on several wheat and maize sites. Overall, ORCHIDEE-STICS agrees well with the observations especially for wheat. We will assess from the misfit between model and data, where structural improvements of the model are needed, and what is the beneficial effect of these improvements. Four main forms of model improvements will be tested : i) optimal adjustment of generic physiological parameters of ORCHIDEE, ii) adjustment of agricultural technology, iii) adjustment of crop varieties phenological parameters and iv) realistic reproduction of each site cultivation history. All this information being rather uncertain at the European scale, this assessment is particularly of importance and will help to rank priorities for future model's developments. The model data comparison will focus on NEE, GPP, Reco fluxes, but also involve latent and sensible heat flux observation.