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USING A COUPLED CANOPY FUNCTIONING AND SVAT MODEL IN THE RESEDA EXPERIMENT. ASSIMILATION OF SPOT/HRV OBSERVATIONS INTO THE MODEL.

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Crop growth models are commonly used to describe the crop seasonal dynamics. In water stress conditions, the control of the water available for the plant along the season is of great importance. In the frame of the ReSeDA experiment, we run a coupled canopy functioning and SVAT model. This coupled model simulates the vegetation growth, as well as the surface radiation and water fluxes, with an hourly time step for the whole growing season.
The use of such a model over different fields requires, for each field, the knowledge of a large set of model parameters. Remote sensing data appear of great interest to fit some of those field-specific model parameters. Here we show how satellite optical measurements are used in combination with the coupled model through the assimilation technique, on a wheat field.

The coupled model has been validated in different situations mainly for grassland covers (Cayrol et al, 1999). Since this model is not crop specific, in this study, most of the growth model parameters were set according to well known crop models such as AFRCWHEAT (Porter, 1994) and SUCROS (Spitters et al, 1989). Each sub-model was initialised and calibrated separately using literature and ground measurements. The canopy functioning sub-model simulations were compared to leaf area index and biomass measurements, while the SVAT sub-model predictions were compared to soil water content and energy fluxes measurements. The coupled model was also run in comparison with the ground measurements.
The second part of this presentation is devoted to the use of the short wave satellite measurements to constrain the coupled model. The radiometric signal is simulated by linking the coupled model to the SAIL (Verhoef, 1981) radiative transfer model. Through an assimilation procedure, we used SPOT/HRV measurements to fit some of the growth model parameters. In the example presented here, we tested this method by fitting the initially biased values of initial shoot biomass and initial specific leaf area.

The calibration of the canopy functioning sub-model gave satisfactory results in terms of biomass and LAI prediction. Concerning the SVAT model, we encountered some troubles in determining some parameters such as the root depth. The coupled model however gave reasonable results in terms of vegetation model outputs, but it was more difficult to conclude concerning the simulation of the energy fluxes. We also noticed that, on a wheat field, the assimilation of SPOT measurements allowed the fit of unknown model initial conditions and improved the radiometric variable prediction.
With the assimilation technique, the coupled model can be extrapolated to regional scale, where no ground measurements are available. In the same way, the coupled model could be run by taking into account the surface within-field spatial variability for precision agriculture purpose.