Simulation of the temporal variations of NOAA/AVHRR reflectances. Coupling of functional model and satellite data.

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The high frequency and the large coverage of AVHRR data have lead numerous researchers to use the optical channels to monitor the temporal variations of vegetative covers at a regional scale. Over agricultural canopies, the seasonal cycle observed can give informations about the development and the growth of the crops, and their spatio-temporal variations. However, the satellite measurements are only radiative measurements and they are not sufficient to give a quantitative indication about biochemical or biological processes involved, for example CO2 fluxes or dry matter production.

We propose here to couple functional models and AVHRR observations: The functional models simulate the seasonal behavior of a crop canopy by the modelization of all mecanismes involved (phenological development, growth of the leaf area index (LAI) and senescence, photosynthesis and respiration, allocation of the assimilate in the various organs, grain production...). The driving variables are meteorological data, farming practices, and informations about soil. The LAI can be linked to visible and near infrared reflectances by the mean of radiative transfer models. It is then possible to simulate the temporal behavior of the reflectances over crop canopies. We assume that some important agricultural regions are concerned by only a few number of majors crops. The relative proportion of these various crops can be obtained from land use classification (Agricultural services or SPOT classification). Consequently, if we combine the various modelizations for each kind of crop, (coupling of functional model plus radiative transfer model), and if we take care about directional and atmospheric aspects, we are able to simulate the temporal variations of AVHRR reflectances.

This idea will be tested over Beauce, which is an important French region for wheat, barley and corn production. The modelization of the AVHRR reflectances will be compared with observations in order to determine if these observations could be used to check the model: choice of the initial conditions, adjustment of some species parameters...