Assimilation of short wavelength satellite observations into an agrometeorological model

Sophie MOULIN

Centre d'Etudes Spatiales de la Biosphère (CESBIO, CNES/CNRS/UPS)
18, avenue E. Belin (BPI 2801), 31401 Toulouse Cédex 4, France.
tel : (33) 5 61 55 85 19, fax : (33) 5 61 55 85 00, e-mail : sophie.moulin@cesbio.cnes.fr.

ABSTRACT

The synergy of agrometeorological models and short wavelength satellite observations allows the consistency of the modelling of some remotely sensed variables' time profiles to be controlled. Satellite observations are also used to constrain the crop model which predicts the canopy productivity. The study was performed over a controlled area.

For given environmental and cultural conditions, the time profile of high spatial resolution satellite signal (SPOT HRV) was predicted at field scale through the link between a crop model and a canopy radiative transfer model. The interannual variations of the measured radiometric signal, due to known parameters variations, were reproduced. The impact of such parameters variations is significant for the estimation of canopy productivity.
The use of SPOT HRV observations to constrain the modelling implies that the signal is well simulated. Synthetic observations allows testing of the assimilation technique for many acquisition configurations. The quality of the productivity estimation depends on the quality of the inverted parameter adjustment. The merit function feature is very sensitive to the number and to the position of observations among the seasonal cycle.
The low spatial resolution radiometric signal (NOAA AVHRR) was simulated at regional scale. The different components of the observed signal were obtained either with the crop model, or empirically. The rebuilding was performed with the land use classification.

The linked crop/reflectance models are able to predict high and coarse spatial resolution radiometric signals. The quality of the adjustment performed by assimilating satellite observations strongly depends on the quality of the modelling performed in the direct way. An improvement is needed for the signal modelling during the growth period.

Moulin, S., 1995, Assimilation d'observations satellitaires courtes longueurs d'onde dans un modèle de fonctionnement de culture, *Ph. D. thesis*, Université Paul Sabatier, Toulouse, France, n° d'ordre: 2219, 301 pages, (in french).