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Assimilation of surface soil moisture and LAI observations in a SVAT model

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The root zone soil moisture and the biomass of the vegetation are two key variables to better understand the complex interaction between the surface layer, the low-level atmosphere and the vegetation canopy. A better comprehension of the processus which explain their variability results in a more precise estimation of their spatial-temporal evolution. Nevertheless, the lack of global observations at sufficiently fine spatial resolution limits their accurate prediction. This strong constraint has driven to use data assimilation systems. They employ all the information provided from the model and observations, as well as their associated incertitude, in order to reinitialize the model at observation times.

In this study different and multispectral remote sensed data is used and assimilated within the ISBA-A-gs surface scheme: in-situ soil surface measurements, brightness temperatures in L-band and reflectances over a fallow in the SMOSREX site situated in the South-West of France. The temporal period under study includes four years (2001-2004) of measuraments, with marked different climatic characteristics. Four assimilation methods, either sequential or variational, have been tested. The different approaches show that (1) a sequential ensemble-based method outperforms that one which uses a linear approximation between observations, (2) a variational method performs better if it includes a memory term. During the whole period, in general, the root-zone soil moisture is well retrieved, improving the control model reference. However, if only observations of soil surface moisture are used the results obtained for the biomass retrieval are poor. In this paper soil surface moisture and LAI observations are also combined in a single assimilation scheme in order to retrieve accurately both, root-zone soil moisture and biomass of the vegetation, at the same time.