ON THE DATA ASSIMILATION OF REMOTE SENSING DERIVED SOIL MOISTURE IN HYDROLOGICAL MODEL

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Several space borne sensors observe the earth’s land surface providing soil moisture products with time and spatial. Potentially, data assimilation techniques allow exploiting these products to correct internal model states in order to improve the model results in terms of discharge and soil moisture. Although, the idea is not new (see Jackson et al. 1981) and many synthetic experiments confirmed that the concept, the results of the rare studies dealing with the assimilation of real products are controversial. There is no doubt that the performances of soil moisture data assimilation studies depend on many factors such as the data assimilation scheme, the hydrological model structure and the soil moisture data. As of today, these dependences are not well understood and the disparity of outcomes in past studies arguably reflects the differences in the design of the experiments.

The aim of the analysis is to set up an ideal procedure for the assimilation of Ascat soil moisture product into a hydrological model. To this end several options in terms of processing of satellite product, error parameterisation and filter design were tested and their impact on the data assimilation performances evaluated.

The area of interest is the Severn catchment at Bewdley (ca. 4000 km²), located in the United Kingdom while the analysed period spans from 2006 to 2011. A hydrological model was set up using the SuperFlex framework. Precipitation and temperature derived from ECMWF ERA-Interim product were used as meteorological forcings. The latter were provided at resolution of 6 hour and 0.125°. Satellite products were first converted into root zone soil water indices using an exponential filter and then rescaled using various CDF matching techniques. As data assimilation scheme different variants of the particle filter were considered. To parameterise the error of the satellite soil moisture products the triple collocation approach was exploited, considering the AMSR-E dataset besides ASCAT one. Results show that it is possible to setup a procedure in order to obtain an improvement in discharge estimation when satellite products are assimilated. However, the improvement clearly depends on the CDF matching approach and on the variant of filter used.