



Assimilation of SMOS soil moisture products to improve streamflow simulations on the Ouémé catchment in Benin

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The Ouémé catchment is located in the central part of Benin in West Africa. Its climate, extremely dry in winter and heavy rains in summer, makes the water cycle a true challenge to model, especially for the water management in the agricultural areas.

DHSVM (Distributed Hydrology Soil Vegetation Model) is a physically based and distributed hydrological model that solves the energy and water balance at each time step. This model simulates the soil moisture at each soil layer, the snow quantity, the evapotranspiration, the runoff and the streamflow. It was used with an hourly time step at a 1 km resolution. Model parameters have been calibrated using 2005 in situ streamflow measurements along with in situ precipitations. When using satellite precipitation observations, the streamflow simulations are no longer in agreement with in situ measurements.

The goal of this work is to assimilate the SMOS soil moisture product into the hydrological model DHSVM using a Kalman filter for a better constraint on the water cycle model when using satellite precipitation observations. First results tend to show an improvement of the simulated streamflow using the SMOS assimilation into DHSVM. SMOS acts on the system by adding or removing some water when satellite observations are either under or over-estimating the precipitations.

The ESA's SMOS mission was launched in November 2009 and has been providing Soil Moisture and Ocean Salinity data for the last five years. Soil moisture products are available at a 25 km resolution with a 3-day global coverage (Level 3 data). Besides the choice of the assimilation method, the difference in spatial resolutions is also being taken care of by using an influence circle area.

Highlights are mainly put on the impacts of the assimilation on the soil moisture and on the streamflow. Furthermore, DHSVM also models the water table depth and a first attempt to estimate groundwater volume for the entire watershed is presented in this study.