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Combined evaluation of optical and microwave satellite dataset for soil moisture deficit estimation

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Soil moisture is a key variable responsible for water and energy exchanges from land surface to the atmosphere (Srivastava et al., 2014). On the other hand, Soil Moisture Deficit (or SMD) can help regulating the proper use of water at specified time to avoid any agricultural losses (Srivastava et al., 2013b) and could help in preventing natural disasters, e.g. flood and drought (Srivastava et al., 2013a). In this study, evaluation of Moderate Resolution Imaging Spectroradiometer (MODIS) Land Surface Temperature (LST) and soil moisture from Soil Moisture and Ocean Salinity (SMOS) satellites are attempted for prediction of Soil Moisture Deficit (SMD). Sophisticated algorithm like Adaptive Neuro Fuzzy Inference System (ANFIS) is used for prediction of SMD using the MODIS and SMOS dataset. The benchmark SMD estimated from Probability Distributed Model (PDM) over the Brue catchment, Southwest of England, U.K. is used for all the validation. The performances are assessed in terms of Nash Sutcliffe Efficiency, Root Mean Square Error and the percentage of bias between ANFIS simulated SMD and the benchmark. The performance statistics revealed a good agreement between benchmark and the ANFIS estimated SMD using the MODIS dataset. The assessment of the products with respect to this peculiar evidence is an important step for successful development of hydro-meteorological model and forecasting system. The analysis of the satellite products (viz. SMOS soil moisture and MODIS LST) towards SMD prediction is a crucial step for successful hydrological modelling, agriculture and water resource management, and can provide important assistance in policy and decision making.

Keywords: Land Surface Temperature, MODIS, SMOS, Soil Moisture Deficit, Fuzzy Logic System

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