Performance assessment of satellite soil moisture products for land data assimilation

Akhilesh Nair (1) and Indu Jayaluxmi (2)

(1) Civil Engineering Deparment,Indian Institute of Technology Bombay, Mumbai, India (akhileshn@iitb.ac.in), (2) Civil Engineering Department,Indian Institute of Technology Bombay, Mumbai, India (indusj@civil.iitb.ac.in)

Despite the considerable interest in the field of land surface data assimilation, relatively little is known about their efficiency to improve the LSM simulation skills. To address this need, we have evaluated the effectiveness of three different remote sensing based soil moisture (SM) products to enhance the LSM simulation skill. This is illustrated using offline simulations wherein firstly the Noah LSM is spun-up for 21 years over the entire Indian subcontinent (Latitude: 8.125^o N – 37.375^o N, Longitude: 68.125^o E – 97.375^o E) at a spatial resolution of 0.25^o.This is followed by a series of experiments to assimilate different bias corrected SM products using Ensemble Kalman Filter. The SM products used are namely from Soil Moisture and Ocean Salinity (SMOS), ESA's Climate Change Initiative (CCI), and Soil Moisture Operational Product System (SMOPS). Validation is carried out by comparing with in-situ stations from International Soil Moisture Network (ISMN) and the Modern-Era Retrospective Analysis for Research and Applications (MERRA) land products. Furthermore, the stream flow estimates from the assimilation experiments are compared with gauge discharge data from the Central Water Commission (CWC) of India. Results indicate huge bias in open loop (without assimilation) simulations, which get considerably reduced after assimilation of satellite SM product. Data assimilation reduces the bias from unmodeled anthropogenic processes (such as irrigation) within LSM. Intercomparison of results with in-situ station shows an improvement in root zone soil moisture post-assimilation. This information can be used as the basis for successful implementation of SM assimilation in different LSMs.