Assimilation of Soil moisture Retrievals from FY-3B Microwave Radiometer Imager into Community Land Model using Ensemble Kalman Filtering

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It is widely known that soil moisture plays an important role in meteorological, agricultural and hydrological fields. Both soil moistures retrieved from remotely sensed microwave measurements and predicted from numerical models have advantages and disadvantages. An effective way to achieve soil moisture estimates with high accuracy and large coverage is to assimilate information from satellites to models.

In this study, two-year surface soil moisture product over China derived from the microwave radio imager (MWRI) sensor onboard of the Fengyun 3B satellite (FY-3B) is assimilated into the Community Land Model (CLM). The FY-3B soil moisture retrievals are firstly compared to the soil moisture product generated by CLM forced by China Land Assimilation System version 1.0 (CLDAS v1.0) forcing data. To reduce satellite-model bias, cumulative distribution function (CDF) matching is used to scale the FY-3B soil moisture retrievals to the CLM modeled soil moisture. Then the scaled satellite retrievals are assimilated into CLM by using Ensemble Kalman Filtering (EnKF) technique. To evaluate the impacts of FY-3B soil moisture product assimilation, CLM with FY-3B soil moisture product assimilation and CLM without any change are run separately over China forced by the CLDAS v1.0 forcing data from Jan. 2011 to Jan. 2013 with a spatial resolution of 0.0625°.

In situ observations from more than one thousand automatic observation stations are used to evaluate the impacts of the assimilation of satellite retrievals. Validation against in situ data shows that the assimilation of FY-3B soil moisture products improves the soil moisture simulation accuracy over many regions in China. Especially, the top 10 cm simulation with assimilation of FY-3B soil moisture retrievals has a reduced bias and higher correlation compared to the simulation without assimilation of satellite information.

References

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