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Comparing Assimilation of Soil Moisture and C-band Backscatter in High Resolution Land Surface Model

Leqiang Sun, Stéphane Belair, Marco Carrera, and Bernard Bilodeau
Environment and Climate Change Canada, Dorval, Canada (sunleqiang@gmail.com)

Canadian Space Agency (CSA) has recently started receiving and processing the images from the recently launched C-band RADARSAT Constellation Mission (RCM). The backscatter and soil moisture retrievals products from the previously launched RADARSAT-2 agree well with both in-situ measurements and surface soil moisture modeled with land surface model Soil, Vegetation, and Snow (SVS). RCM will provide those products at an even better spatial coverage and temporal resolution. In preparation of the potential operational application of RCM products in Canadian Meteorological Center (CMC), this paper presents the scenarios of assimilating either soil moisture retrieval or outright backscatter signal in a 100-meter resolution version of the Canadian Land Data Assimilation System (CaLDAS) on field scale with time interval of three hours. The soil moisture retrieval map was synthesized by extrapolating the regression relationship between in-situ measurements and open loop model output based on soil texture lookup table. Based on this, the backscatter map was then generated with the surface roughness retrieved from RADARSAT-2 images using a modified Integral Equation Model (IEM) model. Bias correction was applied to the Ensemble Kalman filter (EnKF) to mitigate the impact of nonlinear errors introduced by multi-sourced perturbations. Initial results show that the assimilation of backscatter is as effective as assimilating soil moisture retrievals. Compared to open loop, both can improve the analysis of surface moisture, particularly in terms of reducing bias.