A Study on Real Time Simulation and Data Assimilation System

Yang Wang[1], Yaonan Zhang[2], Guohui Zhao[3]

[1]Cold and Arid Regions Environmental and Engineering Research Institute, Chinese Academy of Sciences, Lanzhou, China, wangyang@lzb.ac.cn
[2]Cold and Arid Regions Environmental and Engineering Research Institute, Chinese Academy of Sciences, Lanzhou, China, yaonan@lzb.ac.cn
[3]Cold and Arid Regions Environmental and Engineering Research Institute, Chinese Academy of Sciences, Lanzhou, China, zhgh@lzb.ac.cn

Model computing is an important part is modern science research, while the low accuracy of models often restricts the use of models. Involving observation into the model calculation is an executable method with data assimilation algorithm. In this paper, we discuss a method to dynamical improve the accuracy of land surface model by assimilating stationery observation and remotely sensed data with ensemble Kalman filter (EnKF). We have designed a system, which can acquire observation of meteorological station in real time, simulate the land surface process with models in real time, and assimilate the observation into the model in real time. In the data transmission part, we use 2.4GHz microwave signal to transmit data back every hour. In the simulation part, we choose simplified simple biosphere model (SSiB) to simulate soil moisture, soil and canopy temperature, and evapotranspiration with three kind of forcing data, which are station observation, atmospheric model results and artificial neural network (ANN) prediction. In the data assimilation part, the EnKF algorithm is selected for its outstanding performance in nonlinear and discontinuous problems. We assimilate several kinds of stationery observations and Moderate Resolution Imaging Spectroradiometer (MODIS) Land Surface Temperature (LST) products. The results showed that estimates using atmospheric model results and ANN prediction had deviated from the true value. However, with assimilating the stationery observation, the results had significantly improved. From the results, we can illustrate that the EnKF algorithm can use accurate information to adjust the model outcome and decrease the error of the simulation system.

Keywords: model simulation, data assimilation, MODIS, SSiB