Experiments of satellite data simulation based on the Community Land Model*

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Abstract

The key point that the meteorology and climatology make use of remote sensing is to establish the relationship between land model and remote sensing data. Microwave land surface emissivities can be used for land surface characterization and atmospheric retrieval over land from satellite passive microwave observations. Estimates of these emissivities are particularly important today as the major Numerical Weather Prediction (NWP) centers are currently attempting to assimilate passive microwave observations over land. An important way is to simulate remote sensing data with the credible output of land model. In this study, in consideration of the effects of the model subgrid-heterogeneity, we develop a scheme simulated remote sensing data that the NCAR Community Land Model version 2.0 (CLM 2.0) was coupled with the microwave land emissivity model developed by Weng（Weng model ） to simulate microwave signatures for various surface conditions, such as snow, bare soil , deserts, and vegetation, the output of CLM model as the input of Weng model, and we use Qp model developed by Shi, $\omega-\tau$ model, and dry snow emission model developed by Jiang to improve Weng model, we finally select optimal combination to simulate remote sensing data. To validate the scheme, several experiments are presented, and the modeling brightness temperatures are compared with AMSR-E brightness temperature data. Overall, the coupled model provides realistic estimates approach of brightness temperatures, and the modeling brightness temperatures match with the observations basically. In order to raise the estimate precision of the modeling brightness temperatures, we improve the output of CLM Model by assimilating in situ soil moisture measurements into CLM model with the extended Kalman filter (EKF) assimilation algorithm. The results indicate that the scheme used assimilation can significantly improve the precision of the modeling brightness temperatures, which shows that the scheme is reasonable. Although we establish a realistic scheme to simulate the observed brightness temperature, there is still more work to do in the future.

Key words：microwave land emissivity model，CLM model，AMSR-E，extended Kalman filter

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