Impacts of Land Surface Conditions on the Surface Climate of UM (Unified Model) Simulations Over the Korean Peninsula

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The impacts of land surface conditions, land cover (LC) map and leaf area index (LAI), on the short range weather forecasting over the Korean Peninsula were examined using Unified Model (UM). The land surface scheme used in this simulation is MOSES 2.2 (Met-Office Surface Exchange Scheme). Two types of experiments were performed for the July of 2009 through consecutive reruns of 72-hours every 12 hours. The control experiment (CTRL) uses the original IGBP LC map and annual mean LAI, whereas the new land surface experiment (NLSE) uses KLC_v2 (Kongju Natn'l Univ. land cover) and improved monthly MODIS LAI by spatio-temporal continuity method. The spatial resolution and vertical layers are 10-km and 38 eta-theta layers, respectively. The initial and boundary conditions are prescribed by the global model (UM) every 6 hours. The large differences in the LC between two experiments resulted in the significant differences of biophysical parameters, such as albedo, roughness length, and other parameters. Increase of broadleaf forest and leaf area index over south-eastern part of China greatly reduced the albedo, but significantly increased roughness length. As the results, the surface temperature and the wind speed are greatly increased and decreased, respectively. And decrease of needleleaf forest and leaf area index over Manchuria region significantly reduced roughness length and increased albedo. These changes of land surface properties increased not only the wind speed but also the vertical mixing, but decreased the land surface temperature and air temperature systematically. The contradictory changes of surface properties between South-China and Manchuria resulted in the decrease of latitudinal temperature gradient and northward transport of moisture and heat. As a result, the seasonal march of monsoonal rain band in the NLSE is delayed compared to that of CTRL experiment. And the simulation skill of precipitation over South Korea was improved about 4~5% in the NLSE experiment. The POD, CSI and ETS are systematically increased but the FAR is decreased without regard to the rainfall intensity (0.1 mm/3hr and 5.0 mm/3hr) and forecasting hours. This study shows that realistic prescription of land surface conditions can significantly improve the simulation skill of surface variables.