Geophysical Research Abstracts
Vol. 21, EGU2019-1942, 2019
EGU General Assembly 2019

The Application Study of the WRF Double-Moment 6-Class Microphysics Scheme in the GRAPES_Meso Model

Hong Wang (1) and Meng Zhang ()

(1) Chinese Academy of Meteorological Sciences (CAMS), Beijing, China (wangh@cma.gov.cn), (2) Beijing Meteorological Bureau, Beijing, China (316398453@qq.com)

This study coupled the Weather Research and Forecasting (WRF) Double-Moment 6-Class (WDM6) Microphysics Scheme into the operational mesoscale version of Global/Regional Assimilation and PrEdiction System (GRAPES_Meso) developed by Chinese Meteorology Administration. One precipitation process occurred on 3-5 June 2015 in Beijing and its surrounding area was respectively simulated by the WDM6, the Weather Research and Forecasting (WRF) Single-Moment 6-Class (WSM6) and National Centers for Environmental Prediction (NCEP) 5-Class schemes. Based on the findings of the three schemes, both the distribution and magnitude of the precipitation simulation results using the WDM6 scheme were more consistent with the observation. Thus, the WDM6 scheme could be used as an alternative microphysics scheme in the GRAPES_Meso model for simulation and prediction of cloud and precipitation in China region. Compared with the WDM6 scheme, the cloud liquid water content simulated by the WSM6 scheme was found to be greater, which provided more water vapor for graupel growth, leading to an increase in precipitation in the cold-rain processes. On the other hand, the WDM6 scheme incorporated the double-moment microphysics into the warm-rain processes and was able to forecast the number concentration of the cloud condensation nuclei (CCN), cloud droplet and raindrop. The sensitivity tests using the WDM6 scheme showed that an increasing in CCN number concentration led to CCN activation ratio and cloud droplet number concentration (Nc) increasing and cloud droplet effective diameter decreasing. The formation of more small-scale cloud droplets resulted in a decrease in raindrop number concentration (Nr), inhibiting the warm-rain processes, thus gradually decreasing the amount of precipitation. For areas main with cold-rain processes, the overall amount of precipitation increased but indicated a gradual decrease when the CCN number concentration reached a certain degree. Hence, the effect of CCN number concentration on precipitation in space exhibits significant differences for one precipitation event.