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Sensitivity test of microphysics schemes in the WRF model for a case of heavy rainfall in 11 June 2014

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Previous studies demonstrate a 4-km resolution in WRF forecasts, which explicitly resolves convection yields for better guidance in precipitation forecasts. As horizontal grids decrease, the explicit representation of microphysical processes can be appropriate and computed for increasingly small clouds, cloud particles, water droplets. Especially, WRF microphysical schemes (MP) that have the characteristics of the different ice hydrometeors used in cloud-scale simulations of thunderstorms can greatly influence the distribution and intensity of precipitation. This study attempts to identify differences in model performances with MP schemes for heavy rainfall event and seek causes of those differences. To accomplish this, we selected the heavy rainfall event of 11 Jun 2014. In this case, convective system was developed for short range (e.g., 3-5 hours) and maximum hourly rainfall amounts exceeded about 60mm over the Seoul metropolitan area. The model used in this study is the Advanced Research WRF version 3.6. The model configuration consisted of a two-way nested domain with grid spacing of 4.5 (Domain 1) and 1.5km (Domain 2). The domain used in this study is second domain. Model integration was conducted during a 24-hour period, from 0000UTC June 11 to 0000UTC June 12, 2014. The cumulus parameterization was not applied. Among the microphysics packages for clouds and precipitation, the Lin, WRF single-moment 6 scheme (WSM6), and WRF double-moment 6 scheme (WDM6) scheme have been used in this study. Sensitivity tests showed that MP schemes are sensitive to moisture availability. The overall distribution of the simulated precipitation was similar; however, the maximum amount of rainfall is greater in the Lin, WSM6, and WDM6 schemes, in that order. The WDM6 scheme effectively suppresses the spurious light precipitation. Further study is needed to clarify the reasons for the different features in precipitation by analyzing the vertical wind and moisture structure for the selected case. Through comparison study of the MP schemes, we expect that sensitivity test in this study can provide an understanding for MP parameterization impact on the physical reason of precipitation.