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A study of the impact of physical (cloud) initialization on severe convection numerical prediction.

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By using the second generation of SMS-WARR Shanghai Meteorological Service-WRF ADAS Rapid Refresh System, a severe convective case in East China was analyzed with an emphasis of the influence of the cloud initialization and the related physical processes. The comparison between results of with/without cloud initialization shows that the forecast using cloud initialization can greatly increase the 00-06 hour precipitation T score, and position of the forecasted precipitation is closer to the observation as well. Further analysis indicates that the cloud initialization can significantly improve the initial fields of hydrometeors, provide more accurate related information of the convection system, obtain the better forecasts of hydrometeors, vertical velocity, etc. over severe convection area, and largely avoid delay of precipitation occurrence during early stage. In the system, cloud analysis constructs the initial state of cloud hydrometeors and adjusts the temperature and humidity field according to corresponding physical constraints, which mitigate the inconsistency between the microphysics and dynamics at initial time, then shorten the "spin-up" time due to the lack of the initial microphysical information. However, results with/without cloud initialization from integrations of more than 6 hours are quite similar to each other. In comparison with ECMWF analysis and radiosonde, cloud initialization can substantially improve the initial humidity analysis over the cloud areas, and result in a better position of the mesoscale vortex and low-level jet