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# Evaluating Cloud Initialization in a Convection-permit NWP Model

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In general, to avoid "double counting precipitation" problem, in convection permit NWP models, it was a common practice to turn off convective parameterization. However, if there were not any cloud information in the initial conditions, the occurrence of precipitation could be delayed due to spin-up of cloud field or microphysical variables. In this study, we utilized the complex cloud analysis package from the Advanced Regional Prediction System (ARPS) to adjust the initial states of the model on water substance, such as cloud water, cloud ice, rain water, et al., that is, to initialize the microphysical variables (i.e. hydrometers), mainly based on radar reflectivity observations. Using the Advanced Research WRF (ARW) model, numerical experiments with/without cloud initialization and convective parameterization were carried out at grey-zone resolutions (i.e. 1, 3, and 9 km). The results from the experiments without convective parameterization indicate that model ignition with radar reflectivity can significantly reduce spin-up time and accurately simulate precipitation at the initial time. In addition, it helps to improve location and intensity of predicted precipitation. With grey-zone resolutions (i.e. 1, 3, and 9 km), using the cumulus convective parameterization scheme (without radar data) cannot produce realistic precipitation at the early time. The issues related to microphysical parametrization associated with cloud initialization were also discussed.