Preliminary comparison of the CWBNTU and other double-moment bulk microphysics schemes in the WRF model for simulating an extreme precipitation event

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Abstract

To better resolve the representation of hydrometeors' size distribution and physical interactions for fine grid-scale simulations in numerical models, a double-moment bulk microphysics scheme of CWBNTU developed by this study has been implemented into the Weather Research and Forecasting (WRF) model version 4.4.2. The CWBNTU scheme is simplified from the multi-moment National Taiwan University (NTU) scheme through some approximations with the reduction of prognostic moments from 28 to 11. Thus, it includes three major improvements over the current double-moment schemes in WRF: (1) the three solid-phase hydrometeors' (pristine ice, snow-aggregates, rimed crystals) classification is referred to the NTU scheme according to their key formation mechanisms, (2) adopted several fitting relations from the NTU simulations to permit the variations of spectral index, apparent density, and crystal shape for the three group frozen particles, (3) the theoretical bulk fall speed calculations consider the dependence on hydrometeor spectrum and morphology (e.g., shape and density). An extreme precipitation event will be selected for simulation with the CWBNTU and other double-moment schemes (e.g., WDM6, Morrison). Validations with observations and some preliminary comparisons will be presented.

Key word: double-moment, microphysics, WRF