



Precipitation Forecast Experiments Using the Weather Research and Forecasting (WRF) Model at Gray-Zone Resolutions

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In the Weather and Research and Forecasting (WRF) community, a standard model setup at the grid size smaller than 5 km excludes the cumulus parameterization scheme (CPS), although it is unclear to determine a cut-off grid size where convection permitting can be assumed adequate. Also, efforts to improve high-resolution precipitation forecasts at the range of 1-10 km (so called gray-zone for parameterized precipitation physics) have recently been given. This study attempts to statistically evaluate the skill of a gray-zone CPS, with a focus on the quantitative precipitation forecast (QPF) in summertime. The WRF model simulation with the gray-zone simplified Arakawa-Schubert CPS (GSAS) at a 3-km spatial resolution over East Asia is evaluated for summer of 2013, and compared with the results from the conventional setup without CPS. The statistical evaluation of three-month simulations shows that the GSAS demonstrates a typical distribution of the QPF skill, with high (low) scores and bias in light (heavy) precipitation category. The WRF without CPS seriously suppresses the light precipitation events, but the skill for heavier categories is better. Meanwhile, a new set of precipitation data, which is simply averaged precipitation from the two simulations, demonstrates the best skill in all precipitation categories. Bearing in mind that the high-resolution QPF requires essential challenges in model components, along with complexity in precipitating convection mechanisms over geographically different regions, this proposed method can serve as an alternative to improve the QPF for a practical usage.