Convective-scale breeding experiments in WRF simulations at a 100-m resolution

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Recent developments in high-performance computing and advanced observing technologies enable us to step forward to convective-scale data assimilation at a horizontal resolution of O(100) m. On the other hand, previous studies on predictability have been conducted with horizontal resolutions of several kilometers (e.g., Leoncini et al. 2010; Melhauser and Zhang 2012; Keil et al. 2014). Understanding the convective-scale predictability plays an essential role in designing such high-resolution NWP systems. In particular, it would be important to know what would be the effective temporal frequency of data assimilation, whether or not it needs to be the order of seconds. This study performs 30-second breeding cycles at a 100-m resolution using the Weather Research and Forecasting (WRF) model, and explores the convective-scale predictability. Sensitivity to the rescaling interval and threshold is investigated. Breeding experiments at horizontal resolutions of 500 m and 2.5 km are also performed to reveal the resolution dependency of growing modes.

Keywords: cumulus convection, breeding, predictability

