

Mesoscale data assimilation experiment with the NHM-LETKF

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The local ensemble transform Kalman filter (LETKF, [1]) is an EnKF scheme in which the algorithm achieves a high efficiency for parallel implementations. In this study, the LETKF is applied to the nonhydrostatic model of the Japan Meteorological Agency (NHM, [2]), and mesoscale data assimilation as well as ensemble forecast experiments are carried out. The LETKF was already implemented with the NHM [3], but the latest version of the LETKF is used here, including the adaptive inflation scheme [4] and the Gaussian-based localization scheme without local patches. In addition, the newly developed NHM-LETKF facilitates data assimilation experiments with one-way grid nesting in which the first guess of a coarser-resolution model is used as a boundary condition for finer-resolution model integration. Thus, the availability of practical applications for local severe weather forecasts can be enhanced by using this version of the NHM-LETKF.

The NHM-LETKF is applied to a local severe rainfall event in Japan in 2012. Comparison of the root mean square errors between the model first guess and analysis reveals that the system assimilates observations appropriately. Forecasts initialized with LETKF analyses successfully capture intense rainfalls, indicating that the system works effectively for local severe weather. Investigation of probabilistic forecasts by ensemble forecasting shows this could become a reliable data source for decision making in the future. A one-way nested data assimilation scheme is also tested. The experiment results demonstrate that assimilation with a finer-resolution model provides an advantage in the quantitative forecasting of local severe weather conditions.

References

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