

Yokota, S., T. Banno, M. Oigawa, G. Akimoto, K. Kawano, and Y. Ikuta, 2024: JMA Operational Hourly Hybrid 3DVar with Singular Vector-based Mesoscale Ensemble Prediction System. *J. Meteor. Soc. Japan*, **102**, <http://doi.org/10.2151/jmsj.2024-006>.

Plain Language Summary: This study introduces hybrid three-dimensional variational data assimilation (3DVar) using flow-dependent background error covariance (BEC) for Local Analysis (LA) operated at Japan Meteorological Agency (JMA). This flow-dependent BEC is based on a singular vector (SV)-based Mesoscale Ensemble Prediction System (MEPS). Sensitivity experiments showed this hybrid 3DVar improved forecasts especially for surface variables and strong precipitation. These improvements were greater in the experiments with larger ensemble sizes that were increased by using lagged ensemble forecasts.

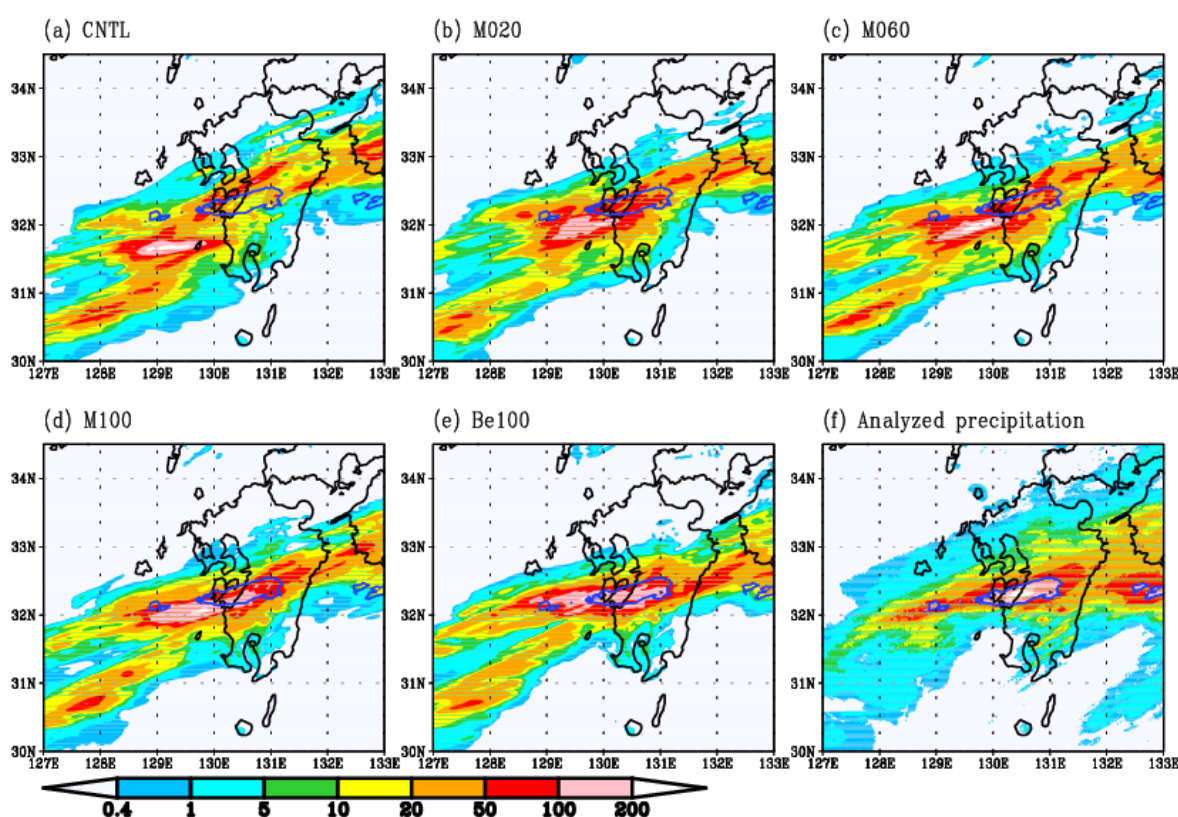


Figure 1. Forecasts of 3-hour accumulated precipitation amount (mm) in experiments with (a) pure 3DVar, (b) 20-, (c) 60-, and (d) 100-member hybrid 3DVar, and (e) 100-member pure En3DVar (initial time: 12 UTC on July 3, 2020) and (f) Radar/Raingauge-Analyzed Precipitation (R/A) for 18–21 UTC on July 3, 2020. Blue contours indicate R/A of 100 mm.

- Hybrid 3DVar is introduced in LA operated at JMA using the flow-dependent BEC derived from the SV-based MEPS.
- Hybrid 3DVar in LA improves forecasts especially for surface variables and strong precipitation.
- Increasing ensemble sizes by using lagged ensemble forecasts improves the forecasts greater.