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Effect of model error on precipitation forecasts in the high-resolution limited area ensemble prediction system of the Korea Meteorological Administration

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In numerical weather prediction using convective-scale model resolution, forecast uncertainties are caused by initial condition error, boundary condition error, and model error. Because convective-scale forecasts are influenced by subgrid scale processes which cannot be resolved easily, the model error becomes more important than the initial and boundary condition errors. To consider the model error, multi-model and multi-physics methods use several models and physics schemes and the stochastic physics method uses random numbers to create a noise term in the model equations (e.g. Stochastic Perturbed Parameterization Tendency (SPPT), Stochastic Kinetic Energy Backscatter (SKEB), Stochastic Convective Vorticity (SCV), and Random Parameters (RP)).
In this study, the RP method was used to consider the model error in the high-resolution limited area ensemble prediction system (EPS) of the Korea Meteorological Administration (KMA). The EPS has 12 ensemble members with 3 km horizontal resolution which generate 48 h forecasts. The initial and boundary conditions were provided by the global EPS of the KMA. The RP method was applied to microphysics and boundary layer schemes, and the ensemble forecasts using RP were compared with those without RP during July 2013. Both Root Mean Square Error (RMSE) and spread of wind at 10 m verified by surface Automatic Weather System (AWS) observations decreased when using RP. However, for 1 hour accumulated precipitation, the spread increased with RP and Equitable Threat Score (ETS) showed different results for each rainfall event.