Improving Ensemble Forecasts by Applying Blending Short-term Forecasts

*Yunsung Hwang[1], Dong-In Lee[2]

1. Division of Earth Environmental System Sciences, Pukyong National University, Busan, Korea, 2. Department of Environmental Atmospheric Sciences, Pukyong National University, Busan, Korea

Improving short-term (up to 8 h) forecasts (nowcasts) is important for the prevention of accidents and predicting possible locations of convections in few hours correctly can save the economic costs. For short-term prediction of convection for high-impact weather, frequently updating high-resolution nowcasting systems are needed. A new blending method (Saliency-based cross-dissolve, SAL) was developed as combining forecasts by applying intensity (saliency)-based-weights to extrapolation (EXT) and model forecasts (High Resolution Rapid Refresh, HRRR). SAL combined EXT and HRRR pixel by pixel by obtaining weights as a function of intensities and forecast lead times. The SAL represented improved results using 18 dBZ echo-top heights from Weather Surveillance Radar 1988 Doppler (WSR-88D) and HRRR in Continental United States (CONUS).

The time-lagged ensemble forecasts combine previous model runs, can reflect the latest observational data by assimilating, and are suitable for short-term prediction. Successful digestion of observational data represented improved skill scores in high-resolution-short-term forecasts. To represent probability of severe weather in CONUS, time-lagged ensemble forecasts are suggested by combining the maps of the mosaics of column maximum reflectivity (CMAX) from WSR-88D, EXT, HRRR, and blending of HRRR and EXT (i.e., SAL). Three ensemble forecasts of 23 and 40 dBZ (ensEXT, ensHRRR, and ensSAL) are predicted using different numbers of previous forecasts (i.e., 1 to 7) and initializations (00, 06, 12, and 18UTC) from the data of mid-May to mid-June 2015. The skill scores of the ensemble forecasts were evaluated as Brier Skill Scores (BSSs), reliabilities, and resolutions (indicated as areas under Relative Operating Characteristics curves). The ensSAL of 40 dBZ showed the highest BSSs in 1 to 2 h forecasts. Reliabilities and resolutions of ensSAL of 40 dBZ indicated the best results except 18Z (ensHRRR showed the best scores). The ensSAL would be the best option for the short term forecasts (1 - 2 h) by obtaining useful information about high-impact weather (over 40 dBZ).