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Very Short-Range Precipitation Forecast in Korea Meteorological Administration

ho yong lee, Jongseong Kim, Joohyung Son, and Seong-Jin Kim

Korea Meteorological Administration, Department of Forecasting Technology, SEOUL, Korea, Republic of
(lhy2502@korea.kr)

Korea Meteorological Administration (KMA) has been providing the public with an hourly precipitation forecast updated every 10 minutes for the next 6 hours since 2015. This forecasts, named as the Very Short-Range Forecast (VSRF), differs from other longer forecasts such as short-range and medium-range forecasts issued by forecasters. The VSRF is automatically generated by a system based on two different models: MAPLE (McGill Algorithm for Precipitation nowcasting by Lagrangian Extrapolation) and KLAPS (Korea Local Analysis and Prediction System).

MAPLE, based on Variational Echo Tracking (VET) from radar observations, has an intrinsic disadvantage: its performance decreases rapidly. On the other hand, numerical weather prediction systems like KLAPS are not initially as effective as MAPLE due to model balancing factors such as spin-up, but they maintain initial skill for a slightly longer period. Therefore, to provide the best predictions to the public, it is necessary to merge the two models properly. KMA conducted tests to determine the optimal way to utilize both models and established weights for each model based on their performance and precipitation tendencies. According to a 4-year evaluation, MAPLE outperforms for up to 2 hours, while KLAPS performs better after 4 hours. Consequently, the two models were merged with a hyperbolic tangent weight applied between 2 and 4 hours, and we named it as the best guidance.

The best guidance was verified against precipitation observed by 720 raingauges over South Korea during the summer seasons from 2020 to 2023. It demonstrated better skill compared to both MAPLE and KLAPS. The average threat scores, with a rain intensity threshold of 0.5 mm/h throughout the forecast period, were 0.40 for the best guidance, 0.38 for MAPLE, and 0.35 for KLAPS.

The best guidance depends on both MAPLE and KLAPS. Therefore, KMA is actively working to improve the performance of each model. Additionally, a very short-range model based on AI is currently under development and running in semi-operations.