Kato, R., S. Shimizu, K. Shimose, K. Hirano, K. Shiraishi, S. Yoshida, T. Sakai, and T. Nagai, 2024: Improvement of two-hour-ahead QPF using blending technique with spatial maximum filter for tolerating forecast displacement errors and water vapor lidar assimilation. *J. Meteor. Soc. Japan*, **102**, http://doi.org/doi:10.2151/jmsj.2024-024.

Plain Language Summary: To improve the forecast accuracy of heavy rainfall associated with mesoscale convective systems (MCSs), we developed a blending forecast system (BFS) by combining observed rainfall with an extrapolation-based nowcast and a numerical weather forecast. A unique feature of this BFS is the use of a blending technique that employs a spatial maximum filter, which helps reduce underestimation in the forecast rainfall due to the misalignment of forecasts. This blending technique, combined with the assimilation of water vapor lidar data, improved the forecast accuracy of two-hour-ahead QPF for a heavy rainfall event associated with quasi-stationary line-shaped MCSs.

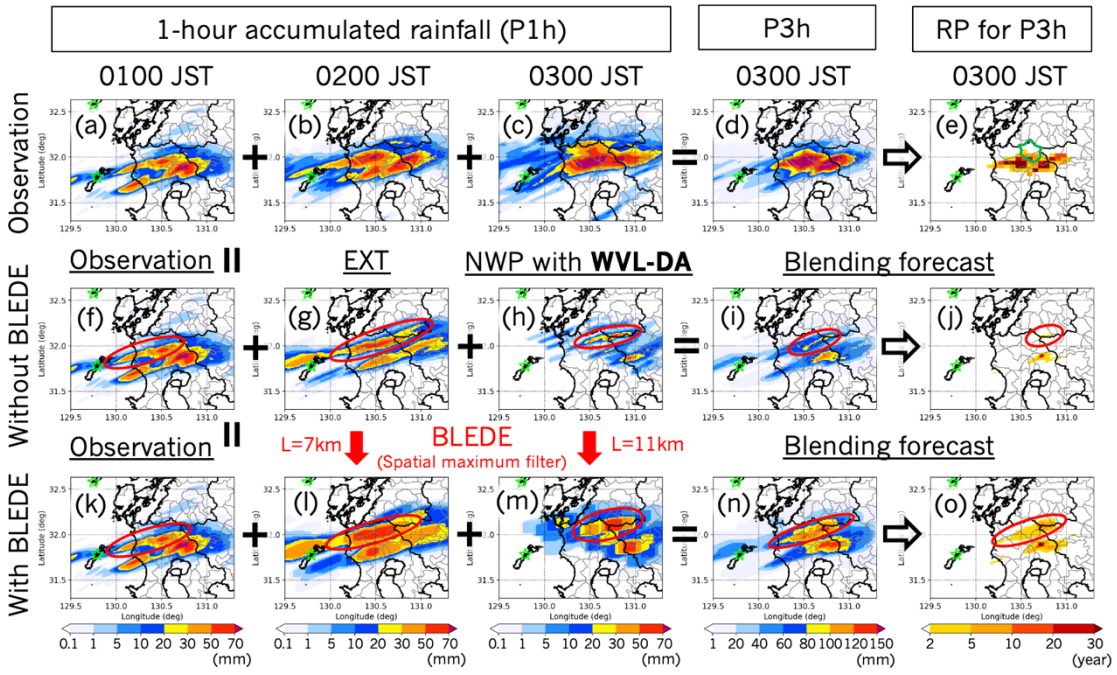

Figure 1. Process of the blending forecast with water vapor lidar data assimilation (WVL-DA), showing the effectiveness of the blending technique with a spatial maximum filter for tolerating forecast displacement errors (BLEDE). (a)–(c) show observation of 1-h accumulated rainfall (P1h); (d) is 3-h accumulated rainfall (P3h) determined by summing (a)–(c), and (e) is the return period of (d). (f) and (k) are the same as (a). (g) is P1h of an extrapolation-based nowcast (EXT) initialized at 0100 JST on 10 July 2021, indicating that P1h is accumulated for the FT from 0 to 1 h. (h) is P1h of a numerical weather forecast with WVL-DA initialized at 0100 JST on the same day, indicating that P1h is accumulated for the FT from 1 to 2 h. (i) is P3h by summing (f)–(h), and (j) is the return period of (i). The BLEDE with a spatial maximum filter of scale L = 7 km and 11 km was applied to P1h of EXT (g) and NWP (h), resulting in (l) and (m), respectively. (n) is the sum of (k)–(m), and (o) is the return period of (n). Red ellipses represent the northwestern band. Green stars represent the locations of WVLs. The green line in (e) represents Isa City, Kagoshima Prefecture, where flooding occurred.

- A blending forecast system (BFS) for predicting heavy rainfall associated with mesoscale convective systems was developed.
- The BFS employs a blending technique using a spatial maximum filter to reduce underestimation of forecast rainfall.
- This blending technique, combined with the assimilation of water vapor lidar data, improved the accuracy of two-hour-ahead quantitative precipitation forecast.