Near-real-time SCALE-LETKF forecasts of the record breaking rainfall in Japan in July 2018

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In July 2018, a stationary precipitation band associated with the Baiu front induced a record breaking rainfall and caused catastrophic destruction in Japan. This event was successfully captured by the near-real-time (NRT) SCALE-LETKF system (Lien et al. 2017) consisting of the Scalable Computing for Advanced Library and Environment-Regional Model (SCALE-RM, Nishizawa et al. 2015; Sato et al. 2015) and the Local Ensemble Transform Kalman Filter (LETKF, Hunt et al. 2007; Miyoshi and Yamane 2007). This system has been continuously operated since 2015 with an 18-km mesh model domain and the ensemble size of 50. In the NRT SCALE-LETKF system, only conventional observations are assimilated every 6 hours. By conducting a series of 50-member ensemble forecasts from the 6-hourly SCALE-LETKF analyses, this study aims to investigate predictability of this torrential rainfall event and important factors that contributed to the heavy precipitation. In general, the NRT SCALE-LETKF system provides skillful ensemble forecasts of the rainfall a few days in advance. Interestingly, the forecast skill exhibits sudden improvement due to assimilating conventional observations at a single location far southwest from the peak accumulated rainfall location. Forecast differences and ensemble correlations suggest that an extratropical cyclone over the Sea of Japan and a low-level trough near Taiwan play important roles in determining the front location.

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