

Data assimilation and forecast experiments for the record-breaking rainfall event in Japan in July 2018 with NICAM-LETKF at 112-km and 28-km resolution

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Abstract

In July 2018, the active Baiu front caused record-breaking rainfalls and disasters in broad areas in western Japan (Figure 1a). Total precipitation exceeded 1000 mm in some areas. This study performs data assimilation and forecast experiments using the NICAM-LETKF system (Terasaki et al. 2015, Terasaki et al. 2017) at 112-km and 28-km resolution with 32 ensemble members. We apply the relaxation to prior spread with a fixed parameter ($\alpha = 0.95$) for both resolution, although the parameter was manually tuned with only 112-km resolution by Kotsuki et al. (2017). We assimilated conventional observations and advanced microwave sounding unit-A (AMSU-A) radiances. We conducted data assimilation cycles for one month starting at 0000 UTC 10 June 2018 for both experiments. Also, we performed forecast experiments from different five initial conditions every day from 0000 UTC 1 July 2018 for both experiments.

Figures 1b and 1c show 6-hour accumulated precipitation from 1200 UTC 6 July 2018 to 1800 UTC 6 July 2018 (36 to 42 hours forecasts) for 112-km and 28-km forecast experiments, respectively, initialized at 0000 UTC 5 July 2018. JMA's radar observed the heavy rainfalls along the Baiu front extending from southwest to northeast in western Japan (Figure 1a). The 28-

km resolution experiment outperforms the 112-km resolution experiment for the location and intensity of the heavy rainfall, while forecasted precipitation is much less than the observation. The 112-km experiment also successfully reproduces the heavy rain by the Baiu front; however, the location is shifted northward compared with the observation and 28-km experiment. The locations of the Pacific and Okhotsk highs determine the location of the Baiu front. The 112-km resolution may be too coarse to resolve these phenomena sufficiently.

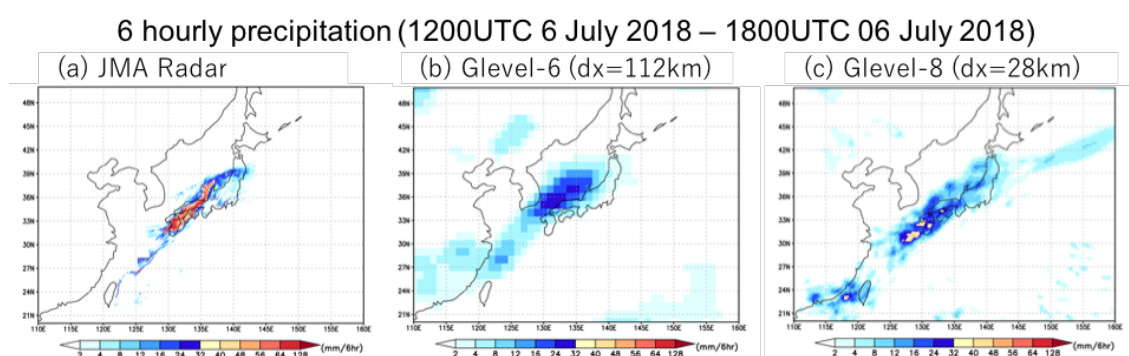


Fig. 1 6-hour accumulated precipitation from 1200 UTC 06 July 2018 to 1800 UTC 06 July 2018 . (a) JMA radar, (b) 112-km experiment, and (c) 28-km experiment, respectively. Initial time of the forecast experiments (b, c) is 0000 UTC 05 July 2018.

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