Precipitation nowcasting with Phased-Array Weather Radar: a case of July 2018 record-breaking rainfall in Western Japan

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Abstract

The Phased-Array Weather Radar (PAWR) can observe the whole sky much more frequently and densely than the conventional parabolic-antenna radars. At RIKEN we have been operating an optical-flow-based precipitation nowcasting system in real time with a PAWR since July 2017 (Otsuka et al. 2016).

On 4-7 July 2018, a Baiu front caused torrential rains in Kansai area, Japan. During this period, a PAWR installed at Kobe Branch of the National Institute of Information and Communications Technology successfully captured details of the rain system, and our three-dimensional precipitation nowcasting system produced 30-second-update 10-minute predictions at 250-m resolution. Figure 1 shows an example of 5-minute nowcast initialized at 14:21:30 JST 6 July 2018. The motion of a convective rain band embedded in a widespread stratiform rain area is captured well by the nowcast. At the same time, small-scale structures such as each convective cell in the rain band changes rapidly in the observations. Figure 2 shows the mean threat scores as a function of forecast time for 1000-1500 JST 6 July 2018. The nowcast clearly outperforms the Eulerian persistence forecasts at the two thresholds of 10 and 30 mm/h.

In this presentation we will show preliminary analyses on the structure of observed rain systems during this event.

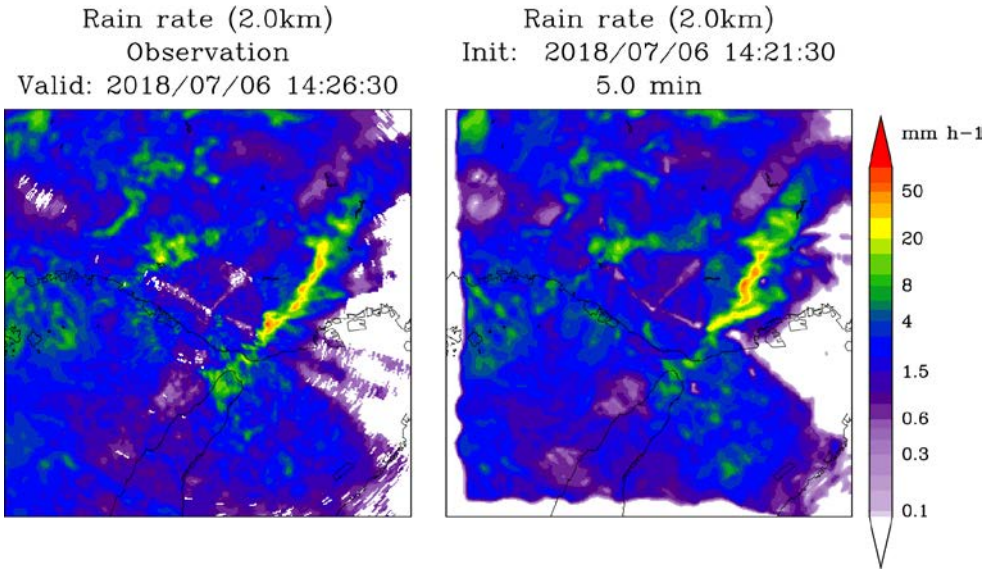

Fig. 1: (left) Kobe PAWR rain rate at the 2 km altitude at 14:26:30 JST 6 July 2018. (right) Corresponding five-minute nowcast initialized at 14:21:30 JST.

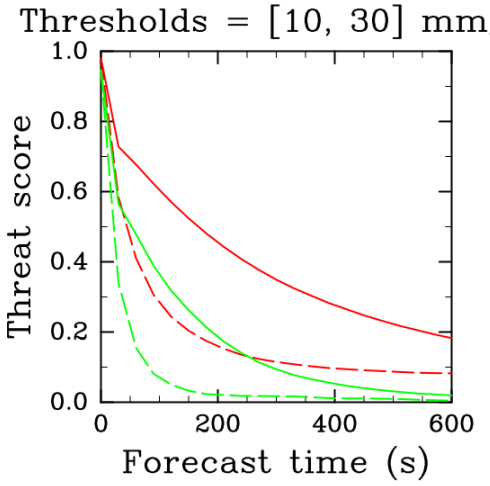

Fig. 2: Mean threat scores as a function of forecast time for 1000-1500 JST 6 July 2018. The solid lines show the nowcasts, and the dashed lines show Eulerian persistence forecasts. Red: 10 mm/h, green: 30 mm/h.

References:

Otsuka, S., G. Tuerhong, R. Kikuchi, Y. Kitano, Y. Taniguchi, J. J. Ruiz, S. Satoh, T. Ushio, and T. Miyoshi, 2016: Precipitation nowcasting with three-dimensional space-time extrapolation of dense and frequent phased-array weather radar observations. *Wea. Forecasting*, **31**, 329-340. doi: 10.1175/WAF-D-15-0063.1.