Impacts of dense surface observations on predicting a torrential rainfall event on September 9 and 10, 2015 in the east Japan area

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To investigate the impact of dense surface observations on a torrential rainfall event occurred on September 9 and 10, 2015 in the east Japan area, we perform a series of data assimilation (DA) experiments using the Local Ensemble Transform Kalman Filter (LETKF) with the SCALE regional numerical weather prediction model. In this event, an active rainband, associated with two typhoons (T1517 Kilo and T1518 Etau), was maintained for an extended period and caused torrential rainfalls over 600 mm/2days with catastrophic flooding of Kinu river.

Two DA experiments were performed: the control experiment (CTRL) at 4-km resolution with only hourly conventional observations (NCEP PREPBUFR), and the other with additional hourly dense surface observation data (TEST). CTRL showed general agreement with the observed weather patterns, although the track of Etau was shifted westward. The heavy rainfall area was shifted to the west as well compared to the JMA analyzed precipitation based on the radar and gauge networks. By contrast, TEST showed stronger rainfall intensity, better matching with the observed precipitation likely due to an improvement of the track of Etau. The dense surface DA contributed to improve the moisture field in the lower layer, leading to an intensified rainfall amount. The results suggest that the dense surface DA have a potential to improve the forecast accuracy for severe rainfall events.

Keywords: Data assimilation, Dence surface weather station data, Torrential rainfall

