

Validation of VIL Nowcast for 30-minute Forecast using Multi-Parameter Phased Array Weather Radar

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The VIL Nowcast, developed to provide precise forecast of imminent rainfall by using the Vertically Integrated Liquid water content (VIL) estimated from three-dimensional volume scan of X-band Polarimetric radar, was modified to allow minutely nowcasting from the Multi-Parameter Phased Array Weather Radar (MP-PAWR) observations. The MP-PAWR VIL Nowcast (VIL-PAWR) produces 10-minute rainfall amount for up to 30 minutes in advance using 1-minute resolution rainfall intensity and VIL estimated from MP-PAWR observations, at a spatial resolution of 250 meters. The validation of the performance of VIL-PAWR was carried out comparing the prediction of VIL-PAWR with in situ rain gauge observations, prediction from High-resolution Precipitation Nowcasts (HRPN) provided by Japan Meteorological Agency (JMA), and radar rainfall accumulation estimated from the X-band polarimetric (multi-parameter) Radar Information Network (XRAIN). The comparison included 39 rainfall events occurred from August 1st to October 31st in 2018 nearby the Tokyo metropolitan area. VIL-PAWR gave better results than HRPN with both traditional grid-to-grid verification approaches and a new verification method focusing on the accuracy of the prediction of the severe rainfall start time. VIL-PAWR had better critical success index (CSI) and false alarm rate (FAR) than HRPN at all lead times, although both skills were still decreasing with threshold increasing and lead time. On the other hand, HRPN showed better probability of detection (POD) skill at the lowest threshold of 0.2 mm for 10-minute rainfall. This result was likely because HRPN tends to overestimate rainfall in comparison with the rain gauge observations. Although the accuracy varied greatly depending on the individual case, VIL-PAWR predicted the start time of severe rainfall more successfully than HRPN; the hit rate of VIL-PAWR for start time was on average 21 percentage points higher than that of HRPN.

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