Tokyo Radar Wind Data Assimilation with the JMA Meso 4D-VAR[1]

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The Japan Meteorological Agency (JMA) started the use of radial velocity data (Vr) of Tokyo radar with the JMA operational mesoscale 4D-VAR analysis on December 11, 2006. Precision of a precipitation forecast improved from information of wind of rainfall area in an initial condition of the mesoscale numerical weather prediction (NWP).

To estimate the impact of assimilating the Vr of Tokyo radar in NWP routine, three-hourly forecast-analysis cycle was performed without and with the Vr of Tokyo radar in the period during 8-17 June 2006. In this period, 15-hour forecasts were made eight times a day at 00, 03, 06, 09, 12, 15, 18, and 21 UTC.

Fig.1. shows the Vr of Tokyo radar has significantly positive impacts on the precipitation forecasts.

Fig.2. shows a case of heavy rain in the experiment period. Fig.2a. and 2c. show, respectively, the forecast of 3-hour precipitation amount starting from the mesoscale 4D-Var analysis without and with the Vr of Tokyo radar. Fig.2b. shows the corresponding observation for the Radar-Raingauge Analyzed Precipitation from conventional weather radar. Without the Vr of Tokyo radar, the amount of the precipitation forecast in the rainfall area of North Kanto which is located in the down stream area of Tokyo radar (indicated by broken line's circle) was much smaller than that of the observation. By assimilating the Vr of Tokyo radar (Fig.2c.), more precipitation is predicted and the precipitation pattern is closer to the observation.

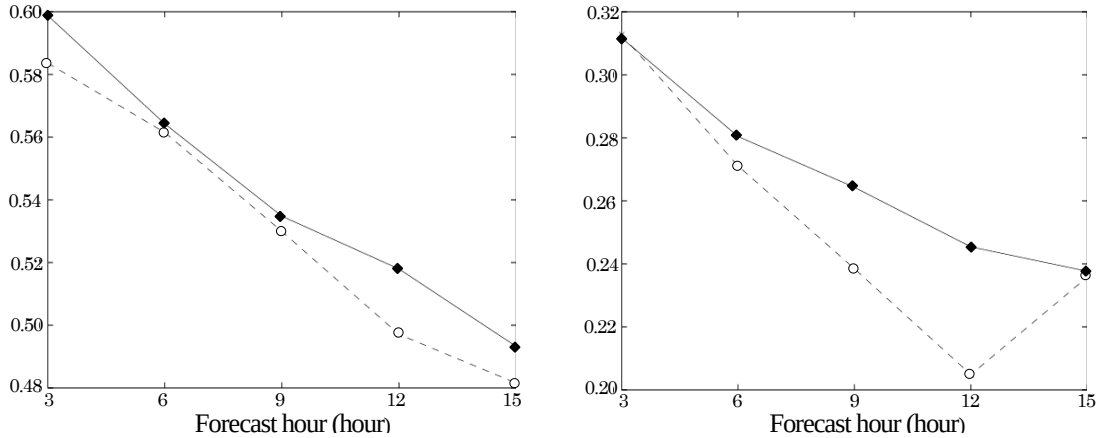

Fig.1 Threat score of 3-hour accumulated precipitation forecast over Japan starting from analysis with the Vr of Tokyo radar (solid line) and without them (broken line) for the period from 8 to 17 June. 2006. Threshold values are 1 mm (left) and 10 mm (right) with a horizontal resolution of 10 km.

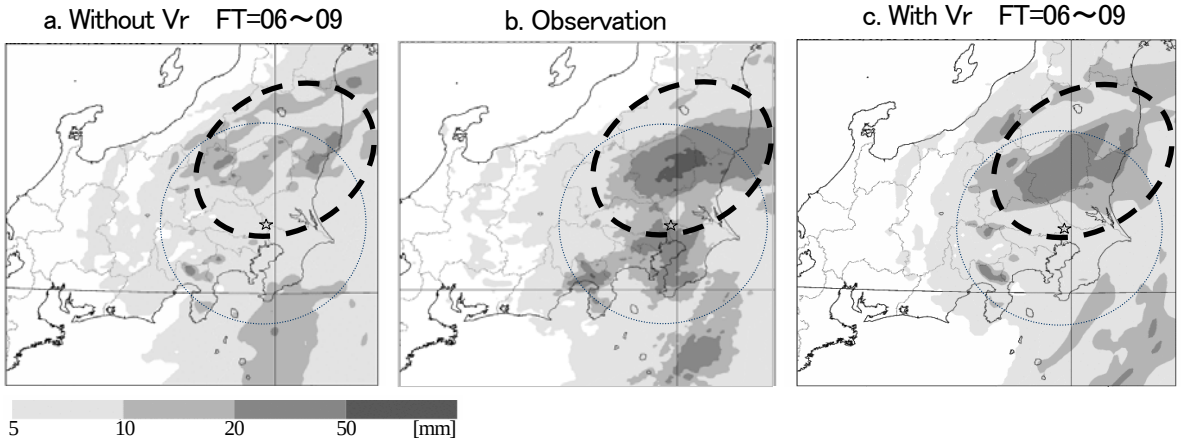

Fig.2 Verification of 3-hour accumulated precipitation forecast starting from initial conditions at 15UTC 15 June 2006. Left: the 06-09 forecasts starting from the 4D-Var analysis without the Vr of Tokyo radar. Center: the Radar-Raingauge Analyzed Precipitation. Right: the 06-09 forecasts starting from the 4D-Var analysis with Vr.

[1] The JMA Meso 4D-VAR is mesoscale analysis system to prepare initial condition for the JMA Meso Scale Model (MSM).