# Use of AMSR-E Data in the JMA Operational Meso Analysis

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The Japan Meteorological Agency (JMA) has been operating a Meso-Scale Model (MSM) with the 4D-Var data assimilation system (Meso 4D-Var) since March 2002. This model is utilized for very short range rainfall forecasts to mitigate natural disasters.

A data assimilation method for rain rate (RR) and total column precipitable water (TCPW), which are retrieved from SSM/I and TMI, has been introduced since October 2003 (Sato et al. 2004). It brought the information of water vapor distribution over the ocean into MSM, and contributed to improvement of the rainfall forecast.

In addition to SSM/I and TMI, the AMSR-E data of Aqua satellite has become available with the cooperation between JMA and JAXA[1]. The AMSR-E data consists of the RR and TCPW data like the SSM/I data with different observation times. Therefore, AMSR-E complements the data coverage, and it would contribute to further improvement of the forecast.

Some observation system experiments with the AMSR-E data were performed. To retrieve both RR and TCPW, the method developed by Takeuchi and Kurino (1997) was employed. It was the same as the method for SSM/I and TMI. Figures 1 and 2 show the case of heavy rain. It occurred on 17 July 2004. Figure 1a shows the analyzed water vapor field without the AMSR-E data at 18 UTC 17 July 2004 and Figure 1b shows the one with AMSR-E. With the AMSR-E assimilation, the water vapor was increased over the area A and decreased over the area B. Figure 2a shows the rainfall forecasts with the initial condition without AMSR-E, and Figure 2b shows the one with AMSR-E. Figure 2c shows the corresponding radar observation. Without the AMSR-E assimilation (Fig. 2a), the amount of the rainfall forecast in Fukui Area (indicated by arrows) was much smaller than that of the observation. By assimilating AMSR-E (Fig. 2b), more precipitation was predicted, and it was closer to the radar observation.

The threat scores of weak rain(1mm/3hour) over Japan area are shown in Fig. 3. The score showed positive impact on the almost all forecast times in both summer and winter experiments.

With the above results, JMA decided to use the AMSR-E data in the operation of MSM and it has started in November 2004.

## References:

Takeuchi, Y and T. Kurino, 1997: “Document of algorithm to derive rain rate and precipitation with SSM/I and AMSR,” Algorithm description of PIs for SSM/I and ADEOS-II/AMSR, 2nd AMSR Workshop, 61-1 - 61-9.

Sato, Y., Y. Takeuchi and T. Tauchi, 2004: Use of TMI and SSM/I data in the JMA operational Meso Analysis., CAS/JSC WGNE Res. Act in Atmos. Ocea. Model.

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[1] Japan Aerospace Exploration Agency

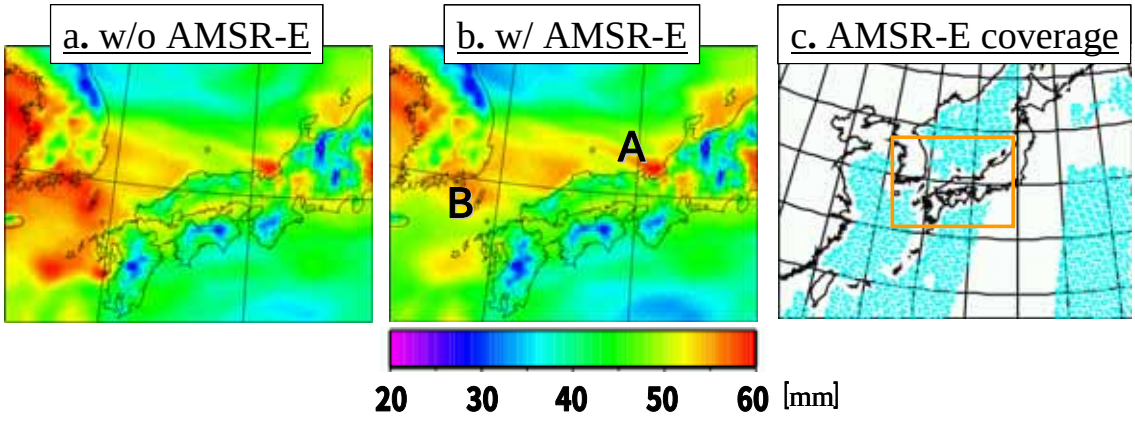


Fig. 1 (a) Analyzed TCPW field without the AMSR assimilation at 18UTC 17 July 2004. (b) Same as in (a) but with the AMSR-E assimilation. (c) The AMSR-E data coverage at the same time.

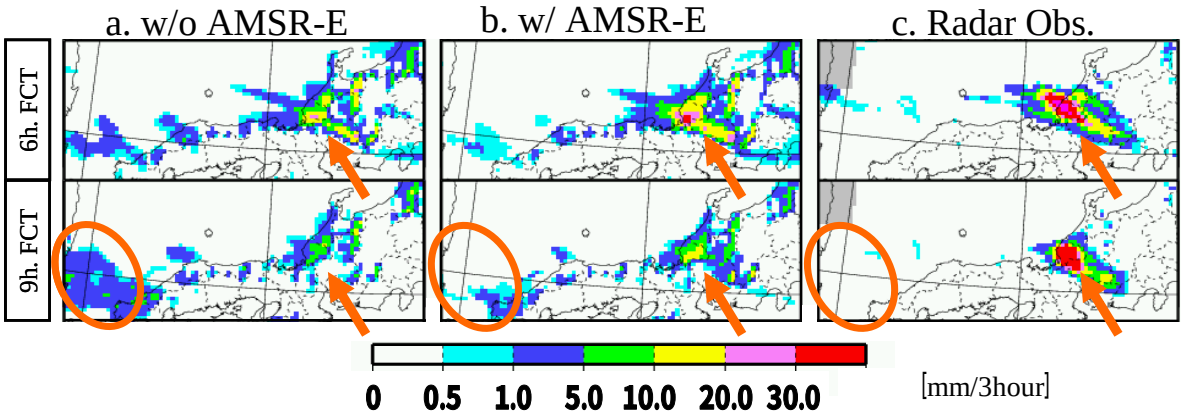


Fig. 2 (a) 3-hour rain forecasts after 6 hours (upper) and 9 hours (lower) from the initial condition of Fig.1 (a). (b). Same as in (a) but from the initial condition of Fig.1 (b). (c) 3-hour rain at 00UTC 18 July 2004 (upper) and 03UTC (lower) estimated by radar observation.

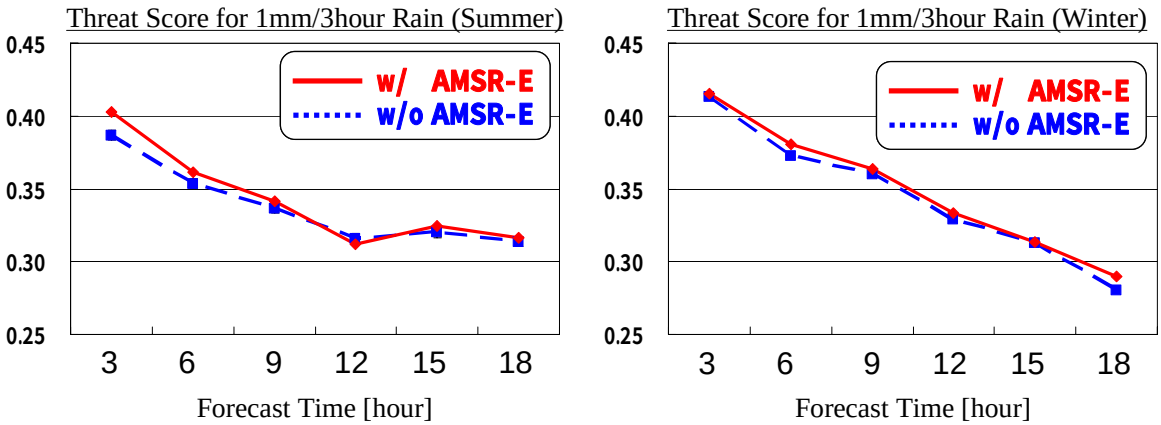


Fig. 3 (a) The threat scores for weak rainfall (1mm/3hour) forecasts in the case of summer 2004 (15 samples). (b) Same as (a) but in winter 2004 (15 samples).