

# Implementation of Targeted Moisture Diffusion for the JMA Regional Spectral Model (RSM)

Takuya Hosomi

*Numerical Prediction Division, Japan Meteorological Agency*

*1-3-4 Otemachi, Chiyoda-ku, Tokyo 100-8122, JAPAN*

*hosomi@met.kishou.go.jp*

Japan Meteorological Agency operates the Regional Spectral Model (RSM) twice a day. It covers East Asia and makes a forecast up to 51 hours. A forecast of the JMA Global Spectral Model (GSM) is used for a lateral boundary condition. An initial condition is analyzed by a regional four-dimensional variational data assimilation (4D-Var) system (Shimbori and Koizumi 2004).

Occasionally RSM predicts a pseudo small low on the sea, usually with a locally strong upward motion and an intense rainfall. The Targeted Moisture Diffusion (TMD) can suppress such a grid-scale storm through applying a second order horizontal diffusion for water vapor around the storm selectively (Stainforth et al. 2003). It works on a grid where an upward motion is bigger than a certain threshold. After some sensitivity tests, -90 hPa/hour of a vertical-p velocity is choosed as the threshold.

To confirm the impact of the scheme, two series of forecast experiments were carried out for a couple of weeks in July 2003 and January 2004. As a result of these experiments, it is found that a tendency of predicting the pseudo small low on the sea is reduced in winter (Fig 1). The new scheme also improves a regional analysis field through an improved first guess field (6hour forecast of the model) (Fig 2). A statistical verification shows that the root mean square error (RMSE) of sea level pressure forecasts is improved in January 2003 (Fig 3). The threat score of precipitation forecasts is also shown in Fig.3. The score for the new RSM is almost equal to the former RSM.

The JMA has implemented TMD in operational RSM in April 2004.

## Reference

Shimbori, T. and K. Koizumi, 2004: Operational implementation of the JMA Regional Four-Dimensional Variational Data Assimilation System. Research Activities in Atmospheric and Oceanic Modelling, No.34, WMO/TD-No.1220, 01.31-01.32.

Stainforth et al. 2003: Unified Model Documentation Paper 15 (Joy of New Dynamics) (UM5.5) (not published).

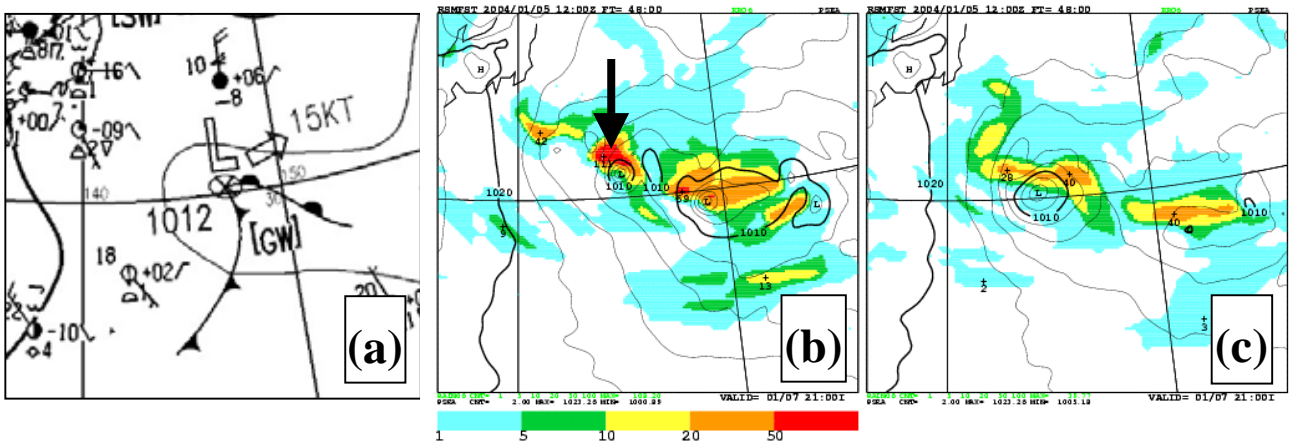


Fig 1 Surface level pressure at 12UTC Jan 07 2004. (a) Subjective analysis, (b) 48 h forecast without TMD (CNTL), (c) 48 h forecast by RSM with TMD (NEW). Predicted rain areas are shaded. TMD suppresses the grid-scale storm denoted by an arrow and the associating heavy rain in CNTL.

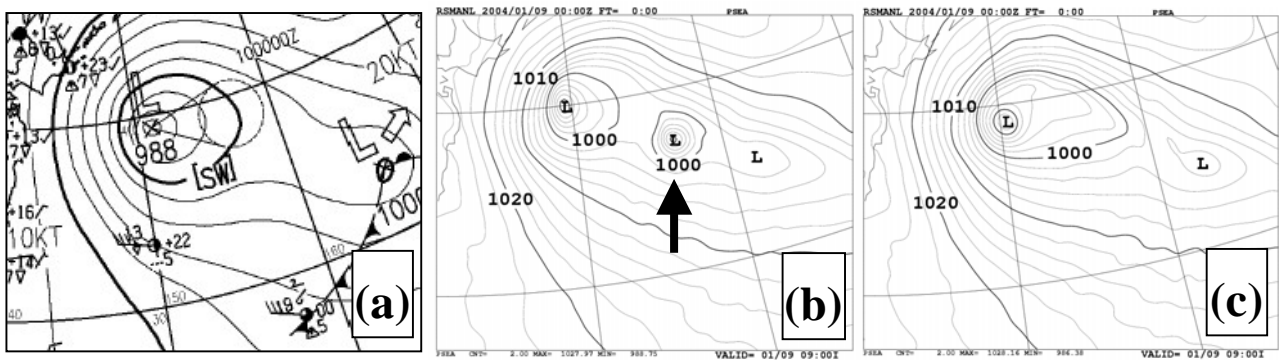


Fig 2 Surface level pressure at 00UTC Jan 09 2004. (a) Subjective analysis, (b) Regional analysis without TMD (CNTL), (c) Regional analysis with the first guess field made by RSM with TMD (NEW). A pseudo low in the CNTL analysis denoted by an arrow disappears in the NEW analysis.

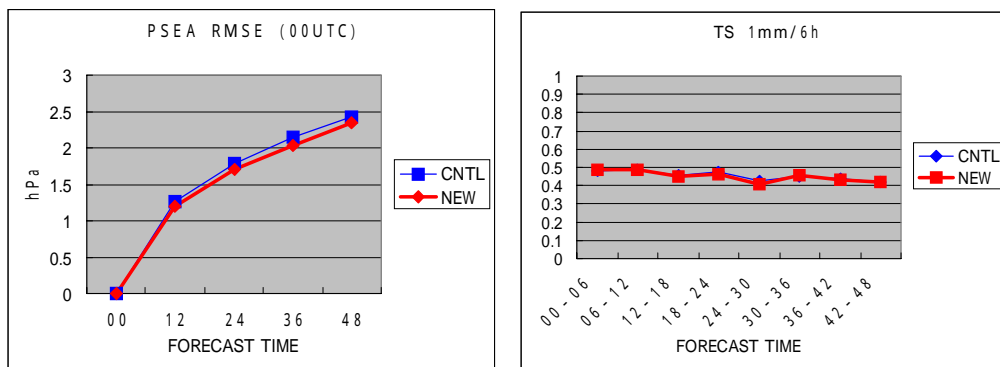


Fig3 (left) RMSE of sea level pressure. (right) Threat score of 1mm/6h precipitation forecasts. Thin line is for CNTL, bold line is for NEW.