Statistical verification of short range forecasts by NHM and WRF-ARW over Southeast Asia and Japan areas

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Statistical verifications of the numerical weather prediction by JMA's non-hydrostatic model (NHM; Saito et al., 2006) are needed for the prevention and mitigation of meteorological disasters in Southeast Asia, because NHM have seldom been executed in tropical region. For the validation of the verifications of NHM, WRF-ARW (Skamarock et al. 2005) was also conducted with the same conditions of NHM. The verification results of the both models were compared for the confirmation of the statistical accuracy of their forecasts.

In the both models, same domain size, same time step and same initial / boundary data were used for fair comparison. Initial / boundary condition were given by NCEP-GFS forecast in every 3-hour. Experiential settings were not changed from the model's own recommended namelists. The domains of the models are shown in Fig. 1. They had 160 x 160 x 40 grids with 20 km in horizontal and 301 x 301 x 40 grids with 5 km resolution. The top heights of the models were 22km (about 45hPa). Two Simulation periods were selected. One is "July 2007 (31 days)" for Japan region, the other is "January 2008 (31 days)" for Southeast Asia region.

Figures 2a-d plot the bias and threat scores against the precipitation intensity (mm / 3 hours) by satellite observation (CMORPH). In Japan region, the bias score (fig. 2a) is close to 1 in weak precipitation intensity. The bias score in heavy precipitation is overestimated, because CMORPH doesn't have good score in heavy rain case. Using surface rain observation, the bias

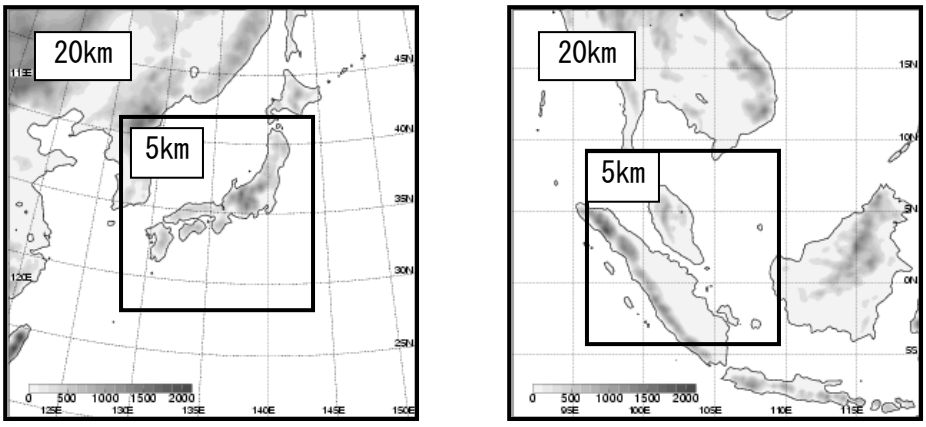

Fig. 1 Model domain and topography for Japan region and Southeast Asian region, with 20km horizontal resolution and 160 x 160 grid (3200 km square), with 5km horizontal resolution and 301 x 301 grid (1500 km square).

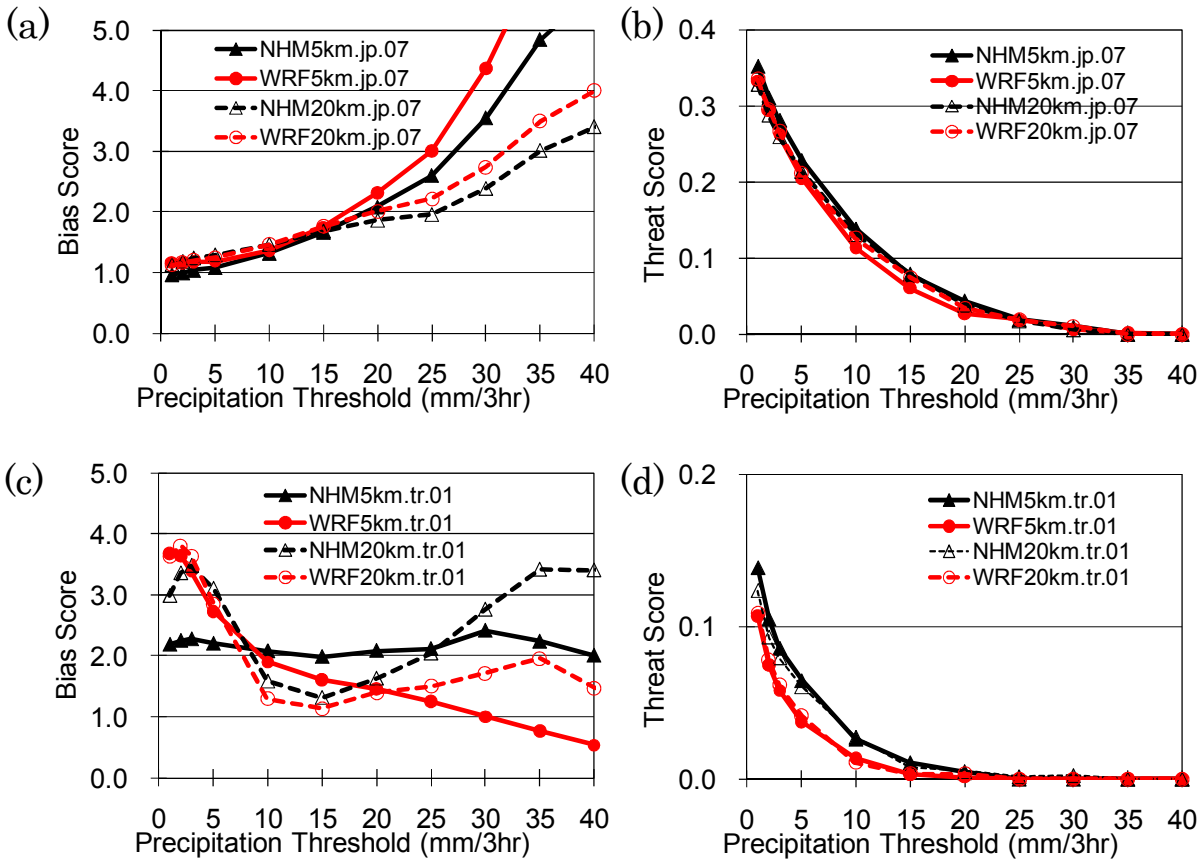

Fig. 2 Bias score and threat score of 3hr-precipitation against CMORPH (satellite).
(a) Bias score, and (b) threat score Japan region.
(c) Bias score, and (d) threat score Southeast Asian region.
Triangles are NHM, circles are WRF, Solid lines are 5km, dashed lines are 20km.

score in heavy rain is close to 1 (not shown). The threat score (fig. 2b) is 0.35 at 1 mm / 3 hours in the both models. This is reasonable accuracy because it is similar to JMA's operational score (0.3~0.4) in this region. The bias score in Southeast Asian region is shown in Fig. 3c. All models exceed the 1 in the bias score. The threat scores of Southeast Asian region (Fig. 4d) is a half of the scores in that of Japan region. We are investigating the cause of this deterioration. So, more improvements should be done for the simulations in low-latitude.

References

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