CLOUD RESOLVING ENSEMBLE EXPERIMENT OF THE 2011 TYPHOON "TALAS"

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1.Introduction

Typhoon "TALAS", landed in the eastern part of Kochi Prefecture on September 3, 2011, caused local heavy rainfalls over the Kinki, Chugoku, Shikoku and Tokai regions in Japan. It caused enormous landslide disasters in southeastern of Kinki, eastern of Shikoku, Sanin and Tokai, and unprecedented human damages consisting of 78 dead and 16 missing persons. The JMA's operational mesoscale model (MSM) of the days generally well predicted the typhoon track, however, the precipitation intensity was weaker compared with observation. For a socially high impact event, we need to investigate the value of cloud-resolving ensemble forecast.

2.Method of experiment

At first, meso ensemble prediction with a horizontal resolution of 10 km and 11 members was performed up to forecast time (FT) of 36 hr by JMANHM, and its down scaling (cloud resolving ensemble) prediction with a horizontal resolution of 2 km and 11 members was performed up to FT=30. Meso ensemble prediction was conducted using the JNoVA as the initial condition of the control run and the JMA one-week global ensemble prediction as the initial and boundary perturbations. Initial conditions of the 2km ensemble forecast is given by FT=06 of the 10km ensemble forecast result.

3. Results of experiment (verification)

This section shows the results of analysis and verification about 2 km ensemble forecast, where the spin-up period from FT=00 to FT=06 was excluded. Control run (CNTL) track was almost the same that in the best track, but the typhoon speed was faster as in the MSM. Precipitation intensity was closer to the actual data than that of MSM (Fig1(a); circle of broken line). Average of 11 members (MEAN) was weaker than CNTL about the peak of precipitation intensity (Fig1(b); circle of broken line), but the MEAN precipitation areas were broader than CNTL throughout the forecast period. Center position of the typhoon was improved to the south side. Fig1(c) shows the occurrence probability of precipitation intensity over 50mm/3hr. High probability of more than 90% are seen in southeastern of Kinki, eastern of Shikoku, and in Tokai (Fig1(c); circle of broken line). Fig1(d) shows the occurrence probability of precipitation intensity over 100mm/3hr. Probability of more than 35% is seen in southeastern of Kinki, eastern of Shikoku and Sanin (Fig1(d); circle of broken line). Figs.2(a) and 2(b) show the mean error (ME) and the root mean square error (RMSE) of the surface data for the ensemble forecast results at FT=18 against the JNoVA analysis, respectively. MEAN was better than CNTL for wind and sea-level pressure except for temperature and relative humidity (Fig2(a)). MEAN was better than CNTL for all elements (Fig2(b)). About MEs at upper levels, MEAN was better than CNTL for all elements except for wind at 850 and 700hPa and TTD at all levels. About RMSEs, MEAN was better than CNTL about all elements. More detailed verifications are underway according to the four quadrant regions around typhoon (Fig3(g)).

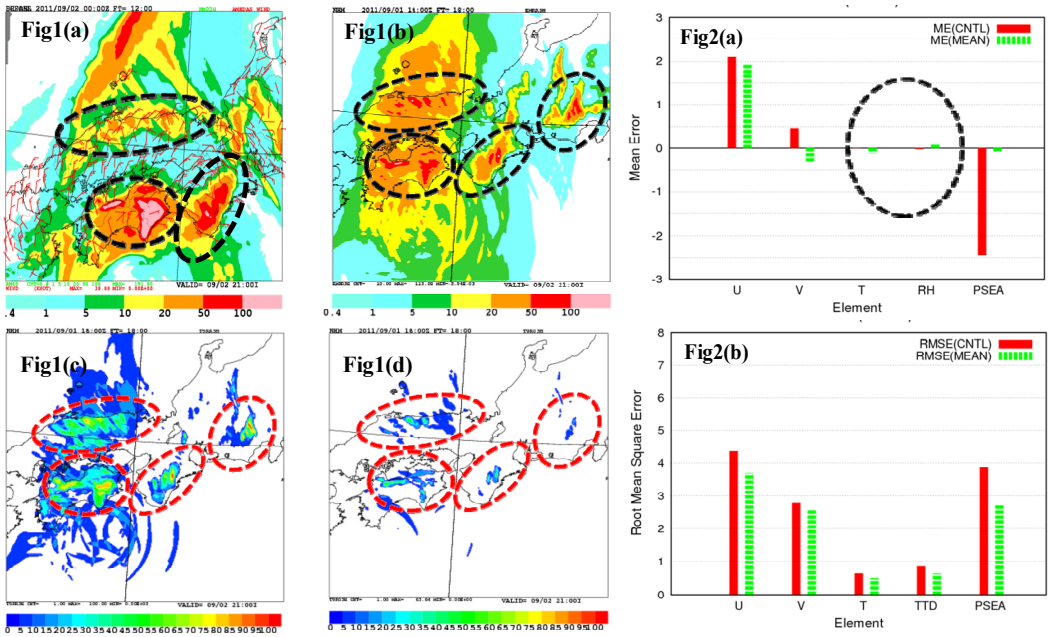

Fig1:(a)Radar-Amedas analysis data(3hr accumulated rainfalls),12UTC Sep2,2011.
(b)Average of 2km-Ensemble forecast (3hr accumulated rainfalls), FT=18.
(c)2km-Ensemble forecast(Occurrence probability of precipitation intensity for 50mm/3hr and more),FT=18.
(d)Same as in (c) but for 100mm/3hr and more.

Fig2:(a)Mean error(Surface) of 2km-Ensemble forecast FT=18 against JNoVA analysis (12UTC Sep2,2011)
(b)Same as in (a) but for Root mean square error(Surface).

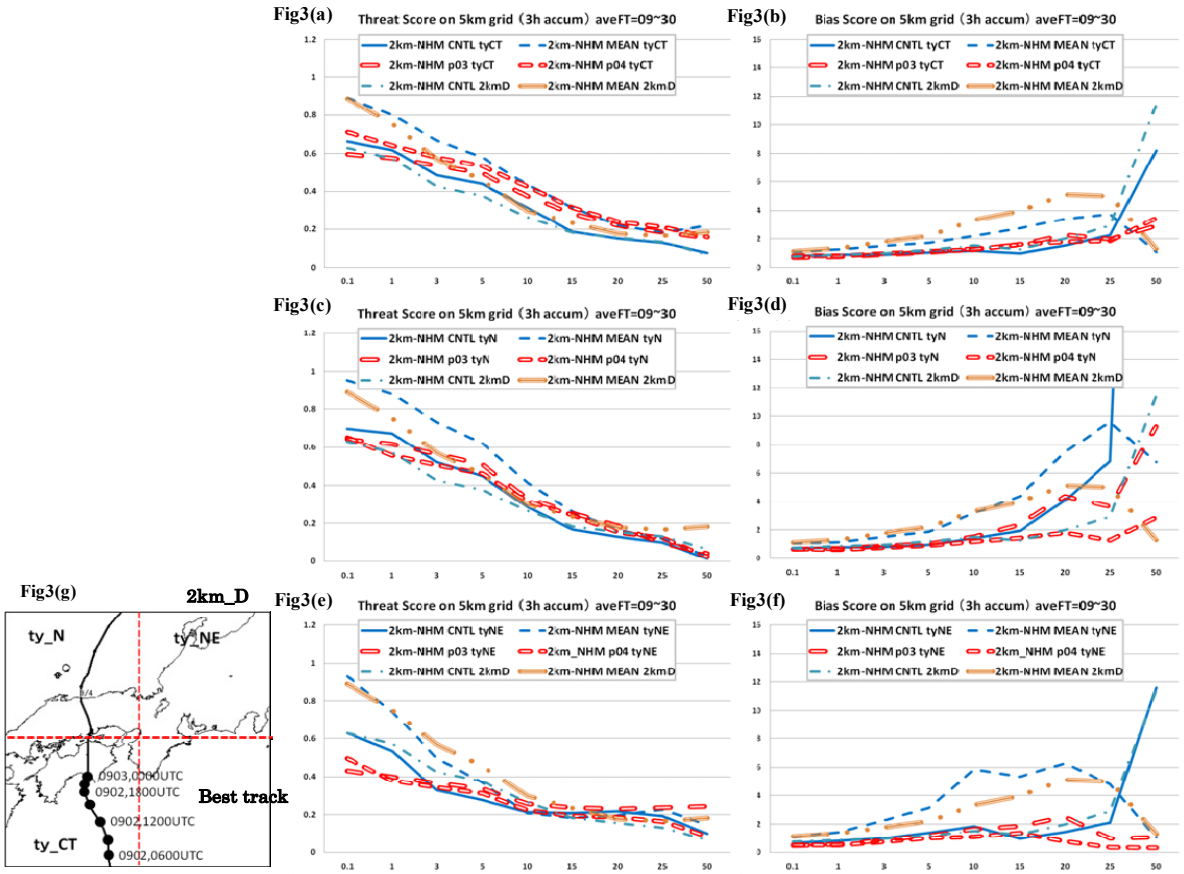

Fig3:Threat Score of 3hr accumulated rainfalls in 2km-Ensemble forecast, average from FT=09 to FT=30 (Left panels). (a)ty_CT and 2km_D. (c)ty_N and 2km_D.(e)ty_NE and 2km_D.
Bias Score of 3 hr accumulated rainfalls in 2 km-Ensemble forecast, average from FT=09 to FT=30 (Right panels). (b)ty_CT and 2km_D. (d)ty_N and 2km_D. (f)ty_NE and 2km_D. (g)Split area and Best track.