

Verification of Regional Ensemble Prediction System of NCMRWF (NEPS-R)

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Abstract

Ensemble based probabilistic forecasting provides better weather forecast guidance. These forecasting systems, in the past two decades, have evolved from global scale to regional scale. The efforts to take into account the uncertainty in forecast at kilometer scale have led to the ensemble approach applied at convective scale resolution. The NCMRWF Regional Ensemble Prediction System (NEPS-R) is based on the regional version of Met Office Global and Regional Ensemble Prediction System (MOGREPS) with 12 members (1 control + 11 perturbed). The horizontal resolution of this regional ensemble prediction system is 4 km and there are 80 vertical levels up to a height of 38.5 km. There are 776 grid points in the East-West as well as North-South directions. The model domain extends from 67^o E to 98^o E and from 7^o N to 38^o N which covers the whole Indian region. The NEPS-R runs with initial and boundary conditions generated from the NCMRWF Global Ensemble Prediction System (NEPS-G) of 12 km horizontal resolution. The model uncertainties in NEPS-R are taken care of by Random Parameters (RP) scheme. Starting from the initial condition of 00UTC NEPS-R runs once in a day to provide forecast up to 75 hours.

This regional ensemble prediction system has been running operationally on regular basis from 20th July, 2019 to provide real time high resolution probabilistic forecast over Indian region. The aim of the present study is to validate this forecasting system using various probabilistic verification metrics like error-spread relationship, Reliability diagram, Relative operating characteristic, Brier Score, Brier Skill Score, Rank Histogram, Rank Probability Skill Score, continuous rank probability skill score etc during the period of Indian summer monsoon, 2019 over Indian Region. The parameters verified in the present study are precipitation, zonal wind speed at 850 hPa and temperature at 2m. The performance of NEPS-R has been evaluated with reference to that of NEPS_G. NEPS-R has positive Brier Skill Score for precipitation with respect to NEPS-G but skill score decreases with forecast lead time.

NEPS-R consistently outperforms its global counterpart in forecasting extreme rainfall events during monsoon 2019. Figure 1 shows that NEPS-R could predict very heavy (>11.5 cm/day) precipitation with more than 90% probability and extremely heavy (>19.5 cm/day) precipitation with more than 50% probability over a large region of west

coast which agrees well with the observation. NEPS-G could only predict more than 70% probability of very heavy precipitation over a very small number of isolated locations.

References

Prasad, S. K., Sarkar, A., Mamgain, A. 2019: Implementation of NCMRWF Regional Ensemble Prediction System (NEPS-R), NMRF/TR/09/2019

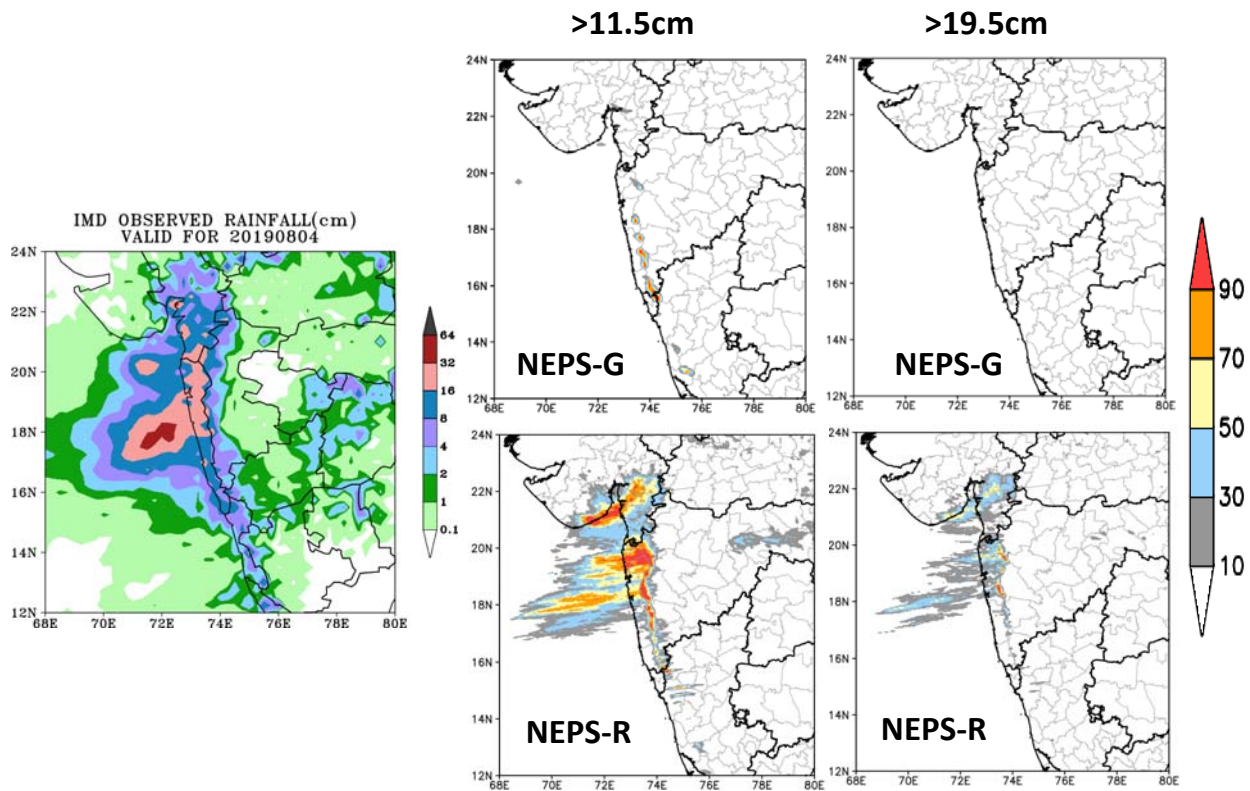


Figure 2: Observed precipitation and day 1 probabilistic precipitation forecasts of NEPS-G and NEPS-R exceeding the threshold values of 11.5 and 19.5 cm/day valid on 4th August, 2019