

ECMWF and NCEP ensemble predictions verification of typhoon intensity during 2011-2015

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ABSTRACT

The ECMWF and NCEP ensemble predictions of typhoon intensity during 2011-2015 are explored. The ECMWF predictions have not improved in recent 5 years, which have the maximum absolute error values in 2015 because of the weakest intensity predictions. The error of NCEP average typhoon intensity prediction reduced significantly between 2013 and 2015, and which is below the average prediction error of ECMWF. The error increases with the increase of forecast time length. And ECMWF have more large error samples than NCEP. The collection of NCEP forecast error variations are not as regular as ECMWF's, in other words, a lot of stronger and weaker forecast samples offset each other. In 2015 NCEP collection of the predictions in the early stage of the typhoon season forecast are weaker than observations, while stronger in the later. Overall average forecast was weak, while weak level is far less than the ECMWF. The stability of NCEP is also slightly better than ECMWF. The NCEP and ECMWF ensemble typhoon intensity forecast products during the rapidly intensification of typhoon are much weaker. In addition, although ECMWF forecast average error is bigger, but the number of better forecast samples is more than NCEP.

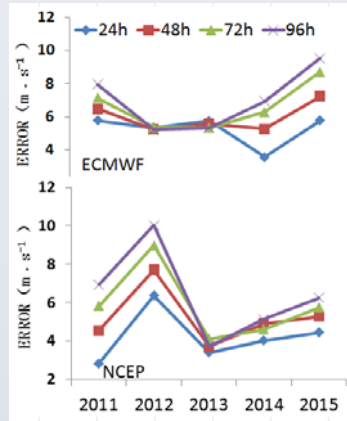


Fig.1 The absolute error of ECMWF and NCEP ensemble forecast

In recent 5 years, the error of ECMWF has not been decreased, and in 2015 the error was biggest. While the error of NCEP has been decreased in recent 3 years, and the error is lower than ECMWF.

Fig.2 The average error of ECMWF and NCEP ensemble forecast

The average error of ECMWF is positive value in 2011 to 2013, while negative in 2014 to 2015, which means that the typhoon intensity forecast by ECMWF is stronger than the observation in 2014 to 2015, and the strongest forecast than observation appeared in 2015. While the average error of NCEP is in the range of +2m/s to -2m/s, which means that the probability of partial or weak intensity forecast by NCEP is almost the same.

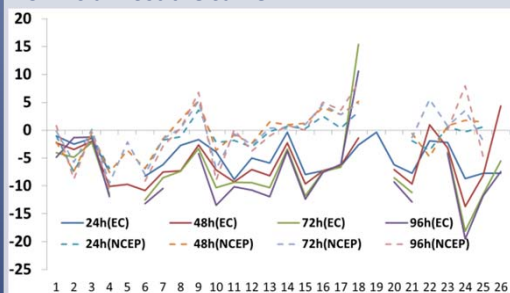
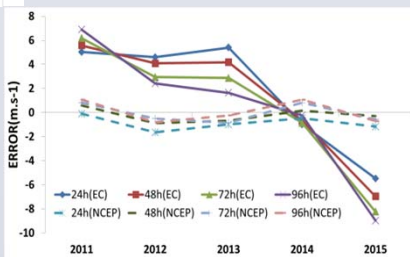
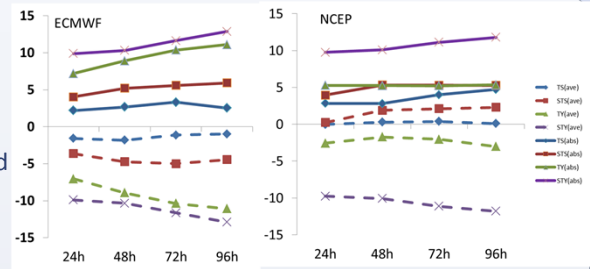


Fig.3 The average error of ECMWF and NCEP in 2015 for each typhoon.

Almost all the average errors of ECMWF for each typhoon are negative, which means that almost

all the intensity forecasts made by ECMWF are weaker than the observations in 2015. While the probability of positive negative for average forecast errors made by NCEP is similar.

Fig.4 The absolute and average error of ECMWF and NCEP in 2015 for TS, STS, TY and STY



ECMWF is better than NCEP in TS, STS stage because of its absolute error is less than NCEP, and furthermore the average error of ECMWF is because of the negative value, which means that the always weaker forecast. So the forecaster can modify the ensemble forecast by increase a value. But the average error of NCEP is near zero, which means the probability of positive negative is even, which make it difficult to modify the ensemble forecast. But NCEP is better than ECMWF in TY, STY stage, because of the larger absolute and average error.

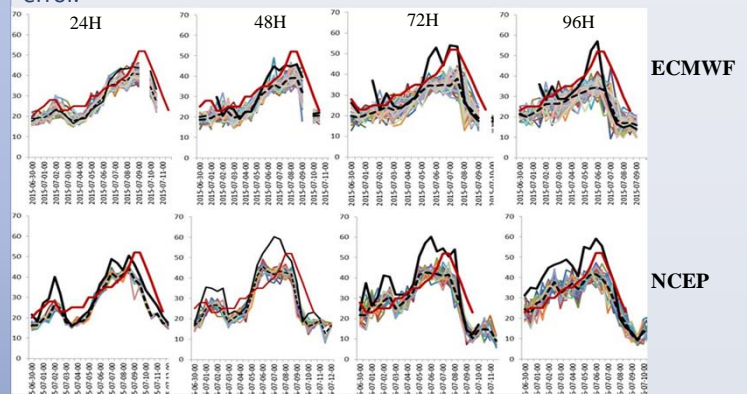


Fig.5 All of the member forecasts of TY 1509 by ECMWF and NCEP, with each ensemble mean and best track by shanghai, and determination forecast. The dispersion of ECMWF is larger than NCEP in 24h and 48h, and the strongest forecast member is almost cover the observation, While the dispersion of NCEP is too small to cover all the possibility of the observation in 24h and 48h forecast, so ECMWF is better in this stage. The forecast intensity of ECMWF in 72h and 96h is apparently less than the observation, While the forecast value of all members of NCEP is much closer to the observation, so the NCEP is better. But the deterministic forecast value of NCEP is much larger than the observation.

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