

# Extended Range Forecasting at ECMWF

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## Summary

Extended range forecasts are produced twice a week (every Monday and Thursday) at ECMWF. Extended-range forecasts are generally more skilful than climatology and persistence, making them potentially useful for some applications. There has been a significant improvement in the forecast skill scores, particularly for the prediction of the MJO, since 2004. Recent changes to the stochastic parameterization scheme have improved the MJO spread/skill relationship. Initialization from ERA5 instead of ERA Interim will improve the tropical and extratropical forecast skill up to week 4.

## Description

### Real-time forecasts:

A 51-member ensemble is integrated for 46 days twice a week (Mondays and Thursdays at 00Z)

Atmospheric component: IFS with the latest operational cycle and with a resolution of Tco639 (about 18 km) up to day 15 and Tco319 (about 36 km) up to day 46.

Fully coupled to an ocean model every hour. Oceanic component: NEMO with a  $\frac{1}{4}$  degree horizontal resolution and 75 vertical levels.

Ensemble generation:  
EDA+ SVs + SPTT

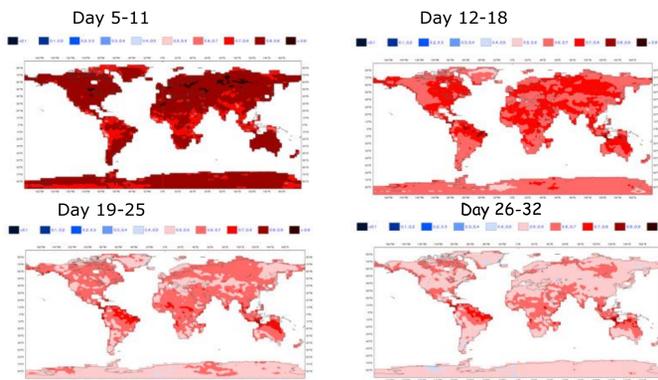
### Re-forecasts:

11 member ensemble starting the same day and month as real-time forecasts but for the past 20 years. Initial conditions from ERA Interim.

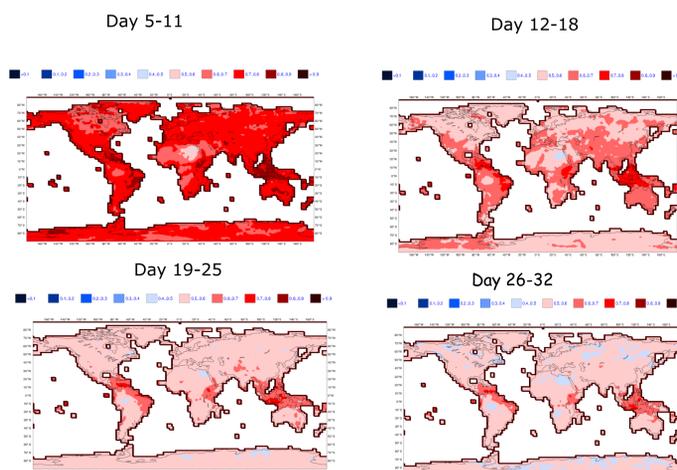
## Verification

Probabilistic skill scores such as BSS, ROC area, CRPSS have been calculated for all the extended-range forecasts since 2004.

ROC score: 2-meter temperature in the upper tercile

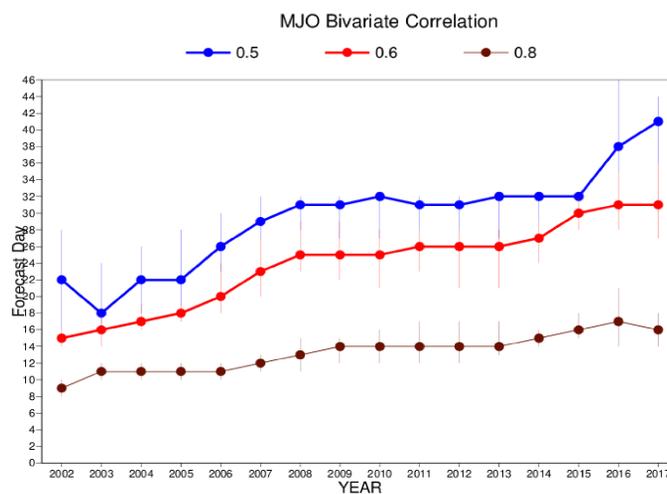


ROC score: Precipitation in the upper tercile

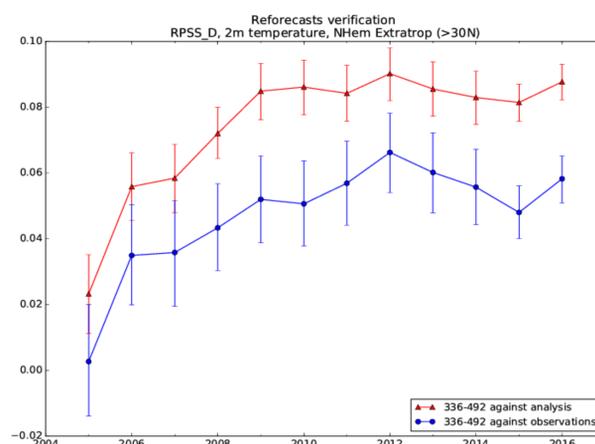


## Progress in last decade

### MJO Prediction

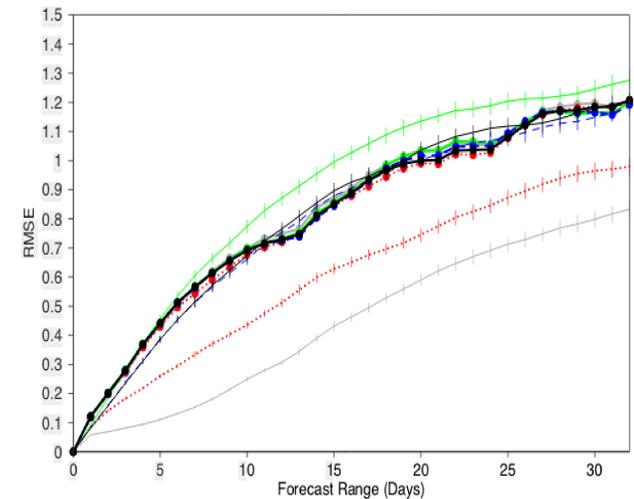


### 2mtm RPSS score



## Recent and future developments

A new SPPT scheme has been implemented in CY45R1. An important impact of this new scheme has been a significant increase in the MJO ensemble spread.

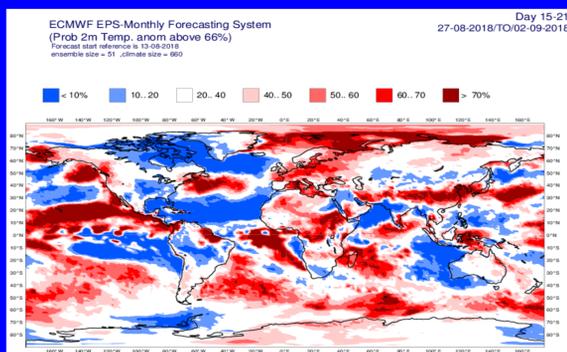


RMS measure of ensemble error (thick lines) and ensemble spread (thin line with bars). Red was with previous SPPT scheme and black is for the revised SPPT scheme (CY45R1) (from Lock et al. 2019)

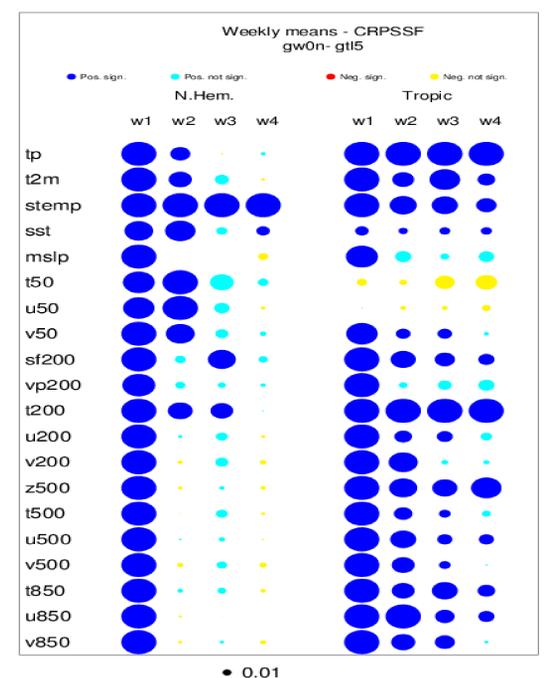
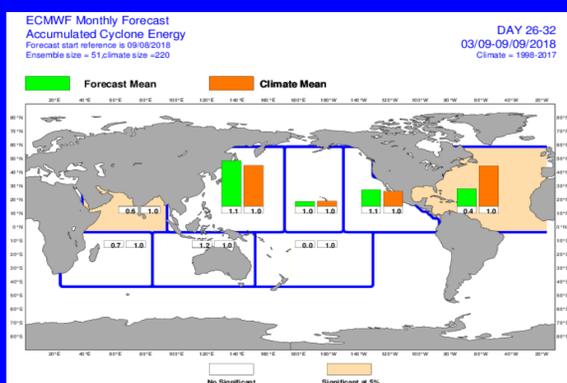
ERA5 will be used to initialize the ECMWF re-forecasts in Cycle 46r1 (to be implemented in June 2019). Experiments suggest a significant improvement in the re-forecast skill scores.

## Examples of Forecast Products:

### 2-meter temperature anomalies



### Tropical cyclone weekly activity



Difference of CRPSS scores between re-forecast experiments initialized with ERA 5 and re-forecasts initialized from the ERA Interim for weeks 1 to 4 over the Northern Extratropics (left panel) and tropics (right panel). Blue (red) dots indicate that the re-forecasts initialized with ERA 5 outperform (underperform) the re-forecasts initialized with ERA interim.