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Forecast performance 2011
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Forecast performance 2011

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The ECMWF forecasting system produces forecasts of excellent quality. Each year, comprehensive verification statistics are prepared to evaluate the accuracy of the forecasts. A summary of verification results is presented to ECMWF's Technical Advisory Committee. Their views about this year's performance of the operational forecasting system are given in Box A. From this year onwards a new set of six headline scores is being used for the evaluation of long-term trends in forecast performance.

Overall performance in the medium-range

Multi-year time series of verification results reflect the combined impact of all the improvements made to the forecast system over the years: increased resolution, improved forecast model, better data assimilation, and the availability of many more satellite observations.

The forecasting system has performed very well in the last 12 months. In particular, the upper-air performance for the deterministic forecast has been consistently good, with the anomaly correlation of the six-day forecast for the northern hemisphere remaining above 80% for each month.

Overall view of ECMWF's Technical Advisory Committee, 6–7 October 2011

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In regard to its overall view of the operational forecasting system the Committee:

- i. congratulated ECMWF on the very high performance level of all the components of its forecasting system and its continued world leading position, while noting a narrowing gap in terms of traditional scores as errors diminish;
- ii. expressed its appreciation of the imminent introduction of the Monday update run of the monthly extension of the EPS at the request of Member States;
- iii. acknowledged the value of the EFI for the Member and Co-operating State forecasting services and the high skill of the EFI in predicting severe weather events several days ahead, for instance the strong winds in the UK and Ireland in May 2011 and heavy rainfall in the Balkans in December 2010;
- iv. congratulated ECMWF for forecasting the genesis and accurately predicting the track and intensification of hurricane Irene in the Caribbean in August 2011;
- v. noted with satisfaction the removal of temperature bias in the aircraft data used in the analysis;
- vi. with respect to deterministic forecasts:
 - welcomed the recent improvements to the model, in particular the significantly improved skill of precipitation forecasts and the more realistic snow depth forecasts following the introduction of a new snow analysis;
- vii. appreciated ECMWF's responsiveness to specific Member State concerns, particularly the revised formulation of cloud microphysics to improve cloud supercooled liquid water layers, which has resulted in better 2 m temperature forecasts;
- viii. appreciated ECMWF's efforts to continue to improve its deterministic and probabilistic forecast verification system and provide scores reflecting users' needs and usage of ECMWF forecasts, e.g. the on-going development of weather regime-based scores;
- ix. welcomed the development of web-based facilities to allow forecasters to make better use of ECMWF forecasts (ecCharts);
- x. expressed concern that the current ECMWF forecasting system on occasion in spring gave poor forecasts, linked with strong convective events over the United States;
- xi. noted the tendency for heavy rainfall to be underestimated and light rainfall to occur too often;
- xii. noted the cold temperature bias in winter and spring, particularly in northern Europe;

Headline scores

In the context of ECMWF’s Strategy 2011–2020, a set of two primary and four supplementary headline scores has been defined for the evaluation of long-term trends in forecast performance. The aim of the new set of scores is to assess performance for various forecast lead times for surface weather parameters (such as precipitation and wind gusts) as well as for the traditional upper-air fields. These headline scores are shown in Figure 1. Four of the headline scores (two primary and two secondary) are expressed in terms of the lead time at which the score reaches a specific threshold value. The thresholds have been chosen so as to target the verification on the relevant forecast range for each measure of skill.

Figure 1a shows the performance of the high-resolution deterministic forecast as measured by the lead time at which the anomaly correlation of 500 hPa geopotential reaches 80% for the northern hemisphere extratropics; the blue line shows the monthly mean scores and the red line shows the 12-month means. The trend in performance of the Ensemble Prediction System (EPS) is illustrated in Figure 1b. Each point on the curves is the lead time at which the three-month mean (blue lines) or 12-month mean (red line) of the continuous ranked probability skill score of the 850 hPa temperature falls below 25% for the northern hemisphere extratropics. For both the deterministic and EPS forecasts the very high scores achieved during 2010, compared with previous years, have been maintained through 2011.

The new supplementary headline scores for deterministic and probabilistic precipitation forecasts are shown in Figures 1c and 1d (they are based on the skill remaining above a specified threshold). The increase in skill of the deterministic forecast in 2010 is associated with the five-species prognostic microphysics scheme introduced in November 2010 (cycle 36r4). For the EPS forecast, the resolution increase on 26 January 2010 (cycle 36r1) is mainly responsible for the improvement in skill between mid-2009 and mid-2010. Due to the time-averaging of the scores, step-wise changes in model skill appear as gradual changes over 12 months in the plots.

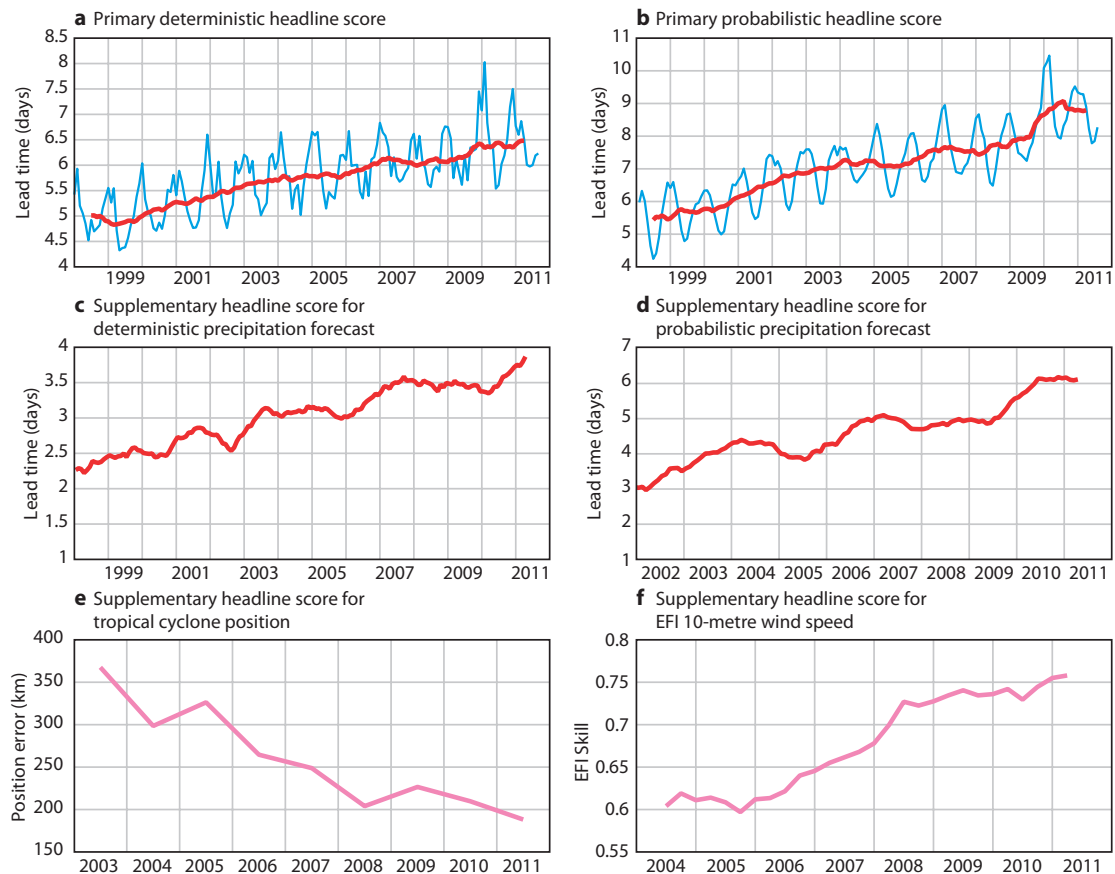


Figure 1 Summary of the two primary and four supplementary headline scores adopted by the ECMWF Council in June 2011 to monitor the trends in forecast performance.

The supplementary headline scores for severe weather are shown in Figures 1e and 1f. The mean position error of the 3-day deterministic forecast for all tropical cyclones occurring globally in 12-month periods ending on 31 October is shown in Figure 1e; verification is against the position reported in real-time via the Global Telecommunication System (GTS). The position error reached its lowest ever value this year. Figure 1f shows the skill of the extreme forecast index (EFI) for 10-metre wind speed at forecast day 4 (final point includes summer, June to August 2011). It shows a continually improving trend.

The complete set of annual results is available in *ECMWF Tech. Memo. No 654* on 'Verification statistics and evaluations of ECMWF forecasts in 2010-2011', downloadable from:

- www.ecmwf.int/publications/library

This document presents recent verification statistics and evaluations of ECMWF forecasts (including weather, waves and severe weather events) along with information about changes to the data assimilation/forecasting and post-processing system. Also the performance of the monthly and seasonal forecasting systems is assessed.

Further reading

Verification pages have been created on the ECMWF web server and are regularly updated. Currently they are accessible at the following addresses:

Medium range: www.ecmwf.int/products/forecasts/d/charts/medium/verification/

Monthly range: www.ecmwf.int/products/forecasts/d/charts/mofc/verification/

Seasonal range: www.ecmwf.int/products/forecasts/d/

Note: All forecasting system cycle changes since 1985 are described and updated at: www.ecmwf.int/products/data/operational_system/index.html

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