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Forecast performance 2010

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Forecast performance 2010

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Each year, comprehensive verification statistics are prepared to evaluate the performance of all the components of the ECMWF forecasting system. A verification summary is presented to the ECMWF advisory committees and the Council. The views of ECMWF's Technical Advisory Committee about the operational forecasting system are given in Box A. A couple of this year's main results are shown here.

Overall performance in the medium-range

Long time series of skill scores 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 overall performance of the deterministic forecasting system is summarised in the anomaly correlation (ACC) scores for 500 hPa height shown in Figure 1 for Europe since 1980. The skill of the deterministic forecast has been consistently good throughout 2010, with the average anomaly correlation remaining above 60% to around day 8 for every month.

In February 2010 the average monthly ACC remained above 60% throughout the 10-day range of the deterministic forecast for both the European region and the northern hemisphere: the ACC score was 67% at day 10 for the northern hemisphere and 61% for Europe. These are the highest scores ever reached by the forecasting system. The 2009/10 winter season has been unusual over the northern hemisphere, with a strong negative phase of the North Atlantic Oscillation and Arctic Oscillation circulation patterns. These are typically associated with cold weather in northern Europe and more active weather systems and heavy rainfall affecting south-west Europe. The exceptional scores are partially a result of the large anomalies this winter; however, the high scores for the ECMWF model confirm that it has performed consistently well in predicting these anomalous weather conditions. The ACC scores for other NWP Centres have also been particularly high during this period last winter, but ECMWF maintains its lead.

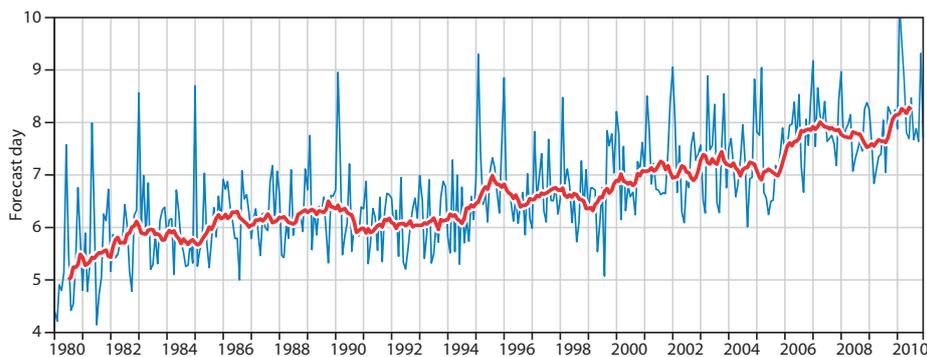


Figure 1 Deterministic forecasting system performance for Europe. Forecast range (days) at which the monthly mean (blue) and 12-month running mean (red) anomaly correlation for 500 hPa height operational 12 UTC forecasts reaches 60%. This score has been consistently high over the last year. The last month included in the statistics is September 2010. The resolution of the forecast model was T63 (320 km) initially, and was increased to T106 in 1987, T213 in 1993, T319 in 2000, T511 in 2001, T799 in 2006 and T1279 (16 km) in January 2010.

Tropical cyclone forecast accuracy

Developments of the forecasting system have resulted in substantial improvements to the quality of tropical cyclone forecasts in recent years. Average position and intensity errors for the deterministic medium-range forecasts of all tropical cyclones (all ocean basins) over the last seven 12-month periods are shown in Figure 2. For the last three years, the forecast has on average predicted the location of tropical cyclones three days ahead to within 200 km of the observed position. This compares with position errors of around 300 km in previous years. The model has a tendency to move the tropical cyclones more slowly than is observed, showing a speed bias of on average one km/hour. The increase in resolution in January 2010 significantly reduced the tropical cyclone intensity errors, continuing the improvements made in earlier model upgrades.

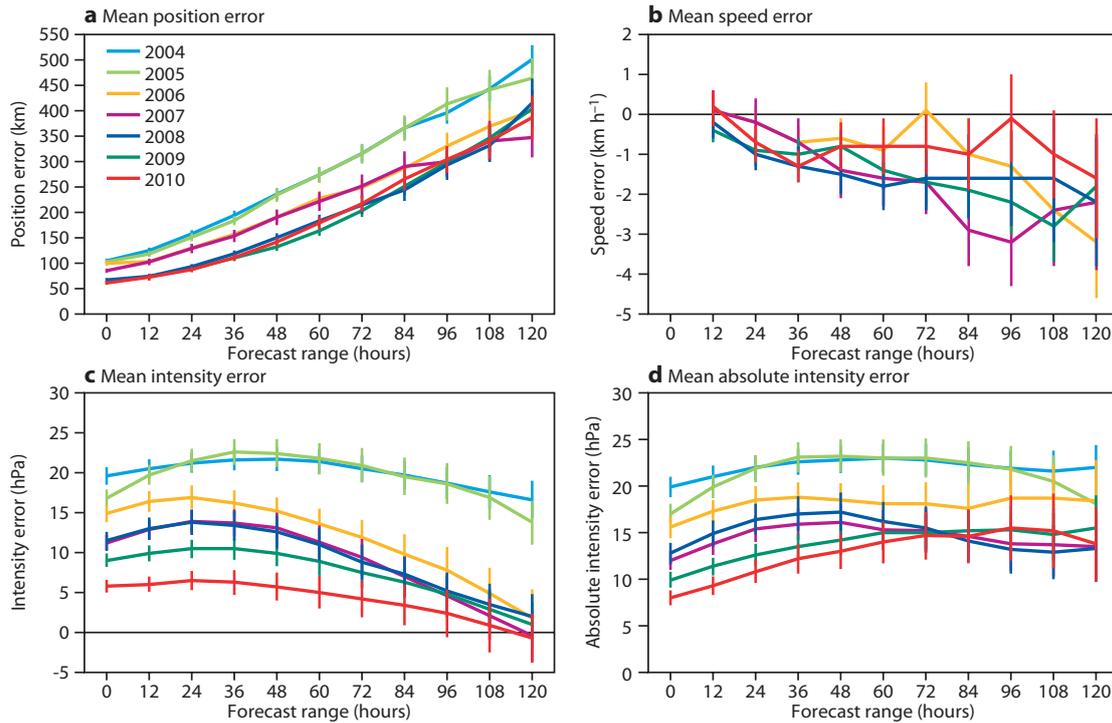


Figure 2 Verification of tropical cyclone predictions from the operational deterministic forecast. Results are shown for 12-month periods ending on 30 November. (a) The mean position error. (b) The mean speed error (negative values indicate that the forecast speed is too slow). (c) The mean intensity error (bias) in the cyclone core pressure (positive error indicates the forecast pressure is less deep than observed). (d) The mean absolute intensity error of the core pressure. The uncertainty in the scores is indicated by the 90% confidence interval (based on T-test); there are substantially fewer events at later forecast steps than earlier in the forecast and hence there will be greater uncertainty in the scores at the later ranges. Verification is against the observations reported in real-time via the GTS.

Overall view of ECMWF's Technical Advisory Committee, 6–9 October 2010**A**

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

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| <p>i. congratulated ECMWF on the consistently good results from all its forecasting systems in the previous year, in particular for the outstanding forecasts produced in February, when scores for the northern hemisphere and Europe reached their highest level ever, and on maintaining its leading position in global weather forecasting;</p> <p>ii. was encouraged by the clear positive impact from the introduction of the ensemble of data assimilations and by the promise shown by the new cloud microphysics;</p> <p>iii. was encouraged to learn that monthly forecasts for temperature are beginning to show some evidence of skill out to week 3, in particular during high-impact episodes such as the recent extreme temperatures experienced in Europe this winter and Russia this summer;</p> <p>iv. appreciated the continued positive trend shown in the verification of severe events;</p> <p>v. noted that the skill of the ensemble prediction system, already high, continues to increase, both in absolute terms and in relation to other centres;</p> | <p>vi. welcomed the increased use of ensemble products in the Member States for input into downstream models and at longer time ranges;</p> <p>vii. was pleased to note that the scores for ECMWF wave forecasts continue to improve and maintain their lead over other centres' forecasts;</p> <p>viii. with respect to deterministic forecasts of weather parameters:</p> <ul style="list-style-type: none"> • acknowledged that precipitation forecasts show some improvement at day 3-4 but there remains a tendency to overpredict light rain; • noted, with some concern, that the significant cold bias over Europe at night continued during the last winter and spring; • noted that the severity of the cold temperatures during the last winter had emphasised model problems with snow depth and density but was encouraged by the work which has been undertaken to improve the snow analysis and forecasts. |
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Further reading

The complete set of annual results is available in ECMWF Technical Memoranda on “*Verification statistics and evaluations of ECMWF forecasts*”, downloadable from: www.ecmwf.int/publications/library

Verification pages have been created on the ECMWF web server and are regularly updated.

Currently they are accessible at the following addresses:

- **Medium range:** <http://www.ecmwf.int/products/forecasts/d/charts/medium/verification/>
- **Monthly range:** <http://www.ecmwf.int/products/forecasts/d/charts/mofc/verification/>
- **Seasonal range:** <http://www.ecmwf.int/products/forecasts/d/charts/seasonal/verification/>

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

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