

The importance of standardised verification procedures for inter-comparison of global NWP model forecasts: revised WMO guidelines

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Standard verification of global NWP models

- Global NWP centres regularly compare the performance of their models by exchanging an agreed standard set of verification scores
- It is important for such comparisons that the verification procedures used to compute these scores are consistent between the centres
- These procedures have been established by the World Meteorological Organisation (WMO) Commission for Basic Systems (CBS)

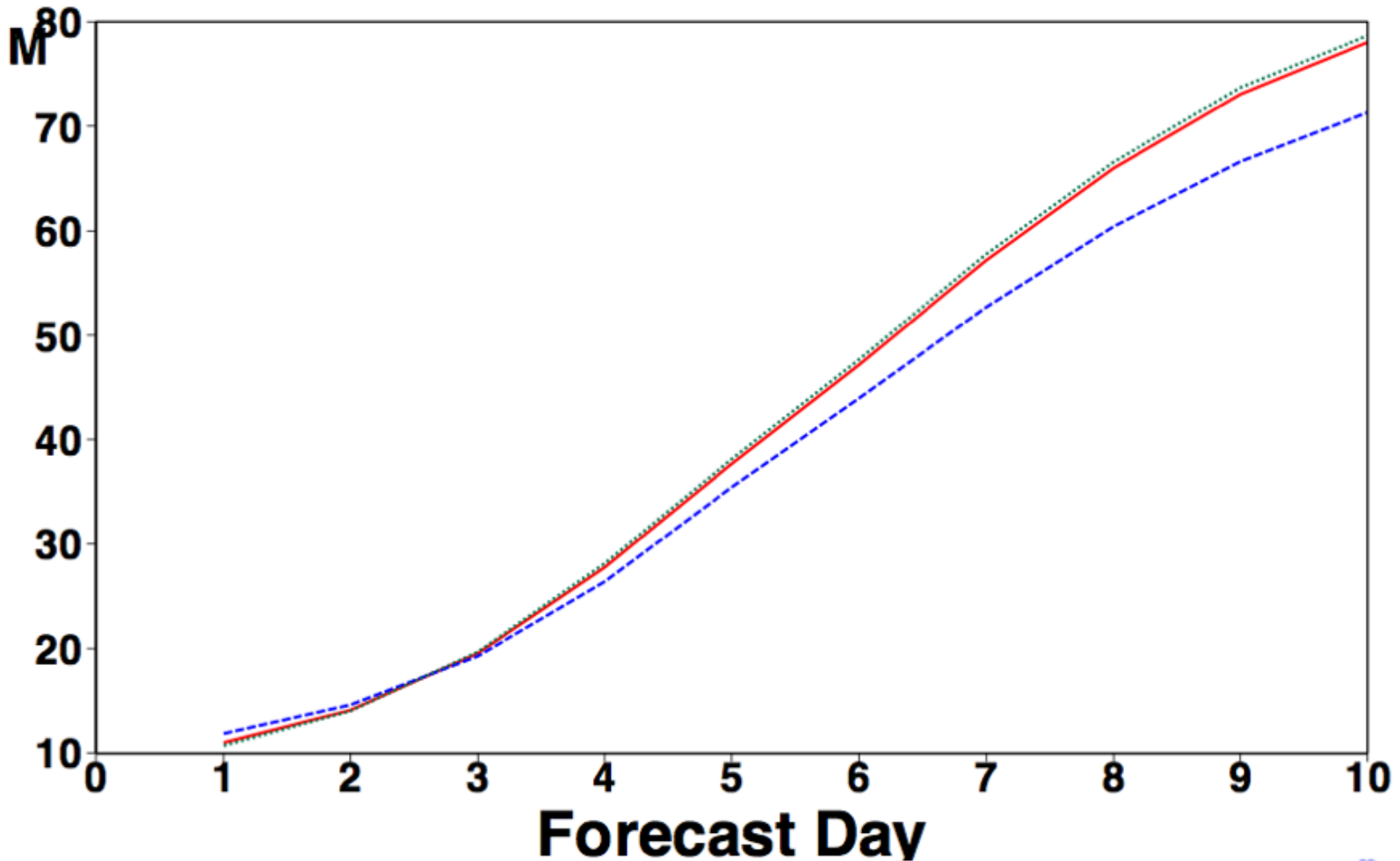
Review of CBS standard verification

- The CBS Co-ordination Group on Forecast Verification (CG-FV) has reviewed the current procedures and the way they have been implemented in different centres
- Procedures not as consistent as they could be, some errors
- Verification against radiosonde observations:
 - Official CBS list updated annually
 - Centres have not always used the latest list
 - QC meant lists were further reduced and different
- Verification against analyses:
 - Different methods of interpolation from model grid to standard verification grid (2.5° x 2.5°)
 - Climatology for anomaly correlation can have large impact on scores (no common climate between centres)

ECMWF scores against radiosonde observations

RMSE for June-August 2008. 500 hPa height, Northern Hemisphere

Red: WMO radiosonde list for 2008; blue: WMO radiosonde list for 2000

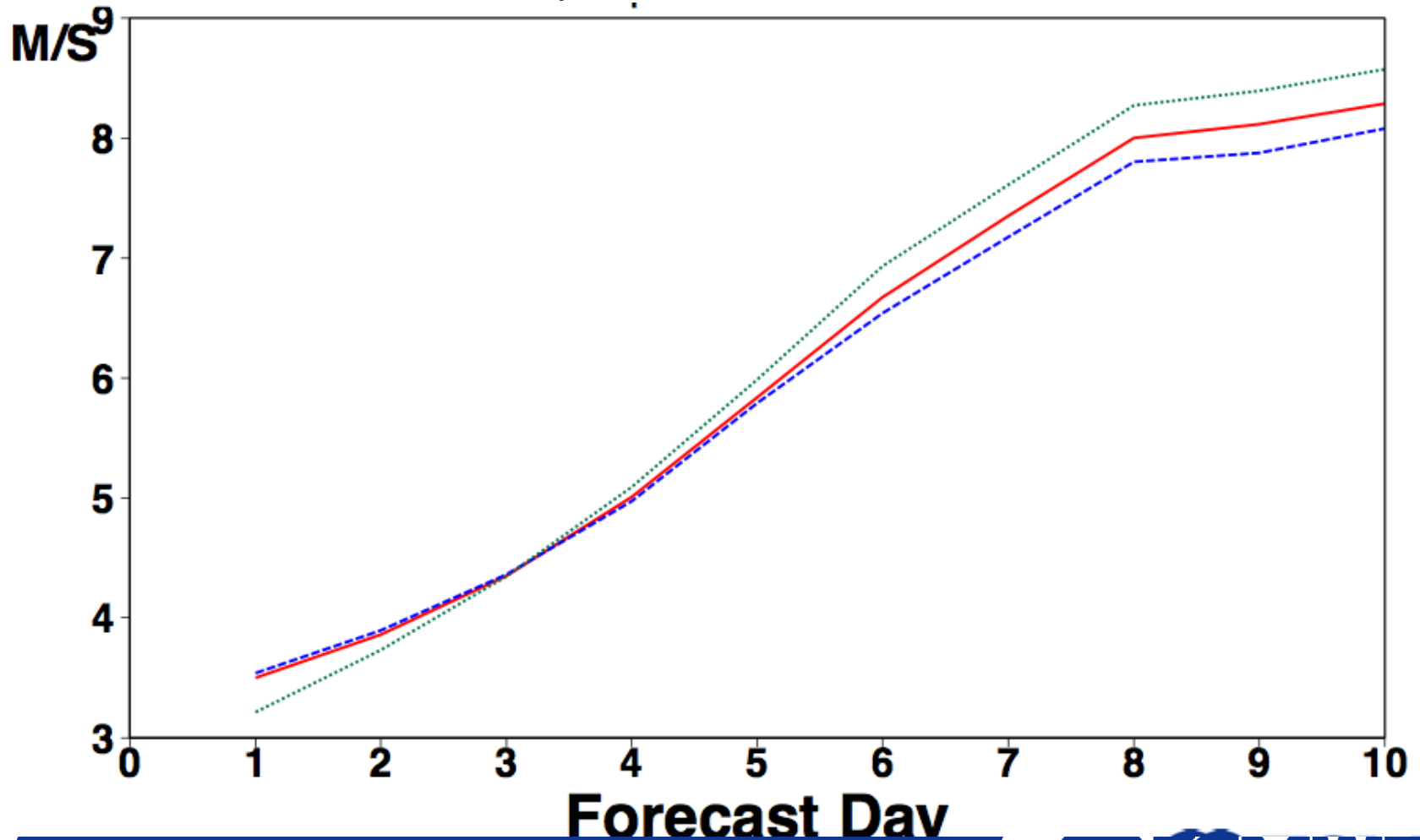


ECMWF scores against radiosonde observations

RMSE for June-August 2008. 850 hPa vector wind, Europe

Red: WMO radiosonde list for 2008; **blue:** WMO radiosonde list for 2000

Green: as red but different interpolation to station location

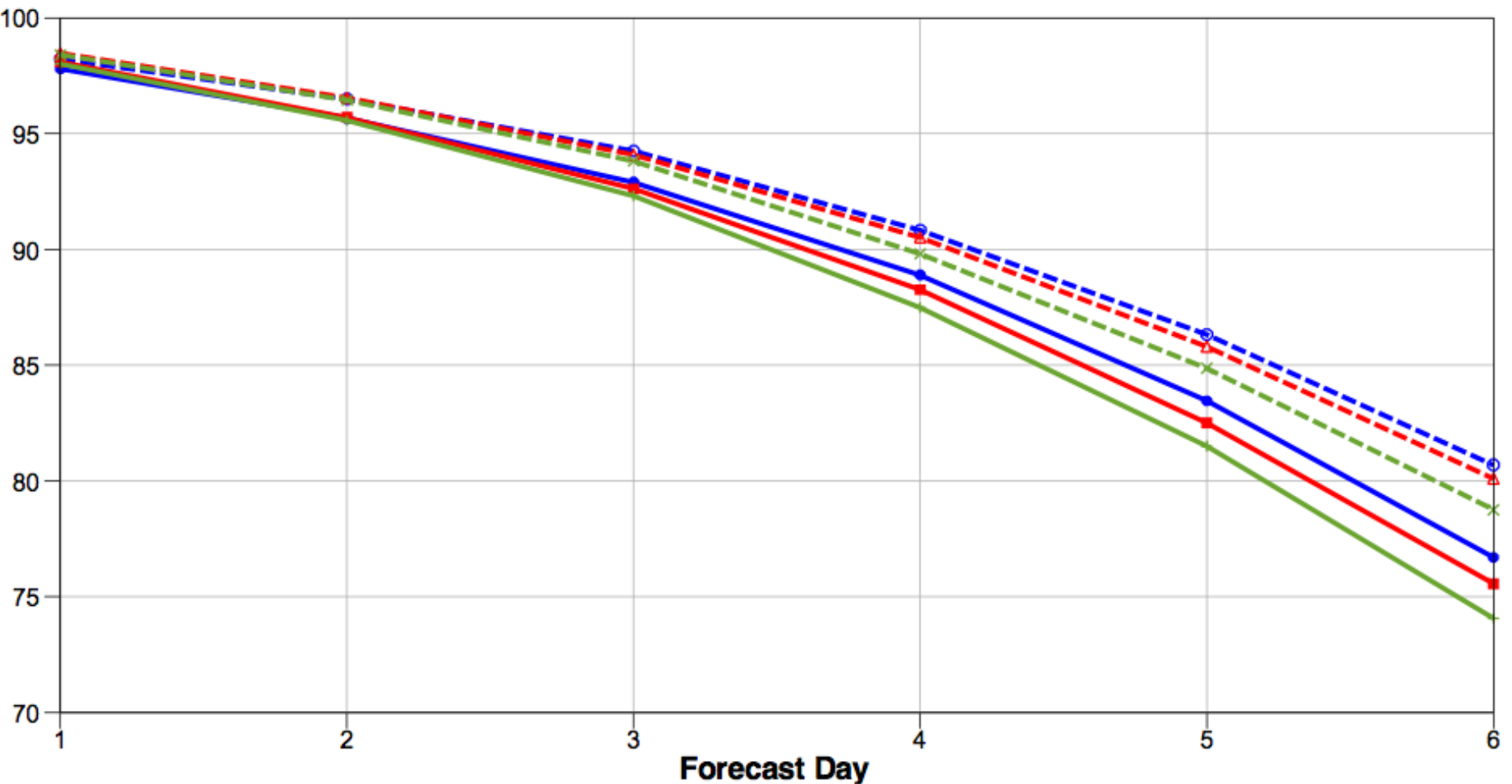


Effect of climatology on anomaly correlation

ACC error for Dec 2007 – Feb2008. 850 hPa temperature, N hemisphere

Dashed lines: old climate from 1980s; Solid: new ECMWF re-analysis

Colours: 3 different models

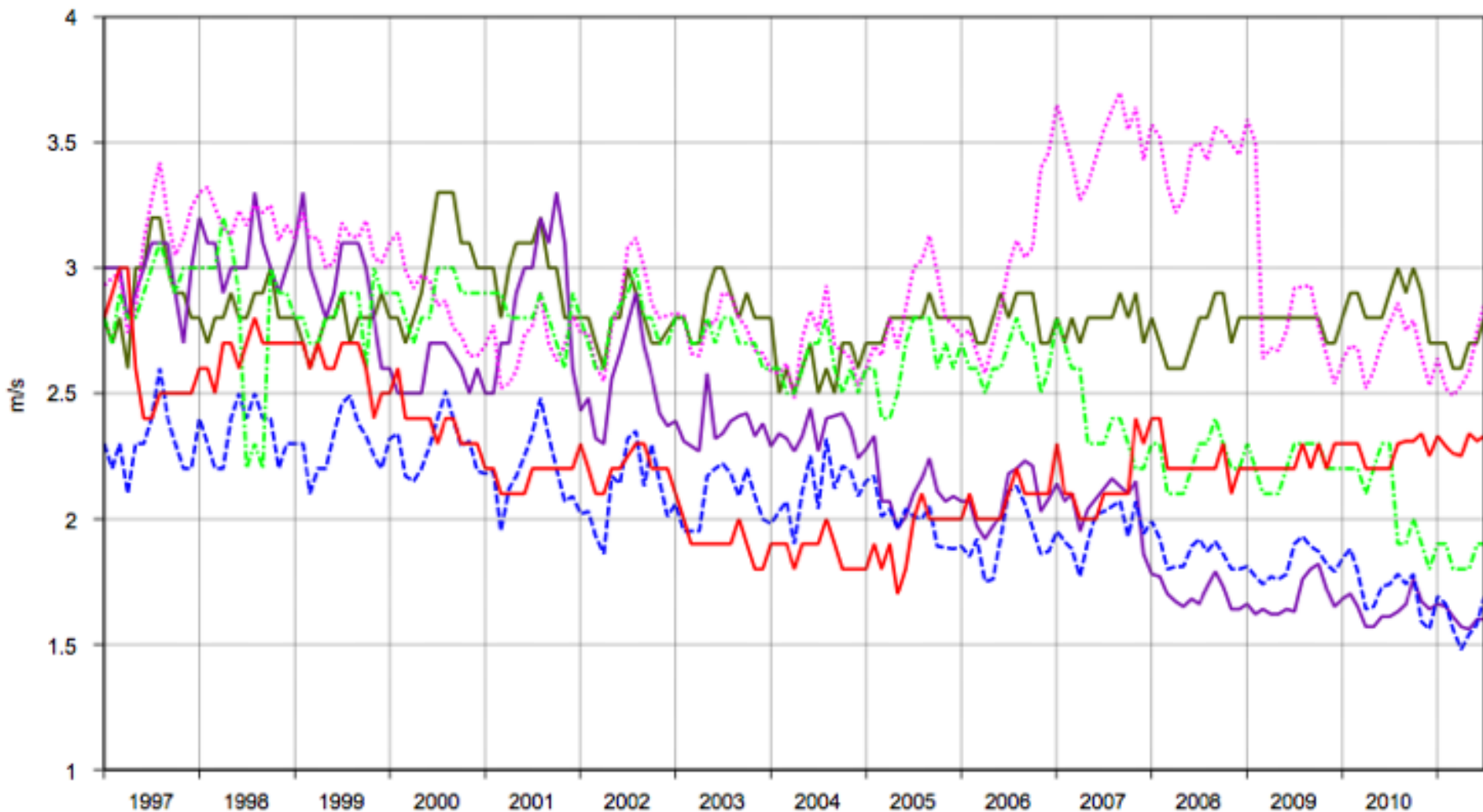


Verification to WMO standards

wind 850hPa

Root mean square forecast error

Tropics (lat -20.0 to 20.0, lon -180.0 to 180.0)



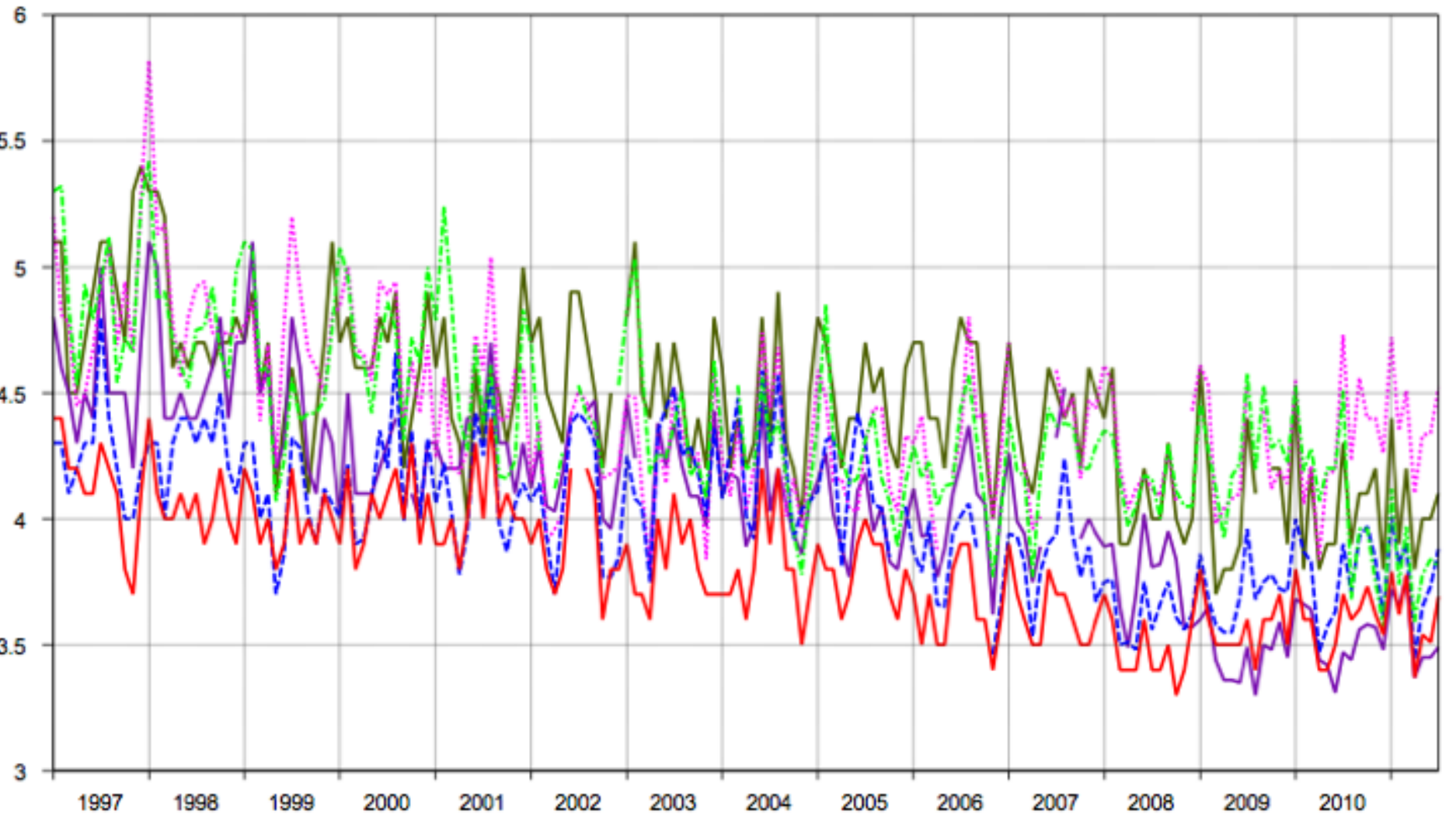
Verification to WMO standards

wind 850hPa

Root mean square forecast error

Tropics (lat -20.0 to 20.0, lon -180.0 to 180.0)

- UKMO 12utc T+24
- CMC 00utc T+24
- JMA 12utc T+24
- M-F 00utc T+24
- ECMWF 12utc T+24
- NCEP 00utc T+24



Revised standard procedures

- Approved by the 16th WMO Congress in June 2011
 - increase in resolution of the grid used for verification from 2.5° to 1.5°
 - defined interpolation method to retain features at the scale of the verifying grid but not introduce additional smoothing
 - common climatology for anomaly correlation (based on the ECMWF ERA-Interim re-analysis data set)
 - additional scores to measure forecast activity
- Lead Centre for Deterministic NWP Verification (LC-DNV)
 - To collect, process and publish the scores
 - responsible for maintaining the consistent implementation of the procedures amongst the centres, including exchange of sonde lists
 - use of daily scores for computing bootstrap intervals

Lead Centre for Verification

Deterministic NWP Verification (LC-DNV)

- <http://www.ecmwf.int/products/forecasts/wmolcdnv/>
- LC-DNV will facilitate this transition to the new standardised procedures
- Website includes
 - Relevant documentation on new procedures
 - Link to ftp site for accessing common climatology
 - Details of how to send new scores to LC
 - contact details to encourage feedback from NMHSs and other GDPFS Centres on the usefulness of the verification information
- Transition to use of new scoring procedures will progress in coming months
- LC-DNV will continue to develop to add displays of new results when available

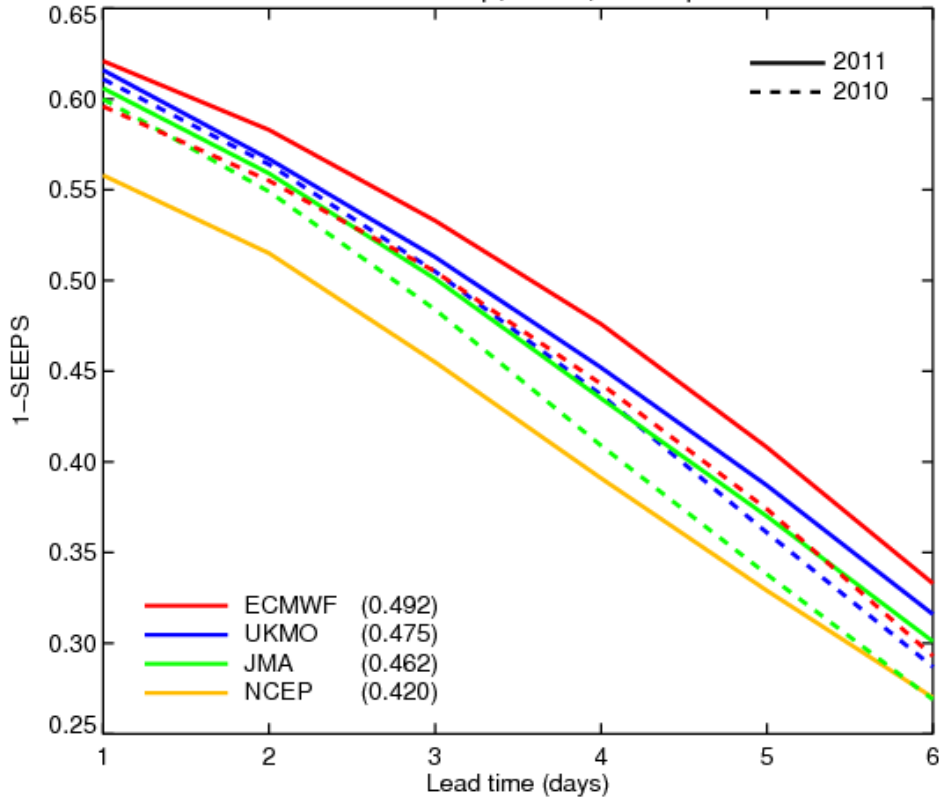
Summary and future changes

- Focus on surface weather: temperature, wind and 24-h precipitation
 - SEEPS for precipitation
 - Identify a quality-controlled set of global sites for temperature and wind
- Sensitivity studies using an ensemble of analyses (move away from using own analyses)
- Development of a similar framework for limited area models: SRNWP (Clive Wilson this session)

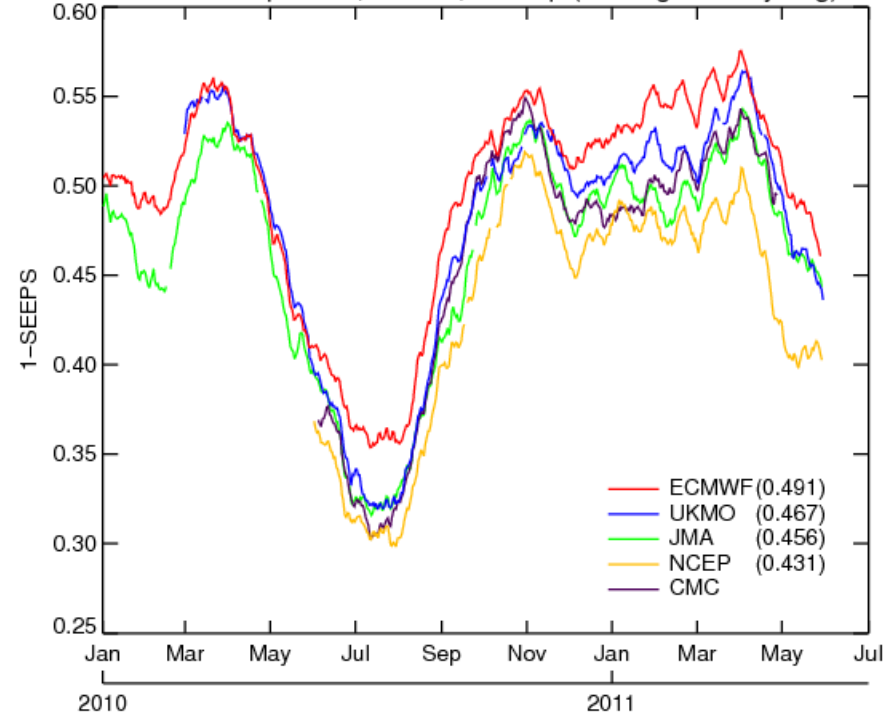
Precipitation skill comparison

Monitoring global precipitation using SEEPS

24-h Precip, MAM, ExTrop



24-h Precipitation, +072 h, ExTrop (moving monthly avg)



SEEPS regional detail

From Rodwell et al, 2010 (QJ)

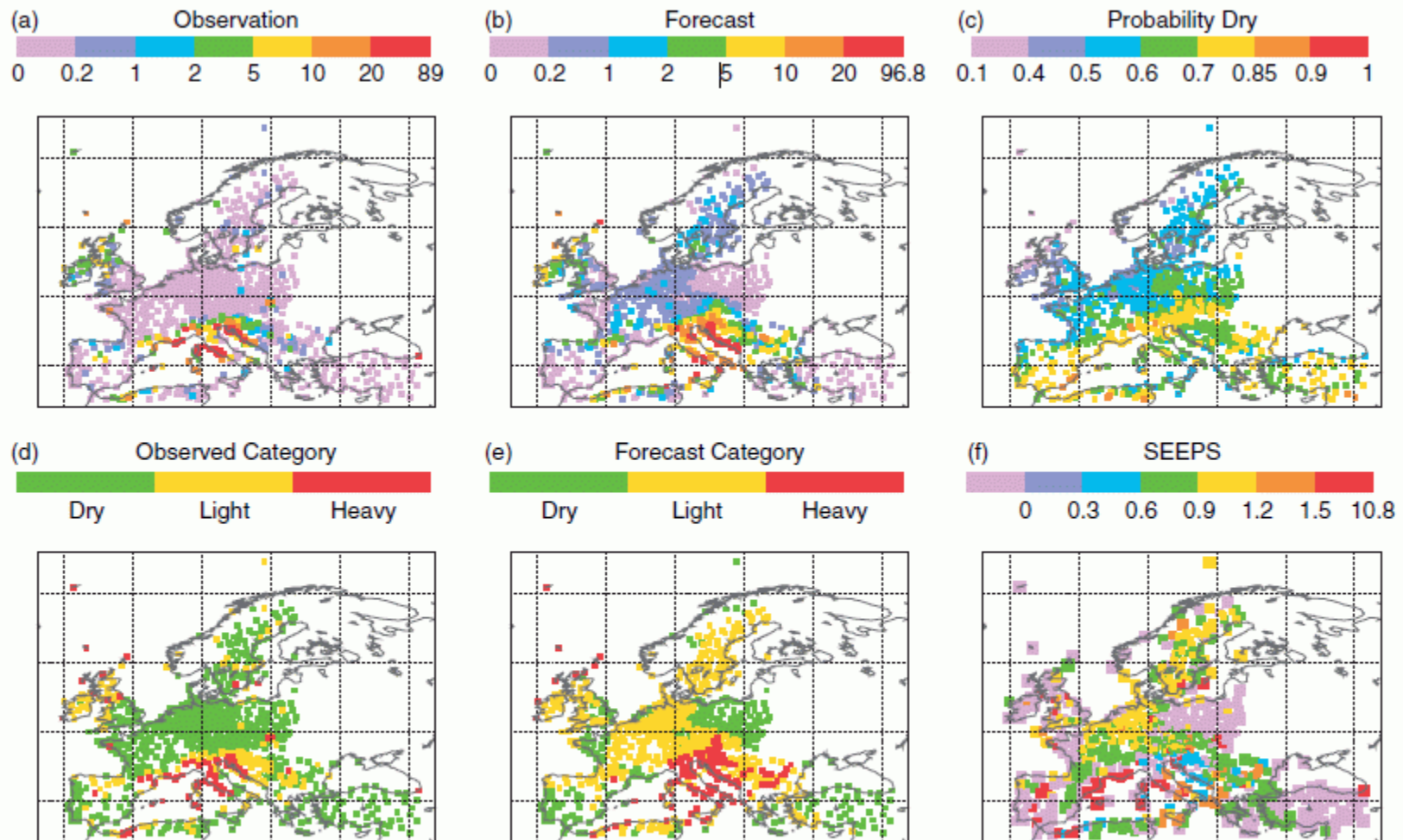


Figure 7. (a) Observed precipitation accumulated over 24 hours for 15 December 2008 at 1200 UTC to 16 December 2008 at 1200 UTC. (b) Forecast precipitation accumulated over lead times of 72–96 h and valid for the same period as the observations. (c) Probability of a ‘dry’ day in December, based on the 1980–2008 climatology. (d) Observed precipitation category. (e) Forecast precipitation category. (f) SEEPS. Units in (a) and (b) are mm. Squares in (f) are plotted with areas proportional to the weight given to each station in the area-mean score.