III WORKSHOP REPORT

Introduction

The 12th biennial Workshop on Meteorological Operational Systems was held at ECMWF on 2 – 6 November 2009. This year there was a strong focus on the role of observations. The workshop reviewed the state of the art of observation handling in meteorological operational systems and addressed future trends in:

- The role of observations in verification of medium-range forecast products (session 1).
- Data management and meteorological visualisations on workstations (sessions 2 and 3).

The workshop was attended by nearly 60 participants from Meteorological Services, WMO, EUMETSAT, research institutions and commercial weather services coming from 22 countries in Europe, Asia and the Americas.

The presentations given in session 1 addressed the changes to the forecasting system, together with developments in the range of products provided by the Centre. There was a focus on tools and products for observation monitoring, and on the use of observations in verification of rare events. Users of the ECMWF forecasts reported on their approach to medium- and extended-range weather forecasting, including the use and application of ECMWF products.

In session 2, experiences were shared on the management of observation, from collection to applications. New meteorological visualisation applications and updates to existing applications were presented in session 3 and also demonstrated during an exhibition.

During the week, the workshop split into two working groups to discuss issues relevant to the session topics. Some of their key findings were as follows.

Statistical adaptation

- For general public forecasting, high-resolution models may now be good enough to use direct model output for surface temperature and winds in areas of low/smooth orography. However, for more complex terrain, other parameters, and specific users there is still a clear benefit from statistical adaptation.
- Methods are so far generally linear, but there is some work beginning on non-linear or regime-dependent adaptation. It is too early to assess the added benefit of these approaches.
- Some users have begun to calibrate EPS model output using re-forecasts. Initial results are encouraging and show improved performance.

Requirements for observations

- There is a strong need for high-resolution observational data for both validation/verification of models and for use in statistical adaptation. Freely available (WMO) station data is limited and not at sufficient spatial resolution for all requirements.
- Most countries have additional local observational data that is not widely disseminated. It would be beneficial if this data could be more widely exchanged.
- All observations need careful quality control. It is important to understand the different aspects of observation uncertainty (observation error, interpolation, representativeness) when using this data for verification.
- There is large potential to use satellite and radar data to give high resolution (space/time) observational information for verification. More work is needed to fully exploit this data. GPSRO data may be particularly useful because it is bias-free.
- For SYNOP observations the harmonisation of reporting practice will be of value (e.g. for reporting snow amounts and wind gusts).

Monitoring of observations

- It would be of value to establish a basic set of monitoring statistics for satellite data and to make this available for comparison between centres in (near) real time.
- Routine exchange of alerts from monitoring at different centres could improve the identification of observation problems.

Graphical Workstations and Data Management

- Google is providing users with very high expectations. There is access to very large amounts of data and response times are nearly instantaneous

- Analysing / visualising large amounts of meteorological data interactively is very important. A key issue is specifying the requirements for the Graphical User Interface (i.e. in terms of features and functionalities, usability and performance) and deciding how data can be organised to fulfil these requirements.

Cataloguing and discovery

- There is a need to publicise the availability of data and products. WMO mandates the use of ISO19115 but there does not seem to be a lot of uptake by the community as yet.

- Forecaster workstation could use GISC catalogues to provide forecasters with information about data availability for certain areas of interest. This should be considered as a backup. Operations cannot be based on remote data only.

- CSW (Catalogue Service for Web, OGC – Hierarchical structure) should be considered for cataloguing ISO19115 records.

- The troubleshooting in a service-oriented architecture (SOA) is generally hard, but the following of standards helps training of developers. In SOA applications security and its implications should not be underestimated. SOA is generally vulnerable to network outages but SOA systems can be deployed on a single computer.

Performance

- Efficient data management is the key of good visualisations. Hardware may be the limiting factor (e.g. disks). Large databases may constitute a bottleneck and replicated databases may hit network bottleneck. Good indexing is essential (meta indexing) for good performance.

- Multiple organisations of the data can help optimise response time, but is costly in terms of disk space. Intelligent pre-processing (e.g. clusters, means) is necessary to present large amount of data to the forecaster.

The workshop programme, the presentations and the summaries of the working group discussions, which were presented at the final plenary, can be found at:

http://www.ecmwf.int/newsevents/meetings/workshops/2009/MOS_11/index.html