

MOSAC

15-16th November 2007

Chairman's Report

12th Met Office Scientific Advisory Committee Meeting (15-16 November 2007)

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The 12th meeting of MOSAC was attended by ten committee members, six Chief Scientist equivalents from other national meteorological services/ECMWF, and four from UK Universities/NERC. The Revised Terms of Reference for MOSAC (attached as an Appendix to this document) stress that the context for its discussions is the Met Office's corporate strategy and the outputs required by its primary government customers for meteorological and oceanographic services. This aspect was aided by the written material provided, introductory comments by the Head of NWP, a verbal contribution by the Head of Forecasting, a presentation about Defence applications and the presence of the PWS Programme Manager.

The Met Office was congratulated for its excellent NWP scores in the past year, its performance in high profile flooding and storm-surge situations, and the achievements in its R&D programme. It is clear that the forecasters are starting to make good use of the ensemble forecast products and that this helped considerably in the confidence they were able to attach to early warnings of the high impact events. The Met Office was able to reinforce its position as second to ECMWF in most measures of forecast skill for the year. A number of beneficial changes have been made to the operational suite during this year, mostly in the use and assimilation of data. The relatively poor performance in summer 2006 was not as evident in 2007, partly due to physics parametrization changes and perhaps partly due to the different nature of this summer's weather. The continuing relevance of the R&D programme was supported by measures of its pull through with 81% of the projects having impact on forecast scores within 5 years, including 36% with significant impact. The publication of 84 papers in the year by 250 scientists is probably adequate, given the operationally driven nature of the programme.

The document describing Meteorology R&D programme contained clearer objectives and provided greater evidence of planning than last year. The aspirations for the 2020 forecast suite and the shorter-term targets for 2009 and 2011 presented to the committee were thought to be generally well-founded and were in general supported. However no discussion of computer resources required to meet the targets was presented this year. Next year, with the computer procurement finished, the Committee would like to see this aspect again. The key role played by the new variable resolution version of the model between the global model and the kilometre scale UK model was noted. There was discussion over the continuing necessity for a single slightly higher resolution deterministic run as well as ensemble runs. The committee was pleased to see the inclusion of air quality forecasting in the proposed operational suites.

The Committee considered that there is a gap in the strategy and the thinking between forecasting up to 15 days and on longer time-scales, the latter generally occurring in the Hadley Centre. Recently there has been increasing interest in the seamless nature of the prediction problem from one day to one century, and the Met Office, with its roles spanning the range, is in a unique position to benefit from this perspective. The strategy for the range of time-scales should include the expected role to be played by ECMWF. The extent to which coupling to the surface layers of the ocean needs to be represented on differing time-scales and how this would affect the model suite will need to be considered. Decisions on, for example, the model lid should, wherever possible be made with due consideration for the needs on various time-scales and the desire for efficiency in particular applications. New

parametrisation developments will continue to necessitate similar considerations. The interesting work that the committee saw on the middle atmosphere will have relevance to the forecast problem from the second week onwards. Consideration will also have to be given to the predictability of the NAO and blocking; the lack of mention of them in the NWP programme was noted. The Committee felt that it would be useful in future to have a presentation from the seasonal prediction and climate areas so that it could get a better idea of the connection between the research in them and that in NWP, and how lessons learnt from each of these areas are reflected in the research effort aimed at improving the model.

Excellent research has been performed towards the development of a newer, very general version of the dynamical core of the model. However it was not clear that sufficient consideration is being given to model scalability to give efficiency on the massively parallel computers that are very likely to be the only means of providing the computational power sought during the next decade. The possible advantages of other grid structures should be kept under consideration. Collaboration with the academic community may be useful in many such areas.

The Committee welcomed the extent of the collaboration listed by the Met Office. Of particular note is the collaboration with other Met services who are using the UM. It was noted that this could provide some constraints on development of the UM system as the needs of others will have to be taken into account. In the case of Australia the use of the UM is spreading into the wider community. The hope was expressed that the importance of the wider community use in the UK will not be overlooked in the enthusiasm for the new relationships. The tensions between the characteristics of an operational forecast modelling system and one for the research community was highlighted. The UK academic/NERC community have put a large effort into helping use of the UM by academics, and this knowledge and experience should be tapped into for similar communities elsewhere. In general the Committee would like to get a better feeling of how the Met Office sees itself as part of a global meteorological community, maximising the value gained through the tasks shared throughout that community and at the same time carrying out its wider, corporate responsibilities.

The top priority given by the Head of Forecasting was for improvements in boundary layer representation and prediction. There is clearly significant R&D activity in this area, but given its number one status according to operations, the Committee would like to see the development and execution of a coherent plan in this area.

It was also felt that with a new leader of the Observations-Based Research theme just in place it would be opportune for a strategy to be developed and it was pleased to accept the offer to see this next year.

The Committee welcomed the formation of a Land Surface Development Group and noted the short-term measures that had been taken in this area to cope with problems that had been found. It looked forward to a prioritised programme with a view to providing the necessary longer-term solutions.

The Committee understood the argument that kilometre scale forecasting R&D activities, previously in specific themes, should be distributed amongst the modelling, observation and data assimilation themes now that the activity has become operational. However they asserted the necessity that the overview of the necessary R&D in this area should not be lost, as it is such a novel and central aspect of the future NWP programme. The Met Office is pioneering data assimilation on this scale with a 3DVar system operational at 4km and on the way to 1.5km and also examples

of 4DVar at 4km. The possibility was raised that the expected observational capability may prove to be insufficient to give the basis for the forecast skill on this scale that customers had anticipated. Other operational observational systems may be required and the collaboration of NERC/academia should be sought now in the technical development of innovative observational capability.

The Met Office continues to perform excellent R&D that enables the operational use of data from the evolving range of satellite-borne instrumentation. The Committee particularly welcomed the construction of an operational high-resolution SST product, OSTIA.

An excellent range of diagnostics of performance of the models in the tropics was presented. The exploitation of these for improving the model would have impact on forecasting on all time-scales and should be pursued through collaborations, both with relevant National Weather Services using the UM, notably Australia and South Africa, and with UK academia/NERC.

The presentation from the customer focussed Defence R&D theme was welcomed by the Committee. It was said that some of the modelling systems and issues would be of interest to the academic community and the question was raised as to the extent that collaboration might be possible.

The Committee welcomed that the possible rethink by the Met Office on the need to calibrate the forecasting of extreme events using the ensemble system by performing reforecasts of many past events.

The Committee considered that the paperwork for the meeting continued to improve in general, though the quality of some figures needs attention and some of the referencing to figures had gone astray. The Committee repeated the comment that it has made over the years that those giving presentations should assume that the papers have been read and use their talks to highlight major points and issues, allowing ample time for discussion of them.

The purposes of MOSAC are:

- To provide independent assessment of the quality and relevance of the Met Office's Meteorological and Oceanographic R&D in the context of the Met Office's corporate strategy and the outputs required by its primary government customers for meteorological and oceanographic services
- To foster productive links with the global meteorological community.

The Terms of Reference for MOSAC are:

In the context of the Met Office's corporate strategy and the outputs required by its primary government customers for meteorological and oceanographic services

- To review the Met Office's Meteorological and Oceanographic R&D programmes
- To identify any areas of scientific concerns in relation to the Met Office's R&D plans to meet its customer's requirements and its own strategic aims
- To provide the Met Office Board with critical comment on the proposed programme of activity and its priorities, and agree a summary view of the performance of the research that will be presented formally by the Chair to the Met Office Board.

Information on the outcome of the review will also be provided by the Chair to the PWS (Public Weather Service) Customer Group on aspects relevant to them.

It should be noted that the Hadley Centre's Climate Prediction Programme is subject to scientific review by a separate panel.

It is expected that MOSAC will have one meeting over two or three days each year. Members of MOSAC are independent experts in the field of meteorology and numerical weather prediction (NWP) drawn from universities and from the meteorological services of other countries. They are selected by the Chair in consultation with Met Office's Chief Scientist on the basis of their proven track record in meteorology and of the relevance of their expertise to the scientific questions underlying the Met Office Meteorological and Oceanographic R&D programmes.