RSMC Exeter report of activities for 2012

Executive Summary

At RSMC Exeter, activities for 2012 revolved mainly around the Regional Specialised Meteorological Centre (RSMC) suite of tests, including the quarterly IAEA-led tests and occasional monthly tests. In addition, there were some updates and improvements to the RSMC job procedures and software, as well as improvements in the underlying dispersion model used. The Provisional Technical Secretariat (PTS) of the Comprehensive Test Ban Treaty Organization (CTBTO) made both operational and planned requests for inverse modelling support by RSMC Exeter during 2012.

1. Introduction

The UK Met Office is designated by the WMO as the Regional Specialized Meteorological Centre (RSMC) for the provision of atmospheric transport modelling in case of an environmental Emergency Response. The regions of responsibility are WMO Regional Associations (RA) I & VI, which encompasses Europe, Ukraine, the Russian Federation and Africa. In the case of an event, RSMC Exeter would respond jointly with RSMC Toulouse. In addition to emergency response, RSMC Exeter contributes global inverse modelling support to the CTBTO verification system

2. Operational Contact Information

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3. Responses and information on dissemination of products

i. Participation in international inverse dispersion modeling events and exercises with CTBTO

During 2012 RSMC Exeter received approximately 23 requests for both real and exercise scenarios from the Provisional Technical Secretariat of the Comprehensive Test Ban Treaty Organisation (CTBTO).

4. i) Routine operations

RSMC Exeter took part in a planned International Atomic Energy Authority (IAEA) quarterly exercise as lead RSMC (in conjunction with RSMC Toulouse) in August 2012. Graphics were posted to the relevant RSMC mirrored websites, as well as to the IAEA.

In addition, RSMC Exeter has been responding to the monthly tests (initiated by RSMCs Melbourne, Montreal and Washington) by running dispersion models and sending output onto the mirrored RSMC web pages. As a result of these tests, and the quarterly IAEA exercise, feedback was received from other RSMCs about a textual product (the Joint Statement) not being disseminated to the RSMC mirrored websites. In addition, a file indicating that particular RSMCs were acting as lead was not being correctly sent by RSMC Exeter.

As a result of the feedback, changes were made to procedures and processes at RSMC Exeter such that all expected files are now (as of February 2013) being sent to the appropriate locations on the RSMC mirrored websites.

5. Lessons learned from recent experiences and significant operational and technical changes:

i. All requests for RSMC support during 2012 were carried out in a timely fashion.

ii. Various incremental changes continue to be made to NAME III to improve the capability of this model.

iii. As described in **4**. above, changes to the dissemination of products to the RSMC mirrored websites have been made to ensure that all products are issued in the correct format and to the correct locations. Testing for this has continued into 2013 and we are now at a stage where all files are being correctly received by all the RSMC websites.

6. Operational issues and challenges:

i. As highlighted in previous reports, there is a need to ensure that all operational staff are regularly exercised and tested in their execution of all aspects of Emergency Response. The initiation of the dispersion model (NAME) runs is a straightforward task, since the process is well-documented and performed frequently by the team. However, the writing of the Joint Statement is somewhat more involved and it is this aspect that has been focussed on. To ensure that all team members are up to date, specific “training” days continue to be rostered to allow the EMARC (RSMC) forecasters dedicated time away from operational duties in which to continually practice these (and other) Emergency Response activities.

ii. In 2012 the intention had been for RSMC Exeter to host its own RSMC mirrored website, in the same way that all other RSMCs host their own version of the mirrored website. However, this coincided with a major overhaul of the web infrastructure

employed by the UK Met Office and, as a result, this work could not be scheduled. Notwithstanding this, the process was initiated in November 2012 and technical teams are now assessing the requirements with a view to work starting in the Spring of 2013.

7. Summary and status of the operational atmospheric transport and dispersion models

The Met Office's Numerical Atmospheric-dispersion Modelling Environment, NAME III (v. 6.1 is the current version of this) is a Lagrangian particle-trajectory model designed to predict the atmospheric dispersion and deposition of gases and particulates. A large number of particles are used to represent releases from pollution sources. Each model particle can have its own characteristics, represent different compounds or chemicals and represent real particulate sizes. These particles are advected by the temporally varying, three-dimensional model winds and dispersed using random walk techniques that take into account the atmospheric turbulent velocity structures.

Several deposition processes remove particles from the atmosphere; i) impaction with the surface, ii) washout where particles are `swept out' by falling precipitation, iii) rainout where particles are absorbed directly into cloud droplets as they form and, iv) fall out due to gravity.

A modular code design offers the user flexibility in configuring model runs and provides an infrastructure onto which extra modules could be added. NAME is capable of utilising meteorological data from a variety of sources: fields from a numerical weather prediction model, radar rainfall estimates, and single-site observations, with the available data used in a nested sense.

Other effects, such as plume-rise (for buoyant or momentum-driven releases), radioactive decay of radio nuclides, and chemical transformations, can also be included. At short ranges, NAME functionality includes modelling of short-period concentration fluctuations and the effects of small-scale terrain or isolated buildings on dispersion.

During 2012 improvements have been made and NAME is now able to run on more than one computer core. This capability is not currently being used but the aim is to utilise it in the near future. It means that NAME runs (particularly the longer runs like RSMC and RIMNET) will run faster and/or can be run with more particles so the output is less noisy.

In addition, precipitation is now interpolated between meteorological model grid points instead of taking the nearest grid point which results in small changes to the amount of wet deposition (it should look a bit smoother). This small change in deposition will also result in an even smaller change in air concentration.

8. Plans for 2013:

- A continuation of the process to upgrade the EMARC computer facilities, including forecaster hardware, helping to improve response time for an event.

- NAME III will continue to be developed. In particular, mean rainfall rates instead of instantaneous rainfall rates will be used to compute the amount of wet deposition.
- Ongoing dedicated training for the forecasting team to ensure that they are able to respond to any ATM requests in a timely and professional manner.
- RSMC Exeter will continue to respond to requests, including the quarterly test in November 2013 (RSMC Exeter and RSMC Toulouse acting as lead on this date) as well as ad-hoc requests from IAEA.
- RSMC Exeter will continue the process to stand up their own “mirrored” web site, enabling ATM modelling products and information from all other RSMCs to be hosted on the Met Office site.