RSMC Exeter report of activities for 2014

Executive Summary

At RSMC Exeter, activities for 2014 revolved mostly around the Regional Specialised Meteorological Centre (RSMC) suite of tests, including the quarterly IAEA-led tests and regular monthly tests (where model data is disseminated to all RSMC mirrored websites). 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 2014. The RSMC Exeter Mirrored web pages, that became operational during the latter part of 2013, continue to function as planned.

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 2014 RSMC Exeter received occasional requests for both real and exercise scenarios from the Provisional Technical Secretariat of the Comprehensive Test Ban Treaty Organisation (CTBTO). These were all responded to within the expected timescale.

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 February 2014. Graphics were posted to the relevant RSMC mirrored websites, as well as to the IAEA and to NMSs within RA I and RA VI

In addition, RSMC Exeter has been regularly 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. This has proved to be an extremely useful test of the system, helping Exeter (and other RSMCs) to identify problems at any early stage and to quickly rectify these.

Anton Muscat (RSMC Exeter) represented WMO (and the wider RSMC community) at a meeting at the IAEA, 19-23 May 2014, in Vienna where he gave an overview of the role of the RSMCs.

In addition, following consultation with Rene Servranchx, Anton Muscat and Cyrille Honour (representing VAAC Toulouse) undertook a series of meetings with Eurocontrol in the Autumn of 2014, including a nuclear accident exercise 18-20 November 2014, where information was passed to aviation users to help with planning around a nuclear accident exercise. The outcome of this exercise was that Eurocontrol would like to define a series of dispersion charts that are relevant to their customers (i.e. aviation). Actions around this are being agreed but the onus will lie with ICAO, and appropriate teams/groups, to define the mandate for RSMCs to provide charts to aviation users. In addition, work needs to be undertaken to understand exactly what is significant, in terms of levels of radiation release, to aviation users.

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

i. All requests for RSMC support during 2014 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.

6. Operational issues and challenges:

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.

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

The Met Office's Numerical Atmospheric-dispersion Modelling Environment, NAME III (v. 6.3 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 2014, the introduction of new computers have allowed RSMC Exeter to increase the number of computer processors and the number of particles used by each RSMC run, resulting in smoother output with no increase in run time.

In addition, the resolution of our global meteorology (used by NAME for RSMC runs) has increased from ~25km to ~17km and the global meteorological model has a new dynamical core called ENDGame. If there is a requirement then a fuller document describing the changes introduced by ENDGame can be supplied to interested parties, although this particular RSMC Report of Activities is not really a suitable vehicle for conveying the information.

8. Plans for 2015:

In 2015 we plan to move to NAME version 6.5 (we are currently using version 6.3 but are jumping version 6.4 due to issues with speed). Features new in 6.5 which are relevant to Emergency Response are:

- Improved advection close to the poles
- Improved representation of mesoscale motions in the atmosphere (the size between the motions resolved by the meteorological models and eddies)
- Improved representation of gaseous and particulate Iodine
- Ability to use UKPP and EuroPP rainfall
- There is also an improved convection scheme which we may turn on for RSMC runs depending on whether this impacts the run time or not.