RSMC Exeter report of activities for 2016

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, e.g. an accident at a Nuclear Power Plant (NPP) 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 2016 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 2016. 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 continues to respond to the monthly tests (initiated by RSMCs Melbourne, Montreal and Washington) by running dispersion models and sending output to 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 any issues.

During December 2016 the IAEA requested assistance from RSMC Exeter (and RSMC Toulouse) for an ad-hoc exercise to assist them with their internal exercise processes. This required the issuance of standard RSMC products as well as a Joint Statement.

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

i. All requests for RSMC support during 2016 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. During the early part of 2016, changes were made to the RSMC Exeter mirrored webpage that provided a link to an “All Products” archive. This allows historical product information to be kept with the mirrored webpage environment and viewed when required.

6. Operational issues and challenges:

There is a continued 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. Additionally, the regular completion of this aspect of the RSMC response has been included in the Performance Review targets of the meteorologists to ensure that they are up to date with the activity.

7. RSMC representation at ad-hoc meetings:

The representative for RSMC Exeter attended two ad-hoc meetings during 2016 on behalf of the World Meteorological Organisation (WMO). The first of these meetings was to attend a WMO workshop on Forecasting Emissions from Vegetation Fires, held in Jakarta, 29 August – 1 September 2016. The role of the representative was mainly to outline the GDPFS process so that attendees were clear about what requirements there would be to allow a centre in Southeast Asia to register as a RSMC for vegetation fires. The second was to attend an IAEA Technical Meeting to Review the IAEA's Assessment and Prognosis Procedures for Nuclear and Radiological Emergencies, this being held in Vienna, 28 November – 2 December 2016.

Additionally, the representative for RSMC Exeter attended the Second Planning Meeting in Budapest, Hungary, 24-25 October 2016 in order to discuss and plan an upcoming Convention Exercise (ConvEx-3) planned for June 2017.

8. Summary and status of operational atmospheric transport and dispersion models

The Met Office's Numerical Atmospheric-dispersion Modelling Environment, NAME III (v. 6.5 is the current version) 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 2016 an upgrade to version 6.5 of NAME was made. The main improvements in NAME 6.5 are to the representation of mesoscale motions (larger than turbulence, but

smaller than the motions which can be represented at the resolution of each meteorological model), the ability to use UKPP and EuroPP precipitation fields with NAME and improved particle trajectories close to the poles.

The option to add the ability to use ECMWF data with NAME was also included in the 6.5 release.

Also included in the 6.5 release were some minor improvements to the RSMC products – the addition of Exercise (or Real) in the titles of the graphics and the increased visibility of the source term symbol, as well as a set of instructions for the “Manually Enter Observations” tab on the CHEMET and PACRAM interfaces.

9. Plans for 2017:

Currently the NAME III dispersion model is run on local (minor) servers (more than one server, in separate IT Halls, for added redundancy) with atmospheric model information being passed to the server.

Utilising the Met Office’s new HPC to its full extent will, during the course of 2017, lead to a finer resolution of global model date (improving from 17km to ~10km) along with other changes. These changes will result in a step change in the amount of atmospheric model data available, making the passing of the model data to an external server problematic.

Therefore, there is an advanced plan to port the NAME III dispersion model to the HPC itself. This is planned to take place in the Spring of 2017. The benefits of this change will include the much earlier availability of atmospheric model data to NAME, by an estimated two hours, ensuring that the most recent driving atmospheric model information is available for the dispersion model.

In the summer of 2017 there is the expectation that the Global Model (which is often used to “drive” NAME for releases outside of the UK) is due to increase resolution from 17km to approx. 10km, allowing for better modelling.

In June 2017, RSMC Exeter and RSMC Toulouse will be the lead RSMCs for a ConvEx-3 NPP accident exercise, based on a theoretical release from Paks NPP, Hungary.