RSMC Melbourne report of activities for 2015

Executive Summary

Primary activities for 2015 were the monthly tests conducted for scenarios over Canada, the United States and Australia and the IAEA quarterly tests for scenarios over the Republic of Korea (February), Australia (May, as Lead Centre), Netherlands (August) and USA (November). The Provisional Technical Secretariat (PTS) of the Comprehensive Test Ban Treaty Organization (CTBTO) made 19 requests for inverse modelling support throughout the year, many of which were associated with their National Data Centre Preparedness Exercise in October/November. RSMC Melbourne also participated in the IAEA Time of Arrival (TOA) intercomparison exercise conducted in June and October.

1. Introduction

The Bureau National Operations Centre (BNOC) of the Australian Bureau of Meteorology is designated by the WMO as the Melbourne Regional Specialized Meteorological Centre (RSMC) with the specialization to provide atmospheric transport model products for environmental emergency response. The region of responsibility is WMO Regional Association (RA) V, which includes the countries: Australia, Brunei Darussalam, Fiji, Indonesia, Malaysia, New Zealand, Papua New Guinea, Philippines and Singapore. RSMCs Washington and Montréal also respond jointly in support of RSMC Melbourne in case of an event in WMO RA-V until a second RSMC can be designated for this region. In addition to emergency response, RSMC Melbourne contributes global inverse modelling support to the CTBTO's verification system.

2. Operational Contact Information

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3. Responses and information on dissemination of products

i. Dissemination of products

Transport model graphical products and joint statements are posted to secure joint web pages, and faxed to relevant RSMCs and NMHSs. For examples of the graphical products, see Annex 4 of **WMO, 2015**.

In addition to the other RSMCs, the following RA-V member countries' NMHSs are in our email and fax lists: Brunei Darussalam, Fiji, Indonesia, Malaysia, New Zealand, Papua New Guinea, Philippines, and Singapore.

ii. Response to requests by CTBTO-PTS

A total of 19 requests for support were received from the Provisional Technical Secretariat of the Comprehensive Test Ban Treaty Organization during 2015, including a test on 3 March 2015 to finalise changes to the CTBTO upload mechanism and 12 requests during October/November 2015 as part of the National Data Centre Preparedness Exercise, NPE15. In all cases, the products were supplied to CTBTO within the allowed time limit.

iii. Time of Arrival Intercomparison Exercise

RSMC Melbourne participated in the IAEA Time of Arrival (TOA) intercomparison exercise conducted on 2 June 2015 and 27 October 2015. Initial results were very zoomed out and difficult to read due to black hatching. The use of solid contour fill was flagged as a problem. The second exercise results were much improved with better hatching but the continued use of solid colour fill in the background remains an issue for faxing and further development is required to replace this with coloured hatching only.

4. Routine operations

Monthly Test:

RSMCs Melbourne, Montréal and Washington generally hold a joint exercise on the second Thursday of every month. In addition, RSMC Melbourne participated in four IAEA-initiated exercises during the year, one in which RSMC Melbourne was lead with support from RSMC Montréal and RSMC Washington. The table below shows the list of tests held in 2015.

Once the model products are posted to the common web pages, an email is sent in English to the relevant RSMCs, the NMHS contact points in WMO RA-V, the IAEA and WMO. The email contains login information to retrieve the RSMC products from the common web pages.

Month	Source location	Initiated by	RSMC providing joint statement
January	Lucas Heights, Australia	Melbourne	Melbourne
February	Wolsong, Republic of Korea	IAEA	Beijing, Tokyo, Obninsk
March	Susquehanna, Pennsylvania, USA	Washington	Montréal
April	Bruce NPP, Ontario, Canada	Montréal	Washington
May	Lucas Heights, Australia	IAEA	Melbourne
June	Dresden NPP, Illinois, USA	Washington	Montréal
July	Lucas Heights, Australia	Melbourne	Melbourne
August	Borssele, Netherlands	IAEA	Exeter, Toulouse
September	Point Lepreau NPP, New Brunswick, Canada	Montréal	Washington
October	Lucas Heights, Australia	Melbourne	Melbourne
November	Nine Mile Point 1 NPP, New York, USA	IAEA	Washington, Montreal
December	Monticello NPP, Minnesota, USA	Washington	Montréal

Table 1: RSMC monthly and quarterly tests for 2015

5. Lessons learned and significant operational or technical changes:

- The routine monthly RSMC tests continue to be invaluable for identifying and rectifying any problems in our scripts or in the uploading of data to the various ftp sites, as well as helping our operational staff maintain familiarity with the procedures for responding to requests for support. The participation of other RSMCs in these exercises is welcomed and encouraged.
- The operational HYSPLIT version was updated to Rev 745 (from 577) in September 2015. Wet deposition parameters were also adjusted to utilise new in-cloud removal mechanism adapted from NAME (Leadbetter et al., 2014, Sportisse 2007) and now uses a scavenging coefficient rather than a ratio. Wet deposition is calculated using the below-cloud parameters if the particle is located below the base of the lowest layer of cloud which exists at the position of the particle.
- Routine generation of plume TOA charts was added to the operational EER suite in August-September 2015. These charts are generated during exercises/incidents but are not yet uploaded to the mirror website or disseminated to users.

6. Operational issues and challenges:

- The length and large number of stations involved in the CTBTO tests in October/November meant that the allowed simulation runtime was exceeded on two occasions and the job failed. This has since been rectified by adding extra time.

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

RSMC Melbourne's operational Environmental Emergency Response (EER) system is currently based on version 4.9 *(revision 745)* of the Hybrid Single-Particle Lagrangian Integrated Trajectories (HYSPLIT) model, developed by Roland Draxler at the NOAA Air Resources Laboratory. HYSPLIT is driven by meteorological input from the various "ACCESS" operational numerical weather prediction systems run in the Bureau of Meteorology. The system is available for running on demand and produces forecast trajectories, concentrations (or exposures) and depositions for nuclear accident, volcanic ash, smoke and other episodes. For most initial responses to requests for nuclear EER products the input to HYSPLIT is provided by the N320L70 (approximately 40km horizontal resolution) global ACCESS-G system.

8. Plans for 2016:

- An upgrade to RSMC Melbourne's global NWP model, ACCESS-G, to version APS2 (N512L70), is scheduled to become operational in early 2016. Horizontal resolution will increase to approximately 25km but the number of vertical levels above the surface remains unchanged at 70. A subsequent increase in the horizontal resolution of the city-based ACCESS-C systems from 0.036° (approximately 4km horizontal resolution) to 0.0135° (approximately 1.5km horizontal resolution) is planned for mid-2016 following porting to a new Cray XC40 supercomputer.
- Further refinement of TOA Charts displays is required prior to inclusion in the suite of operational products.
- Work is underway to create an "All Products" web-link repository of historical EER modelling results on the RSMC Melbourne web server.
- Update HYSPLIT to later release (>779) to take advantage of ongoing developments.

References

Leadbetter, S.J., et al., "Sensitivity of the modelled deposition of Caesium-137 from the Fukushima Dai-ichi nuclear power plant to the wet deposition parameterisation in NAME", Journal of Environmental Radioactivity (2014), http://dx.doi.org/10.1016/j.jenvrad.2014.03.018

Sportisse, B., 2007. "A review of parameterizations for modelling dry deposition and scavenging of radionuclides". Atmospheric Environment 41 (13), 2683-2698, http://dx.doi.org/10.1016/j.atmosenv.2006.11.057

WMO, 2015: Documentation on RSMC Support for Environmental Emergency Response. *WMO-TD/No.778*. Available online at http://www.wmo.int/pages/prog/www/DPFSERA/td778.html