

RSMC Montréal Report of Activities for 2018

Executive Summary

Regional Specialized Meteorological Centre (RSMC) Montreal participated in 13 modelling exercises in 2018, involving hypothetical scenarios run over Canada, the United States, Australia, Indonesia, China, and the Netherlands. RSMC Montréal also responded to 9 requests for backtracking modelling support from the Provisional Technical Secretariat (PTS) of the Comprehensive Test Ban Treaty Organization (CTBTO). Other activities included incremental updates and improvements to the response procedures, software, and to the joint RSMC secure web pages. The latter are the primary means of communicating transport model products to National Meteorological and Hydrological Services (NMHS), and between RSMCs.

1. Introduction

The Canadian Meteorological Centre (Meteorological Service of Canada, Environment and Climate Change Canada) is designated by the World Meteorological Organisation (WMO) as RSMC Montréal for the provision of atmospheric transport modelling (ATM) in support of response to nuclear emergencies. The primary regions of responsibility are WMO Regional Associations (RA) III & IV, which encompass Canada, United-States, Mexico, Central and South America. In addition to emergency response support, RSMC Montréal provides backtracking modelling support to the CTBTO verification system.

2. Operational Contact Information

Canadian Meteorological Centre (CMC)
Environment and Climate Change Canada
2121 Trans-Canada Highway
DORVAL, Québec
Canada H9P 1J3

Business contact: Mr. Nils Ek
Tel : 1 514 421 7207
Fax : 1 514 421 4679
Email : Nils.Ek@canada.ca

Operational contact (24 hours): Shift supervisor
Tel : 1 514 421 4635
Fax : 1 514 412 4639
Email : RSMC.Montreal@ec.gc.ca

3. Responses and information on dissemination of products

i. Production of CTBTO meteorological bulletins

Work continues toward transferring the production of bulletins containing meteorological data from CTBTO atmospheric monitoring stations from the Canadian Meteorological

Centre (CMC) to Zentralanstalt für Meteorologie und Geodynamik (ZAMG) in Austria. These bulletins have been issued by CMC under header SNCN19 CWAO.

In order for these stations to be officially recognized internationally, the WMO requested each member-state that has CTBTO stations on its territory to assign synoptic codes to identify the stations. The transfer of production of bulletins thus requires each CTBTO station to first be assigned a WMO synoptic identifier. Observations from those stations which have a WMO synoptic identifier are now transmitted by ZAMG under header ISAX30 LOWM in BUFR format.

ii. Dissemination of products

Transport model graphical products and joint statements are posted to secure joint web pages. When requested by the International Atomic Energy Agency (IAEA) these products are also faxed to relevant RSMCs and National Meteorological and Hydrological Services (NMHS). For examples of the graphical products, see Annex 4 of WMO (2014). RSMC mirror web pages are monitored using a checklist to ensure consistency and adherence to standards.

The charts of RSMC Montreal's own modelling products that are transmitted to the mirror websites during exercises are archived 3 days after the end of each exercise and replaced on the websites with blank charts.

In addition to the other RSMCs, the following NMHSs are in our email and/or fax lists: Antigua and Barbuda, Argentina, Bahamas, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Guatemala, Guyana, Mexico, Netherlands Antilles and Aruba, Panama, Peru, Suriname, Trinidad and Tobago, Uruguay and Venezuela.

iii. Response to requests from CTBTO-PTS

There were 9 responses to requests from the PTS of the CTBTO in 2018, in January, February, April, May, June, October, November and December.

iv. Other responses

RSMC Montreal participated in a nuclear exercise with Servicio Meteorológico Nacional de Argentina on 27 September 2018.

4. Routine operations

Monthly Test:

RSMCs Montréal, Washington and Melbourne hold a joint test on the third Tuesday of every month. The request to start the exercise is emailed to all RSMCs. RSMC Montréal participated in quarterly tests initiated by the IAEA, which replaced the monthly tests. The following table lists scheduled monthly and quarterly tests in 2018.

Month	Source location	Initiated by	RSMC providing joint statement (Lead)
January	Lucas Heights, Australia	Melbourne	Melbourne
February	RSG-GAS Research Reactor, Indonesia	IAEA	Lead RSMC in WMO RA V (Melbourne)
March	Limerick NPP, PA, USA	Washington	Montréal
April	Darlington NPP, ON, Canada	Montréal	Washington
May	Honyanhe NPP, China	IAEA	Lead RSMCs in WMO RA II
June	Lucas Heights, Australia	Melbourne	Melbourne
July	Shearon Harris NPP, NC, USA	Washington	Montréal
August	Atucha-1 NPP, Argentina	IAEA	Lead RSMCs in WMO RA III and IV
September	Point Lepreau NPP, NB, Canada	Montréal	Washington
October	Lucas Heights, Australia	Melbourne	Melbourne
November	Borssele, Netherlands	IAEA	Lead RSMCs in WMO RA I and VI
December	Davis-Besse NPP, OH, USA	Washington	Montréal

Special exercises:

Date	Source location	Initiated by	RSMC
Sept. 27	Embalse NPP, Argentina	NMHS Argentina	Montreal

5. Lessons learned and significant operational or technical changes:

During 2018 there were no major operational or technical changes. Normal maintenance of the informatics system supporting the dispersion model production continued.

6. Operational issues and challenges:

Email is the preferred method of communications, and RSMC Montreal will only fax products to NMHSs in RA III and IV if requested. Faxes continue to be received at RSMC Montreal.

7. Other activities:

RSMC Montreal participated actively in the CBS ET-ERA meeting of 1-5 October 2018 in

Vienna, represented by Ms Biljana Bekcic. Submissions were made in support of the application for designation as a non-nuclear RSMC.

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

Current global weather conditions and forecasts are available at CMC at all times, to provide, in real time, the necessary input to the atmospheric transport model, and to assist in evaluation and interpretation of the transport model outputs.

For forecasts and analyses, CMC uses the Canadian Global Environmental Multiscale (GEM) numerical weather prediction (NWP) model. Three configurations of GEM are available: global, regional, and high resolution. The data assimilation cycle is based upon an Ensemble Kalman filter running the global GEM, which provides global analyses and medium term forecast guidance at 25 km horizontal resolution. The grid spacing of the regional configuration is approximately 10 km covering North America. High-resolution configurations of the GEM model operate at grid spacing of 2.5 km and cover all areas of Canada.

i. The dispersion model MLDP (Modèle Lagrangien de Dispersion de Particules)

This is a Lagrangian particle dispersion model designed for dispersion problems occurring at regional and global scales, described in detail in D'Amours et al. (2015).

MLDP is executed off-line and requires pre-calculated meteorological fields (3D wind, moisture, temperature and geopotential heights) from an NWP system. At RSMC Montréal these fields are obtained from the GEM model forecast and analysis system, at global, regional, or local-scale resolution. MLDP can be run using forecasts and/or analyses of the meteorological fields, which enable it to be run over any period in the past or future for which the fields are available.

The source term is input by means of an emission scenario module that enables the user to specify different release rates for one or more periods of emission. In addition to modelling of radionuclides from a long list of isotopes, MLDP is used model transport and dispersion of inert tracers as well as volcanic ash (D'Amours et al, 2010).

MLDP runs on a global grid, or, for smaller areas, on a polar stereographic horizontal grid, in either hemisphere. The modeller may define the grid size and resolution needed for a particular simulation. There are also a set of pre-defined grids, from which the user can select the appropriate configuration for rapid operational use.

MLDP can be run backward in time from receptor data. This configuration is used for responding to modelling requests from the CTBTO-PTS.

ii. Trajectory model

This model uses winds directly from the GEM model's analyses and/or forecasts. The wind fields are available every hour. Initial positions are specified of one or more air parcels in a vertical profile, and the parcels are then advected or displaced incrementally, using time and spatial discretizations of the three-dimensional wind field. It is assumed that air parcels preserve

their identity as they are transported in the wind.

The model has been validated using back-trajectories from stations that measured concentrations of tracers originating from a single source (D'Amours 1998). The back-trajectories converge remarkably well towards the tracer source location. On the other hand, the lack of a boundary layer treatment and the assumption of air parcel identity preservation are reflected in the results, which result in vertical motions that are not in line with the observations.

9. Plans for 2019-2020:

RSMC Montreal is prepared to provide modelling guidance in support of response to requests in the event of nuclear emergencies.

The schedule of routine monthly tests for all of 2019 has been set up in collaboration with RSMCs Washington and Melbourne. Each RSMC will select the simulated accident location and write the joint statement, on a rotating basis. The tests include the quarterly tests scheduled by the IAEA. Tests are set for the third Tuesday of each month.

References

- D'Amours, R., 1998: Modelling the ETEX plume dispersion with the Canadian Emergency Response Model, *Atmospheric Environment*, **32**, 4335-4331
- D'Amours, R., A. Malo, R. Servranckx, D. Bensimon, S. Trudel, and J.P. Gauthier-Bilodeau (2010), Application of the atmospheric Lagrangian particle dispersion model MLDP0 to the 2008 eruptions of Okmok and Kasatochi volcanoes, *J. Geophys. Res.*, 115, D00L11, [doi:10.1029/2009JD013602](https://doi.org/10.1029/2009JD013602).
- D'Amours, R., Malo, A., Flesch, T., Wilson, J., Gauthier J.-P., Servranckx, R. (2015). [The Canadian Meteorological Centre's Atmospheric Transport and Dispersion Modelling Suite](#), *Atmosphere-Ocean*, **53** (2), 176–199, [doi:10.1080/07055900.2014.1000260](https://doi.org/10.1080/07055900.2014.1000260)
- WMO, 2014: Documentation on RSMC Support for Environmental Emergency Response. *WMO-TD/No.778*, <http://www.wmo.int/pages/prog/www/DPFSERA/td778.html>