RSMC Vienna report of activities for 2017

Executive Summary

Primary activities for 2017 consisted in processing several operational backtracking calculations on request of the Provisional Technical Secretariat (PTS) of the Comprehensive Test Ban Treaty Organization (CTBTO) for level-5 events. The PTS made 3 request for inverse modelling support in 2017.

In June 2017 RSMC Vienna participated in a major nuclear accident exercise (ConvEx-3) conducted by the International Atomic Energy Agency (IAEA). The exercise was based on a theoretical accident at the Paks nuclear power plant (NPP) in Hungary using real weather conditions. RSMC Vienna delivered standard RSMC products and additionally the new Time of Arrival (ToA) product to all RSMCs and IAEA.

During the occurrence of Ruthenium-106 measurement all across Europe in autumn 2017, RSMC Vienna was asked by the IAEA Incident and Emergency Centre (IEC) for support in identifying a possible source region and the provision of an approximate magnitude range for the release of this event.

1. Introduction

The Zentralanstalt für Meteorologie und Geodynamik (ZAMG) is designated by the World Meteorological Organisation (WMO) as Regional Specialized Meteorological Centre (RSMC) Vienna (backtracking only) since July 1st, 2011 and supports the CTBTO verification system with inverse atmospheric modelling activities on a global scale.

2. Operational Contact Information

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3. Responses and information on dissemination of products

a. Responses to requests from CTBTO-PTS

A total of 3 requests for support were received from the Provisional Technical Secretariat (PTS) of the Comprehensive Test Ban Treaty Organization (CTBTO) in 2017: on February 20th, October 4th and October 23rd. In all cases, the products were supplied to CTBTO within the allowed time limit.

b. Other responses

In June 2017 RSMC Vienna participated in the major nuclear accident exercise ConvEx-3 2017. The exercise was based on a theoretical accident at the Paks NPP in Hungary using real weather conditions. During this exercise RSMC Vienna received a total of 3 requests to provide dispersion modelling of the release. Standard products (trajectories, exposures and depositions) as well as a new product – the Time of Arrival (ToA) – chart were shared amongst all RSMCs and IAEA. Following the exercise, RSMC Tokyo conducted a review of the Time of Arrival charts from all RSMCs and RSMC Exeter generated a detailed evaluation report of the ConvEx-3 2017 exercise.

At the end of September/beginning of October exceptional Ruthenium-106 levels were measured all across Europe with a maximum of 145 mBq/m³ as found in a Rumanian daily sample. Due to the specific isotope encountered in samples from the International Monitoring System (IMS) stations of the Comprehensive Nuclear Test-Ban Treaty Organization (CTBTO) as well as in samples from national European stations reported to the International Atomic Energy Agency (IAEA) it became immediately clear that neither an accident in a nuclear power plant nor a test of a nuclear weapon could have caused the increased levels of radioactivity. RSMC Vienna was asked for support by IAEA IEC in identifying a specific region as possible source and the provision of an approximate magnitude range for the original release of this event. Indeed, the Ruthenium-106 plume could be traced back to the Southern Ural, where the medical isotope processing facility Dimitrowgrad as well as the nuclear waste reprocessing plant of Majak are known to be located. This was achieved by combing backward fields of the dispersion model and corresponding samples in a so called “Probable Source Region” (PSR) approach. In accordance with other European institutes (like the Federal German and French radiation protection agencies BfS and IRSN) RSMC Vienna also assessed the probable release time as around September 25th and the source strength as 1E15 Bq (i.e., 1 Petabequerel), thus indicating a major nuclear accident.

4. Routine operations

RSMC Vienna (backtracking only) does not participate in exercises and tests designed for emergency response activities in forward mode.

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

The ConvEx-3 2017 allowed RSMC Vienna to proof its ability to perform dispersion calculations and generate RSMC standard products, including the new Time of Arrival chart, in an operational mode. The comparison of the ToA product, which was gratefully conducted by RSMC Tokyo, indicated some potential for further optimization.

6. Operational issues and challenges:

None

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

RSMC Vienna (backtracking only) participates in the CTBTO-WMO Backtracking Response System since its entry into operations in 2008. For backtracking the Lagrangian Particle Dispersion Model FLEXPART Version 6.2 is used. The system is driven by meteorological input data from the European Centre for Medium-Range Weather Forecasts (ECMWF) with 1° horizontal resolution and a temporal resolution of 3 hours. In 2014, the dispersion modelling software has been completely re-written in Python and was ported to the ZAMG computer system running operationally on two fully redundant machines, which are connected to uninterruptible power supplies (UPS) and an emergency power generator. The system has been designed to work fully automated. Each step – from receiving and decoding the request to the uploading of the results to the CTBTO server via a secured internet connection – is controlled by a daemon service, written in Python.

8. Plans for 2018:

Due to the end-of-life of the operational computer system, which hosts the backtracking system, a re-design and a re-coding of the response system will occur in the 1st quarter of 2018.