

Summary of RSMC Obninsk Activities for 2023

Executive Summary

The activities of RSMC Obninsk in 2023 were related to the complex of events of the Regional Specialized Meteorological Center (RSMC), including:

- 1) Quarterly exercises led by the IAEA and WMO;
- 2) Monthly Test with RSMCs Montréal, Washington and Melbourne;
- 3) Participation in international inverse dispersion modelling events and exercises with CTBTO;
- 4) ConvEx exercises (under the emergency convention – EMERCON);
- 5) Work on the official Web Portals Unified System for Information Exchange in Incidents and Emergencies of IAEA – «USIE» and «USIE Exercises»;
- 6) Interaction with National Warning Point (NWP) and National Competent Authority for Domestic Emergencies (NCA-D).
- 7) Participation of RSMC Obninsk specialists and experts in scientific and practical conferences.

During 2023 RSMC Obninsk regularly interacted with all members of the Expert Team on Emergency Response Activities (ET-ERA).

RSMC Obninsk didn't receive any emergency requests in 2023.

This document summarizes all the RSMC Obninsk activities and changes in 2023.

Detailed and current information about RSMC Obninsk (as well as its model of atmospheric transport) is available on the official website WMO in section Technical Document No. 778 (Annex 4)

The RSMC Obninsk report of activities is available on the WMO website:

<https://community.wmo.int/activities-resources-and-tools>

1. Introduction

RSMC Obninsk has been functioning since 1995 on a base of Federal Environmental Emergency Response Centre of Roshydromet (FEERC of Roshydromet) which is a part of "Research and Production Association "Typhoon" ("RPA "Typhoon", Obninsk).

The region of responsibility is WMO Regional Association (RA II), which encompasses Asia, jointly with RSMC Tokyo and RSMC Beijing. RSMC Obninsk performs a function of leading RSMC once every three years (according to the Memorandum concluded among RSMC Obninsk, RSMC Tokyo and RSMC Beijing).

RSMC Obninsk is a regional specialized center of the World Meteorological Organization with specialization in the provision of atmospheric transport model products.

RSMC Obninsk operates on 24/7 basis.

In addition to emergency response, RSMC Obninsk contributes to the global CTBTO inverse modeling support.

2. Operational Contact Information

The table below shows all the operational contact information of RSMC Obninsk

	Business Contact	Operational Contact (24 hours)
<i>Address</i>	Federal State Budgetary Institution Research and Production Association «Typhoon» («RPA «Typhoon») Federal Environmental Emergency Response Centre of Roshydromet (FEERC of Roshydromet) 4 Pobedy Street 249038 Obninsk Kaluga Region Russian Federation	
<i>Phone</i>	+7 4843997003 ext. 1808	+7 4843997003 ext. 1881 +7 4843944950
<i>Fax</i>	+7 4843940910	+7 4843940704, +7 4843997003 ext. 1925
<i>Email</i>	mukhalyov@feerc.ru	rsmc@feerc.ru
<i>The contact person</i>	Dr. Victor Mukhalyov Head of RSMC Obninsk	Duty Officer

3. Responses and information on dissemination of products (participation in international inverse dispersion modeling events and exercises with CTBTO)

During 2023, RSMC Obninsk received requests for support from Provisional Technical Secretariat of the Comprehensive Test Ban Treaty Organization (CTBTO), both real and exercise scenarios. In all cases the products were supplied to CTBTO within the time period specified in the request.

The head of RSMC Obninsk took part in Science and Technology Conference 2023 (SnT2023) online, which took place from 19 to 23 June 2023 (Hofburg Palace in Vienna, Austria).

In response to a request, sensitivity fields are calculated (SRS - Source-Receptor Sensitivity fields), by implementing a reverse calculation on the time to the date required in the request.

The results obtained are stored in files of consistent formats and uploaded to the CTBTO server as archives.

The calculated sensitivity fields are stored and used in the International Data Center CTBTO.

In total, RSMC Obninsk received 4 requests in 2023:

- 1 quarter – 1 requests (7 calculations);
- 2 quarter – 3 requests (21 calculations);
- 3 quarter – 0 requests (0 calculations);
- 4 quarter – 0 requests (0 calculations).

4. Routine operations

RSMC Obninsk experts took part in scientific and practical conferences.

4.1 Testing and exercises

RSMC Obninsk participated in quarterly IAEA and WMO exercises in 2023:

- 21.02.2023 (WMO Regions «South America» (III) and «North America, Central America and The Caribbean» (IV)). A contingent accident occurred at a nuclear facility in Canada. All calculations were performed on time. No proposals from RSMC Obninsk were submitted to the Joint Statement on WMO Regions III and IV. *Source location: PICKERING-1 NPP, Canada;*
- 16.05.2023 (WMO Region «South-West Pacific» (V)). A contingent accident occurred at a nuclear facility in Australia. All calculations were performed on time. No proposals from RSMC Obninsk were submitted to the Joint Statement on WMO Region V. *Source location: OPAL research reactor, Australia;*
- 15.08.2023 (WMO Regions «Africa» (I) and «Europe» (VI)). A contingent accident occurred at a nuclear facility in Austria. All calculations were performed on time. No proposals from RSMC Obninsk were submitted to the Joint Statement on WMO Regions I and VI. *Source location: Zwentendorf NPP, Austria;*
- 21.11.2023 (RA II). (WMO Region «Asia» (II)). A contingent accident occurred at a nuclear facility in South Korea. All calculations were performed on time. The discussion of the joint statement was held during the exercise among RSMC Obninsk, Beijing and Tokyo. During testing of the RSMC, Obninsk, together with RSMC Tokyo and RSMC Beijing formed a draft joint statement. RSMC Beijing, as the RSMC leader (in RA II), sent the final version of the joint statement to all participants in the exercise and published this document on mirror websites. *Source location: Hanbit NPP, South Korea;*

and in Monthly Tests with RSMCs Montréal, Washington and Melbourne: 17.01.2023 (*Source location: : Nine Mile Point, USA*), 21.03.2023 (*Source location: Bruce NPP, Canada*), 18.04.2023 (*Source location: Lucas Heights, Australia*), 20.06.2023 (*Source location: Point Beach, USA*), 18.07.2023 (*Source location: Point Lepreau NPP, Canada*), 19.09.2023 (*Source location: Lucas Heights, Australia*), 17.10.2023 (*Source location: Columbia, USA*), 19.12.2023 (*Source location: Pickering Nuclear Generating Station, Canada*).

The graphical products of the transport model were published on the web pages of all the RSMC following the results of each test. After the completion of the exercise, RSMC Obninsk conducted a control test of its products' availability on all the RSMC web pages.

All the RSMC Obninsk products were promptly posted to the mirror sites:

RSMC Beijing	http://rsmc.nmc.cn/rsmc-bin/jntrsmc.pl
RSMC Exeter	https://rsmc.metoffice.gov.uk/cgi-bin/jntrsmc.pl
RSMC Melbourne	http://reg.bom.gov.au/cgi-bin/reg/EER/jntrsmc.pl
RSMC Montreal	https://eer.cmc.ec.gc.ca/eer-bin/jntrsmc.pl
RSMC Obninsk	https://www.feerc.ru/rsmc-bin/jntrsmc.pl
RSMC Offenbach	https://rsmc.dwd.de/rsmc-bin/jntrsmc.pl
RSMC Tokyo	http://eer.kishou.go.jp/cgi-bin/jntrsmc.pl
RSMC Toulouse	http://www.meteo.fr/cmrs/rsmc2-bin/jntrsmc.pl
RSMC Vienna	https://rsmc.zamg.ac.at/rsmc-bin/jntrsmc.pl
RSMC Washington	https://www.ready.noaa.gov/rsmc2-bin/jntrsmc.pl

In 2023, RSMC Obninsk also participated in all communication tests and exercises under the Convention:

- ConvEx-1a (March). *Tests that NWP's are continuously available for receiving notifications and that CA(A)s are available for receiving notifications.*
- ConvEx-1b (August). *Tests that NWP's are continuously available and that CA(A)s can promptly respond to notifications received.*
- ConvEx-2a (June). *Tests the abilities of CAs and INES National Officers to complete the appropriate reporting forms and the abilities of IRMIS Data Providers to upload monitoring data.*
- ConvEx-2b (September). *Tests the arrangements for a request for assistance and the provision of assistance..*
- ConvEx-2c (October). *Tests the arrangements for responding to a transnational nuclear or radiological emergency.*

4.2 Related matters

During 2023, RSMC Obninsk associated its activities with:

- Interacted with the leaders of other RSMCs on the scientific and technical development of ET-ERA.
- RSMC Obninsk experts studying the functionality of the web portal for the Global Data-processing and Forecasting System.
- Constant interaction with ET-ERA members on solving tasks, formed as a result of the meeting of the CBS expert team ET-ERA in 2018.
- Permanent support of the RSMC Obninsk mirror website.
- Preparation of scientific and operational materials on the development of radiation monitoring in the western regions of the Russian Federation.
- Working with portals "USIE Exercises" during quarterly exercises and "USIE" during daily activities.

- Regular interaction with NWP and NCA-D of Russian Federation. Collaboration concerned emergency response, joint participation in international events and other issues.

5. Tests of communications (Email and fax tests)

RSMC Obninsk participated in all the communication tests in 2023 in RA II (Asia). These events are held in accordance with Annex 3 «Memorandum of the RSMCs for EER in RAI».

5.1 Communication test in April

RSMC Obninsk took part in a Communication test conducted by RSMC Beijing in April 2023. RSMC Obninsk sent prompt answers to all requests from Chinese colleagues. All operational and diplomatic channels have been verified. Final results received from RSMC Beijing April 14.

5.2 Communication test in July

RSMC Obninsk conducted a Communication test in the Asian region among 29 countries in July 2023. The requests were sent to all the NMHSs by fax and e-mail in order to verify the work of communication channels and the relevance of contact information.

The test results show:

- *The contact information updated in 4 countries – 14 % of the total (Macao, Bahrain, Turkmenistan, Hong Kong);*
- The e-mail requests (for diplomatic channels) were successful in 25 countries – 86 % of the total. Email requests failed in 4 countries - 14 % of the total (Socialist Republic of Vietnam, Oman, Republic of Uzbekistan, State of Kuwait)
- The e-mail requests (for operative channels) were successful in 26 countries – 90 % of the total. Email requests failed in 3 countries - 10 % of the total (Bahrain, Republic of Uzbekistan, State of Kuwait);
- *In total, 69 addresses were checked by email, of which 61 were confirmed as functioning (88% of the total).*
- The fax requests (for diplomatic channels) were successful in 4 countries – 14 % of the total (Macao, Myanmar, Pakistan, Republic of Uzbekistan, Russian Federation). Fax requests failed in 25 countries - 86 % of the total;
- The fax requests (for operative channels) were successful in 3 countries – 10 % of the total (Macao, Pakistan, Russian Federation). Fax requests (for operational channels) were not fulfilled in 5 countries (Socialist Republic of Vietnam, Kazakhstan, State of Qatar, Pakistan, Iraq, Democratic People's Republic of Korea) - 17 % of the total, due to their absence;
- *In total, 66 numbers were checked by fax, of which 14 were confirmed as functioning (21% of the total).*
- *All the communication channels (operative and diplomatic) were available in 26 countries – 90 % of the total. Only diplomatic channels were available in 3 countries - 10 % of the total (Democratic People's Republic of Korea, State of Qatar, Socialist Republic of Viet Nam).*

- *All channels (e-mail and fax) were available in 4 countries – 14 % of the total (Macao, Kazakhstan, Pakistan, Russian Federation). All types (fax and email) of communication channels (operational and diplomatic) are available in 27 countries – 93 % of the total.*

All the diplomatic and operative communication channels were checked during the test by RSMC Obninsk.

The results of the test were sent to IAEA, WMO and the colleagues in RSMC Tokyo and RSMC Beijing on July 31st.

5.3 Communication test in November

RSMC Obninsk took part in a Communication test conducted by RSMC Tokyo in November 2023. RSMC Obninsk sent prompt answers to all requests from Japanese colleagues. All operational and diplomatic channels have been verified. Final results received from RSMC Tokyo December 01.

6. Lessons learned from recent experiences and significant operational and technical changes

All the requests, received in 2023, were processed within the allowed time limit.

The following requests were received during the reporting period:

- 5 requests with confirmation of the availability of operational channels and means of communication of RSMC Obninsk (2 received by fax, 3 received by email);
- 15 training requests for the provision of conditional assistance with the provision of products of atmospheric transport models (with a conditional release of pollutants into the atmosphere);
- 4 requests (28 calculations) from CTBTO in March, April, May and June.

The interaction with the representatives of the WMO, CTBTO and IAEA during 2023 took place online. All channels were used for communication.

Most of the failures were caused by technical errors in fax and e-mail transmissions, as well as changes in the contact information of NMHSs in the Asian region. Information is fully reflected in the results of communication tests.

During 2023, experts from RSMC Obninsk regularly took part in virtual events (webinars, seminars, etc.) of the IAEA and WMO. For example, in The briefing session on RSMC compliance review process on 8 June 2023 (online format).

The monitoring of software and hardware condition and functioning, as well as prompt troubleshooting was carried out by RSMC Obninsk during 2023. These included: working with certificates for data exchange via the SSH protocol, working on the server equipment of the center for transfer via the FTP protocol, adjusting IP addresses for data transfer to the CTBTO, updating the mirror site of the center. The software updated in 2023 was also used to perform calculations (during several exercises).

7. Operational issues and challenges

The interaction of all regional specialized meteorological centers during the reporting period was high-quality and well-coordinated. Any issues that arose were resolved promptly. All discussions took place online.

The head of RSMC Obninsk took part (presented the report " Status of operational implementation activities of RSMC Obninsk") in the "Meeting of the CBS Expert Group on Emergency Response Activities (ET-ERA)", which was held in Vienna from October 16 to 19, 2023.

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

At present, the following models of regional and global atmospheric transport are used:

- The trajectory model generates a map with a set of 3-D trajectories of air masses starting at specified heights above ground level.
- The STADIUM (STochastic Atmospheric Diffusion Model) is used for modeling atmospheric transport and dispersion of pollutants (radioactive or chemical) over medium and long ranges of distances. The STADIUM is based on Lagrangian approach with turbulent dispersion simulated by random walk technique (Monte-Carlo method). Such an approach allows applying modern parameterizations for turbulent dispersion and deposition processes. Deposition including both wet and dry deposition is computed using a deposition velocity for the dry component of the removal process and in-cloud and below-cloud removal rates for the wet deposition. The model allows considering the essential features associated with instability and non-uniformity of the atmospheric boundary layer, spatial heterogeneity of the underlying surface.

The STADIUM provides a set of spatial-temporal fields of air concentration and deposition (dry and wet) of pollutants as well as information on the arrival time of the radioactive cloud.

A standard RSMC product represents a set of seven forms:

- The forward trajectories of pollutants at various levels for 72 hours from the emission moment (forecast air parcel trajectories starting at 500, 1500 and 3000 meters above model ground level on a map; trajectories are labeled every 6 hours by a filled symbol; the vertical projection of the trajectories with time is shown in the panel below the map);
- The time integrated ground concentration of the pollutants 24, 48 and 72 hours after the emission moment (shows the average daily concentration (exposure) from the surface 500 m before the start of the ejection to the nearest even 12-hour synoptic period, which leads to a temporary integration exceeding 12 hours). The maximum value is also indicated on the calculation form;

- Deposition of pollutants after the release (shows the total (wet and dry) deposition from the start of the release to + 24 hours, + 48 hours and + 72 hours). The maximum value is also indicated on the calculation form.
- Plume arrival time (shows the arrival time of the radioactive plume for +6h, +12h, +18h and +24h).

9. Plans for 2024

RSMC Obninsk will continue to work with all RSMCs, all members of ET-ERA and National Warning Point during training, emergencies and daily activities through established communication channels: fax, e-mail, telephone, SSH and FTP (in case of publication of information on the RSMC web pages).

In 2024, RSMC Obninsk plans to update part of the software package for calculations (a hardware and software package for solving problems of operational analysis and forecasting the distribution of pollutants in the environment).

RSMC Obninsk intends to participate in exercises held under the Convention (type of exercise ConvEx), communication tests, Monthly Tests, as well as in quarterly exercises with WMO, IAEA and CTBTO.

Improving the quality of communications with WMO, IAEA and NMHSs in RA II is also a goal.

References:

- Manual on the Global Data-processing and Forecasting System (WMO-No. 485)
- Documentation On RSMC Support For Environmental Emergency Support (WMO-TD/No.778). Available online at <https://community.wmo.int/technical-document-no-778-documentation-rsmc-support-environmental-emergency-response-targeted-meteorologists-nmss>
- MEETING OF THE CBS EXPERT TEAM ON EMERGENCY RESPONSE ACTIVITIES (ET-ERA) Buenos Aires, Argentina, 30 November to 4 December 2015
- MEETING OF THE CBS EXPERT TEAM ON EMERGENCY RESPONSE ACTIVITIES (ET-ERA) Vienna, Austria, 01-05 October 2018
- «Agreement between the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization and the World Meteorological Organization»
- A.I. Burkov, V.N. Mukhalyov, E.S. Prudnikova «Hydrometeorological aspects in ensuring nuclear energy safety», Abstracts of reports. VI International (XIX Regional) scientific conference "Technogenic systems and environmental risk". Obninsk: IATE MEPhI, 20-21 April 2023, p.121-123.
- V.N. Mukhalyov, L.M. Khachaturova, E.S. Prudnikova, «ACTIVITIES OF FEDERAL ENVIRONMENTAL EMERGENCY RESPONSE CENTRE OF ROSHYDROMET IN INTERNATIONAL EXERCISES CONVEX-3», Hydrometeorology and education №4 2022
- Joint Radiation Emergency Management Plan of the International Organizations (EPR-JPLAN), IAEA 01 March 2017

- Operations Manual for Incident and Emergency Communication (EPR–IEComm), IAEA 20 February 2020
- Operations Manual for IAEA Assessment and Prognosis during a Nuclear or Radiological Emergency (EPR–A&P), IAEA 20 February 2020