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PROCEEDINGS

**FIRST INTERNATIONAL WORKSHOP ON USERS'
REQUIREMENTS FOR THE PROVISION OF
ATMOSPHERIC TRANSPORT MODEL PRODUCTS
FOR ENVIRONMENTAL EMERGENCY RESPONSE**

**MONTRÉAL, QUÉBEC, CANADA
14-17 SEPTEMBER 1993**

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THE PROVISION OF ATMOSPHERIC TRANSPORT MODEL PRODUCTS
FOR ENVIRONMENTAL EMERGENCY RESPONSE, MONTRÉAL, QUÉBEC,
CANADA, 14-17 SEPTEMBER 1993

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Overview

The First International Workshop on Users' Requirements for the Provision of Atmospheric Transport Model Products for Environmental Emergency Response was held in Montréal, Québec, Canada, from 14 to 17 September 1993. The meeting was opened jointly by Hubert Allard, Director General of the Canadian Meteorological Centre (CMC) of the Department of Environment on behalf of the Government of Canada, and by Dieter Schiessl, Director of Basic Systems of the World Meteorological Organization (WMO).

In addition to the WMO, the workshop was attended by representatives of all four Regional Specialized Meteorological Centres (RSMCs), namely from Canada, France, United Kingdom and the United States of America. The event was also attended by international agencies, including the International Atomic Energy Agency (IAEA), the African Centre of Meteorological Applications for Development (ACMAD) and the International Civil Aviation Organization (ICAO), as well as by representatives of GDPS centres and the user community from various countries, namely: Argentina, Australia, Canada, China, France, Germany, Japan, Russia, Sweden and USA.

The workshop was organized into three different themes, each one forming a briefing session:

- . RSMC Capabilities
- . RSMC and Agency Arrangements
- . Users' Requirements

A list of attendees and abstracts of formal papers presented at the workshop can be found in Annexes I and II.

In broad terms, the workshop targeted on understanding users' requirements, the operational and modelling capabilities of the RSMCs, the specific needs of countries which require such services, and the operational arrangements required. More specifically, it was designed to provide a platform for discussion with a view to develop and implement a global/regional system for the RSMCs to provide assistance related to requests for operational support to environmental emergencies. This was achieved through the exchange of information, knowledge and practical experience. During the four days, 20 presentations were delivered. Separate working groups were convened to address issues and to propose and review draft recommendations.

In regard to the dispersion of volcanic ash, the workshop was informed of the aeronautical requirement for certain regional meteorological centres to introduce volcanic ash monitoring and trajectory forecasting as part of their responsibilities. It was noted that these centres will be designated by regional air navigation agreement and that the necessary international arrangements are being coordinated between WMO Commission for Aeronautical Meteorology and ICAO.

The meeting was informed of the arrangements now in place to meet these requirements over the area to the near North of Australia and welcomed the nomination of the ICAO designation of responsible centres.

Highlights

The discussions covered the following main points:

- . regional and global response arrangements in light of the designation of four RSMCs since the time of the adoption of global interim arrangements;
- . the standardization of the products and services among RSMCs according to specific user requirements;
- . the capabilities and the role of RSMCs in the provision of atmospheric transport model products for environmental emergency response. More specifically, presentations focussed on exchanging information on the scientific content of models, the possible output products and discussing procedure for requesting and providing RSMC services;
- . the need for global coverage of meteorological data to run the models. The need for event-related data in order to improve model simulations.

Recommendations to the WMO

It is recommended:

1. that the National Meteorological Service (NMS) of each country be recognized as responsible for providing emergency response services to the appropriate authorities within their country, with the support of RSMCs; that the ultimate responsibility for the provision of emergency meteorological services rests with the NMSs and that the RSMCs provide guidance to NMS for this purpose;
2. that the WMO, in consultation with the IAEA, approve new Regional and Global Arrangements (Attachment 1) in replacement of the current Interim Arrangements;
3. that WMO recognize that RSMCs with this specialization depend critically on the availability of, and free and direct access to, up-to-the-minute global coverage weather data in order to meet their commitment to provide operational emergency support to Member states and international organizations; this is an important consideration in the current discussions with respect to the commercialization of global weather data;
4. that a study be conducted by WMO on the best approach to transmit the specialized products, described in the standards document (Attachment 2), to a large number of users, in consultation with the designated RSMCs.
5. that the WMO, in consultation with the IAEA and other international organizations, identify mechanisms by which event related data, useful for improving model simulations, can be made available to the RSMCs during and after emergencies. Such data include, for example, actual accident information scenario and radiological monitoring data;
6. that the WMO review progress and status of "RSMCs and users' requirements" in 1995, and then consider the need to hold a second international workshop.

Actions

1. The DESIGNATED RSMCs will develop and maintain user interpretation guidelines on the atmospheric transport models and distribute it to the delegated authorities, IAEA, and WMO.
2. The DESIGNATED RSMCs will coordinate among themselves periodic tests and comparisons of the models and operational systems.
3. The IAEA will provide to the RSMCs up-to-date lists of the location, type and power of all nuclear facilities in the world, and other pertinent documents.
4. The WMO and IAEA will jointly coordinate a wider review within the user community and meteorological centres of the "Standards in the Provision of International Services by RSMCs for Radiological Environmental Emergency Response" (Attachment 2), approved at this Workshop.
5. The DESIGNATED RSMCs will undertake the actions included in the "Standards in the Provision of International Services by RSMCs for Radiological Environmental Emergency Response", approved at the Workshop.
6. The WMO, in collaboration with IAEA, should coordinate the development of appropriate training programs.
7. The WMO, in consultation with users, will develop the necessary procedures for the most effective transmission of emergency response products employing systems managed by WMO Members.
8. The WMO Secretariat will contact the Permanent Representatives to obtain nomination of the delegated authorities and provide the list of delegated authorities to the RSMCs.

17 September 1993
Montréal, Canada

ATTACHMENT 1

REGIONAL AND GLOBAL ARRANGEMENTS

Regional Arrangements

The RSMCs designated by WMO for the provision of atmospheric transport model products for environmental emergency response shall:

1. provide services to requesting delegated authorities of countries within that Region and IAEA (for radiological emergencies); the delegated authority will be named by each country through the PR of the country with the WMO;
2. upon reception of a request from the delegated authority of any country, provide basic information to the national meteorological service of that country. This information will consist of an agreed set of basic products;
3. upon reception of a first request related to an event, inform WMO and all designated RSMCs of the request;
4. upon reception of a request related to a nuclear incident, inform IAEA of such request if the event has not yet been confirmed by IAEA;
5. after confirmation of a significant event (by IAEA for radiological events and through other means for other emergencies), distribute basic information to all national meteorological services in the Region;
6. for radiological emergencies, provide on request support and advice to IAEA and WMO Secretariats in the preparation of public and media statements;
7. determine the standard set of basic products and the method of delivery in consultation with users and the IAEA for radiological emergencies;

8. provide product interpretation guidelines to users;
9. provide support and technology transfer to national and regional meteorological centres that want to become designated RSMCs.

Global Arrangements

Until such time as new RSMCs have been designated, it is proposed that RA VI designated RSMCs be responsible to provide services to RAs I and II; while RA IV designated RSMCs be responsible to provide services to RA III and V. IAEA will be consulted regarding these new arrangements.

In cases of radiological emergencies where coordination is required between RSMCs of different regions, the RSMCs of the region where the emergency has occurred will provide this coordination.

17 September 1993



ATTACHMENT 2

STANDARDS IN THE PROVISION OF INTERNATIONAL SERVICES BY
RSMCS FOR RADIOLOGICAL ENVIRONMENTAL EMERGENCY RESPONSE

The workshop recognized the need for a standardization of procedures and products and agreed

- to adopt the following common default source parameters for the initial run of the transport/dispersion models;
- to provide the following standard set of basic products according to common rules;
- to ask the WMO Commission for Basic Systems (CBS) to study through its specialized working group the possibility of using the existing codes to transmit the specialized products in an appropriate format;
- to ask the four designated RSMCs to implement these standards as soon as possible.

1. Default source parameters for the initial run¹

- Uniform vertical distribution up to 500 m above the ground;
- uniform emission rate during 6 hours;
- total pollutant release 1 unit (arbitrary);
- type of radionuclide CS 137

¹This concept is based on the understanding that the first (initial) run of the transport/dispersion models needs to be carried out with default parameters because little or no information (except location and accident time) will be available to the RSMC at this early stage. RSMCs are, however, requested to prepare the following model runs with more realistic parameters as they become available. This may, for example, refer to a more precise assumption of the vertical distribution or the need to conduct a model run for the release of noble gases.

2. Standard set of basic products

Five maps consisting in:

- Three dimensional trajectories starting at 500, 1500 and 3000 m above the ground, with particle locations at synoptic hours;
- time integrated pollutant concentration within the 500 m layer above the ground, in Unit-s/m³, for each of the three time periods. The duration of the first time period is between 12 and 24 hours. It starts at the release time. For a release before 12 UTC, it ends at 00 UTC; for a release after 12 UTC, it ends at 12 UTC the next day. The second time period is the 24 hours following the first time period. The third time period is the 24 hours following the second time period.
- total deposition (wet + dry) in Unit/m² from the release time to the end of the third time period.

3. General rules for displaying results

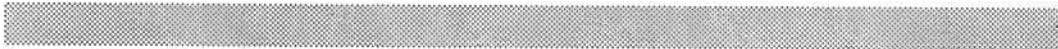
In order to make easier the interpretation of the maps, the producing centres should:

- adopt a maximum of four concentration contours corresponding to powers of 10;
- indicate, if possible, the maximum of the concentration;
- provide sufficient geographic background (latitudes, longitudes, shore lines, etc.) on the maps to be able to precisely locate the contours;
- include for each map a label where the input hypotheses are clearly summarized. The label will indicate if this is a test, an unconfirmed event or an IAEA confirmed event. If the default source is used, the following statement will be added: "Hypothetical source

used; no statement on the existence or strength of the event is implied."

Until further telecommunications arrangements are made, the RSMCs will normally provide the products through telefax.

17 September 1993



ANNEX I

**ATTENDEES TO THE FIRST INTERNATIONAL WORKSHOP ON USERS'
REQUIREMENTS FOR THE PROVISION OF ATMOSPHERIC TRANSPORT
MODEL PRODUCTS FOR ENVIRONMENTAL EMERGENCY RESPONSE**

MONTREAL, QUEBEC, CANADA

14-17 SEPTEMBER 1993

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ANNEX II

ABSTRACTS OF FORMAL PAPERS PRESENTED AT THE FIRST INTERNATIONAL WORKSHOP ON USERS' REQUIREMENTS FOR THE PROVISION OF ATMOSPHERIC TRANSPORT MODEL PRODUCTS FOR ENVIRONMENTAL EMERGENCY RESPONSE

MONTRÉAL, QUÉBEC, CANADA

14-17 SEPTEMBER 1993

RSMC Toulouse (France)

Meteorological central service of Météo-France in Toulouse, with other meteorological centres in Bracknell, Washington and Montréal, has been designated as RSMC with activity specialization on the provision of atmospheric transport model products for environmental emergency response. After Chernobyl, Météo-France has developed tools to forecast pollutant plumes and air parcel trajectories. The main is an atmospheric dispersion eulerian model called MEDIA. It gives concentration of the pollutant, if the source is well known and results depend only on observed and forecast meteorological condition by a weather forecast model. In case of environmental emergency, Météo-France is able to activate a special crisis meteorological cell (CMC). Managed by SCEM director, CMC can provide the authorities with meteorological information and pollutant cloud motion forecasts.

RSMC Montréal (Canada)

The Canadian Meteorological Centre (CMC) in Montréal is the national meteorological centre for Canada. CMC operates a global data assimilation system associated with a global forecast model, for the medium range, and a regional data assimilation system coupled with a variable resolution regional model, for the short range. These models are

executed on a class 7 NEC SX3/44 supercomputer. To meet its commitments as an RSMC, CMC uses a complex 3-D Eulerian transport-dispersion model, and a simple Lagrangian trajectory model. These models are fully integrated with CMC's 24-hour operations and can be executed at any time with a minimum response time.

RSMC Bracknell (United Kingdom)

The UK Meteorological Office numerical model for simulating the long range transport, dispersion and wet and dry deposition of radionuclides to the ground following an accidental release into the atmosphere is described. A brief account is given of the modus operandi of the model, and of its various facilities, including a unique high-resolution, real-time rainfall archive underpinning the wet deposition, and a substantially automated technique for adjusting the model assumptions and products in the light of observed radioactivity. An account is given of the operational backup and emergency response procedures. The difficult question of validation is discussed. The paper also includes some examples of model applications including a simulation of the Kuwait oil fire plumes.

RSMC Washington (United States of America)

Capabilities of RSMC Washington with respect to the provision of diagnostic and forecast transport, dispersion, and deposition estimates for atmospheric releases of hazardous pollutants.

Role of RSMCs in atmospheric transport modelling products for environmental emergency response (WMO)

Efforts undertaken by WMO to implement means and procedures in connection with the International Atomic Energy Agency (IAEA) Conventions on Early Notification and on Assistance in case of a Nuclear Accident or Emergency. The role of WMO's RSMCs in the provision of atmospheric transport model products for environmental emergency response is discussed. In particular, the need to develop and implement a truly global operational system to enable WMO to meet the requirements of its Members,

the IAEA and other UN organizations as appropriate. Specific issues and problems which should be addressed by the workshop are identified.

Regional response arrangements - Region IV (Canada)

RSMCs Montréal and Washington are near completion in developing an arrangement which describes the provision of atmospheric transport model products and services for environmental emergency response, to WMO member states in Region IV. The Centres intend to undertake "joint response" which means that they shall immediately inform each other of any request received, initially both respond independently and directly to the request, and then move rapidly toward providing coordinated response and services. Based on mandatory data provided by the requesting country, a standard set of model output products will be provided, whether a nuclear facility accident or a volcanic ash release. The products and services are described. A list of delegated authorities for requesting countries and their respective operational contacts (e.g. telephone, mode of communication) will have to be established and annexed to this document.

UK response to nuclear incidents (U.K.)

The paper addresses the UK response to nuclear incidents and describes the ability of the UK Meteorological Office to predict the spread of airborne particles in the atmosphere, and the movement of radioactive particles. The Nuclear Accident Model - NAME is described. The ways in which domestic nuclear accidents are responded to are briefly outlined. International incidents including both the "import" and "export" of radioactivity are described, along with the different responsibilities of the Government agencies and departments in their roles of "disaster management". Incidents occurring abroad but not necessarily expected to affect the UK are also responded to under the UK's RSMC commitment.

Regional and Global Response Arrangements (Canada)

A proposal jointly prepared by the four RSMCs. This proposal would replace the current interim global response arrangements by new regional and global arrangements. This reflects the designation of RSMCs for RA IV and VI and the eventual designation of other RSMCs in other WMO regions.

Proposals for standardization of procedures and outputs in case of environmental emergency response (France)

Some proposals in order to make possible comparisons between transport/dispersion/deposition models following recommendations of the last session of the WMO Working Group on Planning and Implementation of the World Weather Watch in Region IV (18-22 January 1993 - Geneva).

Default values which can be adopted for the choice of several input parameters and which are generally assessed with some uncertainty are reviewed as well as the interpretation of results issued from several models which will become easier if one takes care to adopt the same conventions to display the outputs. Finally, the form which has to be filled in case of environmental emergency response and the various standards presently adopted at RSMC Toulouse are given as examples.

Nuclear emergency preparedness (IAEA)

IAEA meteorological needs in dealing with nuclear accidents. The "Assistance in the Case of a Nuclear Accident or Radiological Emergency" and "Early Notification of a Nuclear Accident" conventions that were ratified following the Chernobyl accident, and the responsibilities that derive from those conventions are discussed.

Volcanic emergency preparedness (ICAO)

Information concerning volcanic ash "cloud" required by the international air navigation is discussed. The aeronautical users rely on two main sources of information about volcanic ash: SIGMETs issued by meteorological watch offices (MWOs) and NOTAMS

issued by the aeronautical information services at the instigation of areas control centres (ACCs). The role of ground-based and airborne observations, crucial to the timely issuance of SIGMETs and NOTAMs, is emphasized.

Other GDPS Centres Capabilities

Volcanic emergency preparedness - Australia

Long haul aircraft flying between Australia and Europe and Asia have, from time to time, encountered hazardous clouds of volcanic ash in the vicinity of Indonesia and the Philippines. The problem was most dramatically highlighted when in 1982 two Boeing 747 aircrafts were severely damaged and forced to land at Jakarta Airport. As a consequence of these and other events, the aviation industry has sought from the Australian Bureau of Meteorology (B.O.M.) (and others) a forecast and warning service for volcanic ash clouds.

The service provided by B.O.M. is in accordance with international procedures which have been established over recent years. The warnings issued define the area of the ash cloud, the cloud top and the forecast cloud movement. The warnings are based on the routine monitoring of U.S. National Oceanic and Atmospheric Administration (NOAA) Advanced Very High Resolution Radiometer (AVHRR) satellite data, imagery from the Japanese Meteorological Agency Geostationary Meteorological Satellites (GMS) and forecasts of upper wind fields from the B.O.M. tropical regional model.

Atmospheric transport model products and their dissemination - Japan

Two global models are used by the Japan Meteorological Agency to calculate the movements of hazardous materials emitted into the atmosphere. Japan's requirements with respect to international cooperation in meteorological services are discussed.

Canada's Department of Health User Requirements for Nuclear Response - Canada

This paper outlines the framework of nuclear emergency planning in Canada and the roles of the organizations created in the Federal Nuclear Emergency Response Plan. The Canadian requirements for use of outputs from atmospheric transport models during the pre-release, release, and post-release phase of a nuclear accident are discussed. It is recommended that trajectory and dispersion models be capable of providing results for short, medium, and long distances in terms of downwind cumulative concentrations. It is also suggested that graphical model outputs be geo-reference or otherwise available for transfer in industry standard graphics for use in communications products for the public and the media.

China's requirements for the provision of atmospheric transport model products - China

When atmospheric pollution accidentally happens, China needs to know the characteristic of the pollution, the movement of pollution carried by air flow and the pollution deposition.

The Radiological Analysis Support Systems (RECASS) developed in SPA Typhoon - Russia

This paper discusses the creation of computer systems for information support of handling problems of radiation monitoring and decision-making in the mitigation of consequences of radiation contamination of the environment. The speaker explains the Radioecological Analysis Support Systems (RECASS) which are being developed in SPA "Typhoon" as part of the programme of developing a nation-wide automated system of radiation monitoring within JSP1 CEC project.

The United States Nuclear Regulatory Commission's Meteorological needs in dealing with nuclear accidents - USA

The paper describes conditions early-on in a nuclear incident in an effort to emphasize the need for

specific meteorological data with minimal source term data provided.

The need for meteorological data in case of a nuclear threat or accident, as experienced by the Swedish Radiation Protection Institute - Sweden

In case of a nuclear accident or a threat of a release, the Swedish Radiation Protection Institute is responsible for advising and informing the government, other authorities and the public. This paper presents the Institute's view on the need for meteorological data. It will be pointed out that different kinds of data are needed during different phases of an accident, and also that different kinds of models should be used to calculate consequences at different distances from the accident. A fast simple model must be used for acute situations near the release, more sophisticated dispersion models will be recommended for distances up to say 500 kilometers. Beyond that trajectory models are sufficient. The needs of good trajectories, based both on prognostic and analytic wind fields, and good information on precipitation probabilities will especially be stressed.

The needs for Meteorological Data in Case of a Nuclear Threat or Accident - France

In order to prepare the authorities' action in case of nuclear emergency situation, the IPSN has organized a Technical Emergency Response Center (CTC). This center regroups different experts who work in connection with the responsables of the accidented installation, analyze the situation, anticipate the evolution of the accident and predict the possible releases to the environment.

To evaluate the radiological consequences in the environment, it is necessary to know the radioactivity released and the meteorological conditions around the site and at longer distances, both in observations and in predictions.

The meteorological predictions are supplied by the French National Meteorology Services. Local

observations can be provided by local meteorological stations that exist on each nuclear site.

This organization and relations between IPSN and the National Meteorology are officialized within a formal agreement.

The Nuclear accident response models of the German Weather Service - Germany

The Service operates a complete system of air pollution models to fulfil its national tasks and to assist international programs.

ACMAD - An African regional meteorological centre for emergency preparedness and response in case of natural disaster with meteorological sensitivity

This paper presents ACMAD's main roles, namely to provide state of the art on meteorological/climatological watch for Africa; to promote meteorological applications for socio-economic development in Africa; and to build up progressively a centre of excellence for training and research in African meteorology and climatology.