

**WORLD METEOROLOGICAL ORGANIZATION**

**COMMISSION FOR BASIC SYSTEMS**

**MEETING OF THE CBS EXPERT TEAM ON  
EMERGENCY RESPONSE ACTIVITIES (ET-ERA)**

**COLLEGE PARK, MD, USA, 21-25 OCTOBER 2013**



***FINAL REPORT***



*Valery Kosykh, Nils Ek, Jeffery McQueen, René Servranckx, Rolland Draxler, Greg Brock, Glenn Rolph, Anton Muscat, Zhenxin Song, Hubert Glaab, Martina Suaya, Gwenaëlle Hello, Guenther Winkler, Gerhard Wotawa, Masami Sakamoto, Barbara Stunder, Alice Soares, James Fraser*

## EXECUTIVE SUMMARY

The CBS Meeting of the Expert Team on Emergency Response Activities (ET-ERA) took place at the University of Maryland, in College Park, MD, USA, from 21 to 25 October 2013, under the chairmanship of Mr René Servranckx (Canada, for the nuclear ERA) and Mr James Fraser (Australia, for the non-nuclear ERA).

The meeting was presented with background information related to the OPAG on DPFS, in particular recalled the relevant decisions of the sixty-fifth session of the WMO Executive Council (EC-65, Geneva, Switzerland, May 2013) and statements adopted by the fifteenth session of the Commission for Basic Systems (CBS-15, Jakarta, Indonesia, September 2012), including the DPFS structure and the Task Team Terms of Reference.

The representatives of Regional Specialized Meteorological Centres (RSMCs) with activity specialization in Atmospheric Transport Modelling (RSMC-ATM) and RTH Offenbach presented the status of their respective implementations in relation to the Regional and Global Arrangements, which have been maintained in collaboration with IAEA. The representatives of relevant international organizations (IAEA, ICAO and CTBTO) briefed the meeting on their respective roles and the relevance of meteorological information being made available by WMO RSMCs in relation to their respective decision making processes. The representative of CTBTO proposed amendments to the procedures that are stated in the Manual on the GDPFS (WMO-No. 485).

The meeting concluded that mirrored Web sites and the quarterly exercises will be maintained, the plan for migration from facsimile distribution of products to electronic means (e-mail and Web-based) developed at the meeting will require the engagement of and assistance by the WMO Regional Offices and relevant groups within Regional Associations, and work will continue on ensemble methods. The meeting reviewed the user's requirements for specialized RSMC atmospheric transport modeling products and services (including the use of the Transfer Coefficient Matrix (TCM) approach for providing transport model products), and discussed the Cg-16 and subsequently CBS-15 request for addressing the provision of meteorological information for general public in the EER procedures.

The meeting reviewed sections of the new Manual on the GDPFS related to nuclear and non-nuclear ERA. The meeting noted the progress being made with the revision of the outdated WMO-TD 170. The meeting was informed of the work and results of the WMO Task Team on Meteorological Analyses for Fukushima Daiichi Nuclear Power Plant Accident.

The meeting was presented with the outcomes of the Exercise (2013) and discussed areas for improvement in the draft operational procedures. It concluded that more testing is required prior to the inclusion of the non-nuclear ERA section into the new Manual on the GDPFS. The meeting discussed mechanisms for capacity building and made proposals for revising the WMO web site for nuclear and non-nuclear ERA.

The meeting was informed of the work of the CBS Task Team on the Provision of Operational Meteorological Assistance to Humanitarian Agencies, noting the synergies with the ERA.

The Expert Team's Lists of Actions for nuclear and non-nuclear ERA were updated.

## **GENERAL SUMMARY OF THE WORK OF THE SESSION**

### **1. OPENING**

1.1 The CBS Meeting of the Expert Team on Emergency Response Activities (ET-NERA) was opened by its chairperson, Mr René Servranckx (Canada), at 09.20 hours on Monday, 21 October 2013, at the University of Maryland Alumni Center, in College Park, MD, USA. Dr Steve Fine, Director of NOAA's Air Resources Laboratory, Dr Bill Lapenta, Director of NOAA/NCEP Environmental Modelling Center, and Dr William Bolhofer, Director of the NOAA/NWS International Affairs, and representative of the Permanent Representative of United States of America with WMO and of the President of the Commission for Basic Systems (CBS), welcomed the meeting.

1.2 In their remarks, it was recalled that the ERA programme was born in the aftermath of the NPP accident at Chernobyl (April 1986). The WMO system of Regional Specialized Meteorological Centres (RSMC) designated for the "Activity Specialization for Atmospheric Transport Modelling (ATM) for environmental emergency response (EER)" was established to meet requirements that were first defined in 1993 at a CBS International Workshop on Users' Requirements for the Provision of Atmospheric Transport Model Products for Environmental Emergency Response (EER). Since then, the response system has been maintained and improved through routine exercises, few incidents, and technological advances. It was also noted that ERA has an important role within CBS, and that this Expert Team's meetings provide significant outcomes to the international community.

1.3 Ms Alice Soares, on behalf of the Secretary-General of the WMO, Mr Michel Jarraud, welcomed participants to the meeting and expressed appreciation to NOAA/NWS, and his representatives at the meeting, for hosting this meeting. Ms Soares noted that the WMO Emergency Response Activities (ERA) programme is part of the WMO Global Data-Processing and Forecasting System. Its main goal is to assist WMO's National Meteorological Hydrological Services (NMHS), along with other relevant agencies of WMO Member countries, and in close collaboration with relevant international organizations, to assist them to respond effectively to environmental emergencies. Finally, she ensured the Secretariat support throughout the meeting and wished all participants a very successful meeting.

### **2. ORGANIZATION OF THE MEETING**

#### **2.1 Adoption of the agenda**

2.1.1 The meeting adopted the agenda, which is found in Annex I.

#### **2.2 Working arrangements**

2.2.1 The meeting agreed on the organization of its work, including the working hours. All pre-session documents can be found via the Documentation Plan (INF. 1) which is posted on the WMO Web site linked to the banner for the meeting at:

<http://www.wmo.int/pages/prog/www/BAS/CBS-meetings.html>

2.2.2 The participants, some new to the ET-ERA, briefly introduced themselves in order to facilitate interactions throughout the meeting. The list of participants is provided in Annex II.

### **3. INTRODUCTION**

#### **3.1 Outcomes of CBS-15 (2012) and EC-65 (2013), including DPFS structure and ET Terms of Reference**

3.1.1 The WMO Secretariat provided background related to outcomes of WMO Constituent Bodies, particularly focused on the fifteenth session of the Commission for Basic Systems (CBS-15) and the sixty-fifth session of the WMO Executive Council (EC-65), relevant to ERA. There were a number of issues related to ERA discussed at and/or requested by CBS-15 and EC-65 that need attention by ET-ERA. These include:

- a) the major revision of the *Manual on the Global Data-processing and Forecasting System (GDPFS)*. The new Manual introduces a number of changes to the current procedures, and therefore some GDPFS centres may report temporary non-compliance with regard to some of the requirements. In this context, and noting that the new Manual would most likely be in force by 2015, the Secretariat will clearly indicate the comprehensive summary of changes of functions and procedures well in advance to ensure the smooth transition, and a transition plan for the implementation of the new Manual (which will replace the current version) will be developed to manage the technical changes, for consideration by the upcoming extraordinary session of CBS, planned to be held in Paraguay, from 9 to 13 September 2014.
- b) the need to keep the reference materials (WMO-No. 485 and WMO-TD. 778) consistent to ensure the secure provision of the ERA service.
- c) the increasing need to provide meteorological information for general public interest as well as special user applications (i.e. the need to strengthen activities to address the issue of dissemination of ERA-related information to the public, including the representation of the output from the dispersion models). CBS/DPFS to further address these aspects in WMO-TD. 778, as appropriate, in order to assist users in the interpretation of ERA-related products and the application of them for their own purposes.
- d) the need for capacity building activities, recognizing the increasing sophistication of the atmospheric transport models used in the RSMCs, and the importance of full and correct interpretation of this information by forecasters in NMHSs. CBS-15 requested Members who host RSMCs to consider the provision of appropriate training courses in the use and interpretation of their guidance and products.
- e) the continued development and testing by RSMCs of different parameters and formats for charts, including for the forecast time-range of standard products, and for longer time ranges up to 10 days as well as geo-referenced information.
- f) the need to finalize the revision of the outdated WMO Technical Note 170, entitled: "Meteorological and Hydrological Aspects of Siting and Operations of Nuclear Power Plants". A task Team was established involving several WMO programmes and technical commissions; CBS/DPFS coordinates the overall revision of the publication.
- g) the need for the development of operational procedures for significant non-nuclear incidents, where a NMHS could request and receive ATM support from an RSMC.
- h) the need for developing global and regional arrangements for weather, climate, water and environmental emergencies to assist humanitarian agencies, based on the lessons learnt from the ERA programme.

3.1.2 The meeting agreed to discuss these issues under the relevant agenda items.

## **3.2 Report of the chair and co-chair on nuclear and non-nuclear ERA, respectively**

3.2.1 The chairperson, Mr René Servranckx, provided a short summary of the activities of the Expert Team on ERA. He explained that this is the first meeting of the Expert Team since the decision by CBS-15 (in September 2012) to restructure the CBS OPAG on DPFS. The ET-ERA

consists of two Task Teams that deal respectively with operational procedures for nuclear and for non-nuclear ERA. They replace the groups previously known as the *Coordination Group for Nuclear Emergency Response Activities* (CG-NERA) and the *Expert Team for non-Nuclear Emergency Response Activities* (ET-nNERA). The meeting agreed that the new structure of the ET-ERA presents challenges and adapting to it will take some time and effort, however it also agreed that there are significant advantages in covering both activities under one roof, since they offer many potential similarities (capacity building, Web based ERA information and training, etc.). The experience gained in one area can benefit the other at a lesser cost and effort.

3.2.2 The meeting noted that the nuclear ERA programme is mature and has been in place for over 20 years. An important component of the work is to maintain real time operational response readiness and capacities, in accordance with the roles and responsibilities defined in the *Manual of the GDPFS*. New activities / products are also examined as well as ways to improve existing products and use better delivery mechanisms. Over the past two year, members of the Expert Team:

(a) continued to perform the ongoing activities, which include: (1) monthly and quarterly testing between the IAEA, RTH Offenbach and the RSMCs; (2) testing and maintaining RSMC common Web pages; (3) modelling for CTBTO requests; and (4) maintaining and updating the WMO ERA web pages.

(b) contributed significantly to support the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) in its [assessment of levels and effects of radiation exposure due to the Fukushima-Daiichi NPP accident](#). This was done in addition to the work plan already defined at the last meeting of the CG-NERA. A summary of the results of the work of the *WMO Task Team on Meteorological Analyses for Fukushima Daiichi Nuclear Power Plant Accident* is presented in agenda item 4.10.

3.2.3 The meeting noted that the first discussions on non-nuclear ERA began in the late 1990s. The growing need and interest by WMO Members for support led to the establishment of the *Expert Team on Modelling of Atmospheric Transport for Non-Nuclear Emergency Response Activities* in 2005. The meeting also noted that in the years that followed, this Expert Team gradually developed the scope and concepts for non-nuclear ERA operational support, and by November 2012, the work was mature enough for a Meeting of the *CBS Task Team on the Development of Operational Procedures for non-Nuclear Emergency Response Activities* (Melbourne, 2012), which produced a draft set of operational procedures, guidelines and request for RSMC support form for non-nuclear ERA that has been undergoing testing during the last year. This is covered in details in agenda item 5.

## **4. NUCLEAR ERA**

### **4.1 Review of actions from previous meeting (Vienna, Austria, 2011)**

4.1.1 The chairperson reviewed the progress made relative to actions from its previous meeting (Vienna, October-November 2011). The meeting agreed to continue to maintain a record of progress and to carry forward this list of actions, including adding new actions that have been identified from this meeting. The updated list of actions on nuclear ERA (October 2013) for the ET-ERA is found in Annex III.

4.1.2 The meeting reviewed the performance of the IAEA monthly communication tests with RTH Offenbach, and the quarterly RSMC exercises, which identified a few gaps in the system and areas for improvement. A plan for 2014 and 2015 quarterly RSMC exercises has been proposed by IAEA and agreed by the Team, however it was suggested to change the timing of the exercises for daytime for the lead-RSMCs. The schedule is found in an Action, in Annex III.

### **4.2 Status of operational implementation / activities of RSMCs / RTH Offenbach**

4.2.1 Representatives of the all RSMCs, and RTH Offenbach provided their respective reports on their 2012-2013 activities. The meeting was pleased to note that all parts of the operational nuclear ERA activities have been well maintained by the RSMCs and RTH Offenbach, through ongoing work with IAEA and CTBTO, improved NWP systems, exercises, quarterly tests, and the experiences from real incidents.

4.2.2 The meeting noted that the success rate of RSMC fax transmissions to operational NMHS contact points continues to be generally low. It also noted that the number of WMO Members that have provided official contact points should be increased, even as plans for transition to email distribution of products move forward. The meeting stressed that the implementation of the plan to migrate from fax distribution of products to email/internet distribution of products has been a challenge. It noted that in mid-2012, WMO Secretariat, via circular letter from Secretary-General, had requested all Permanent Representatives to provide confirmation or nomination of contacts for its Delegated Authority, and for its Operational NMHS Contact Point, including name, title, telephone and fax number, and only one operational e-mail address. However, a reduced number of Member States has provided such information. The meeting was wondering if this was due to the lack of understanding of the role of a Delegated Authority and of an Operational Contact Point. The meeting suggested engaging the WMO Regional Offices and relevant groups within the WMO Regional Associations in this process, in order to assist as appropriate. In addition, the IAEA could advise on which WMO Members have National Contact Points under the two International Conventions (Early Notification, and Assistance) on nuclear emergencies.

4.2.3 The meeting was pleased to note that good progress has been made in the implementation of the RSMC mirrored Web sites. It noted that RSMC Tokyo has completed the development of its RSMC mirrored Web site in November 2011, and that RSMC Exeter is developing its version of the common Web site, which will soon be completed.

4.2.4 The meeting noted that the German Weather Service (DWD) plans to establish backup procedures for institutions connected to RTH Offenbach. The standard backup procedure would be that all IAEA data sent to RTH Offenbach for further dissemination are sent in parallel (active backup) to a Backup RTH. It is intended to choose RTH Vienna for the Backup RTH. It will then take over the data dissemination in case of an outage of RTH Offenbach.

4.2.5 The meeting noted that the fifteenth session of the Regional Association II (Doha, December 2012) approved its working structure for the 2013 – 2016 period, including an Expert Group on Operational Forecast (EG-OF), which has a Theme Leader in Emergency Response Activities (TL-ERA). Mr Masami Sakamoto (RSMC Tokyo) has been appointed as TL-ERA, and is responsible for (a) monitoring the provision of products and services by designated RA-II GDPFS Centres within the framework of the Emergency Response Activities (ERA), and (b) advising on evolving requirements for ERA operational systems and services. The meeting stressed that support and assistance by RSMCs in RA-II (Beijing, Obninsk, and Tokyo) and by ERA-related experts within the region is necessary for the success of these activities.

4.2.6 The meeting noted that RSMCs continue to experiment with different parameters and formats for charts, including for geo-referenced information and “Plume Time of Arrival” products. The meeting recalled that some RSMCs provide such products to the IAEA on an experimental, non-official basis during the Fukushima event. Uncertainty in dispersion calculations and inclusion of precipitation data in deposition calculations continue to be of interest (see paragraph 4.3.9).

### **4.3 Cooperation with other international organizations (IAEA, ICAO, CTBTO)**

#### **ICAO**

4.3.1 The meeting noted that the ICAO Annex 3/WMO Technical Regulations (C.3.1), Chapter 3, 3.4 sets out the responsibilities of Meteorological Watch Offices (MWOs) within States that provide air traffic services. As part of these responsibilities, MWOs are tasked to provide information received concerning the release of radioactive material into the atmosphere, in their area(s) of

responsibility or adjacent areas, to their associated area control centres (ACCs)/flight information centres (FICs) and aeronautical information services (AIS) units. The information, in the form of a SIGMET message, is to comprise the location, date and time of the release, and trajectory of the radioactive material. Moreover, Annex 11 – Air Traffic Services and Annex 15 – Aeronautical Information Services to the Convention on International Civil Aviation contain provisions relating to the release of radioactive material into the atmosphere. Annex 11 requires a flight information service (through air traffic service units) to provide information on a release to all aircraft that are likely to be affected, while Annex 15 requires the promulgation of information on the release through the issuance of a NOTAM message (notice to airmen) by AIS units. The NOTAM message details relevant content derived from the SIGMET, supplemented by information on the associated aerodrome and/or airspace restrictions. Flight crew members and others concerned can then flight plan to avoid the hazard/restricted areas. To enhance flight safety, Amendment 75 to Annex 3, applicable since November 2010, has additionally required the RSMC Exeter, which is “co-located” with Volcanic Ash Advisory Centre (VAAC) London to be the focal point to directly notify the ACCs concerned about the release. This procedure was developed by ICAO with the assistance of the International Airways Volcano Watch Operations Group (IAVWOPSG), and consists of the VAAC London (RSMC Exeter) forwarding the early notification provided by the IAEA, without any modification or interpretation, to the ACCs concerned which in turn disseminate the information received to aircraft in flight or about to depart for the affected FIR. Through the regular meetings of the IAVWOPSG (every 18 months or so), the operation and the development of the referred arrangements have been overseen and further developed as required.

4.3.2 The meeting noted that the seventh meeting of the IAVWOPSG (Bangkok, March 2013, report available at <http://www.icao.int/safety/meteorology/iavwopsg/Lists/Meetings/AllItems.aspx>) principally focussed its attention on the further development of a concept of operations, including through the formulation of Conclusion 7/37, which respect to the improved notification to aviation of the release of radioactive material into the atmosphere. WMO, as a member of the IAVWOPSG, is referenced in Conclusion 7/37, in particular, in part c) of the conclusion calls on the need to consult with the WMO ET-ERA (formerly the CG-NERA) in order to evaluate the possible role of the RSMCs in the provision of guidance on the location and movement of radioactive material in the atmosphere. The meeting recalled that the CG-NERA, at its last meeting in Vienna (October-November 2011) expressed some concerns on what the criteria for triggering the SIGMET should be (the dose criteria for the passengers’ health or the contamination of the aircraft itself), and it was of the feeling that further work should be done first to clarify the criteria to be used to produce the guidance. It therefore agreed on the submission of a conjoint paper by IAEA, ICAO and WMO members to the Inter-Agency Committee on Radiological and Nuclear Emergencies (IACRNE) to seek expert advice on the best criteria to be used to develop the referred guidance. The meeting noted that the IACRNE ad-hoc Working Group on Air and Maritime Transportation (WG-AMT) is working on a response to the questions raised at the last meeting of the CG-NERA regarding qualitative and / or quantitative criteria triggering the issuance of a SIGMET for a radioactive cloud. The information will be passed on by the chairperson of the Expert Team to ICAO's International Airways Volcano Watch Operations Group (IAVWOPSG Conclusion 7/37). The meeting requested that the IAEA, the RSMC Montreal and the RSMC Vienna, based on a realistic source term for a major event (Chernobyl or Fukushima), examine the horizontal and vertical extent of the radioactive plume for a few cases.

4.3.3 Further to the abovementioned activities of the IAVWOPSG, the ICAO Secretariat has provided technical advice and assistance to IAEA, WMO and other international organizations that are members of IACRNE (which is led by the IAEA). In this regard, ICAO has assisted the IACRNE members in the development of a revision to a *Joint Radiation Emergency Management Plan of the International Organization* (EPR-JPLAN), which describes a common understanding of how each organization acts during a response to and in making preparedness arrangements for a radiological or nuclear emergency. ICAO is a co-sponsor of the JPLAN together with other international organizations. The revision of the JPLAN was published by the IAEA in July 2013 as the sixth edition, and includes new arrangements/initiatives which were introduced in light of the accident at the Fukushima Daiichi nuclear power plants of the Tokyo Electric Power Company in

2011. The JPLAN is available on the IAEA website at [http://www-pub.iaea.org/MTCD/Publications/PDF/EPRJplan2013\\_web.pdf](http://www-pub.iaea.org/MTCD/Publications/PDF/EPRJplan2013_web.pdf).

4.3.4 The meeting was informed that in July 2014, ICAO will be convening a Meteorology (MET) Divisional Meeting in Montreal, Canada, in part conjointly with the fifteenth session of the WMO Commission for Aeronautical Meteorology (CAeM-XV). The MET Divisional Meeting will address the expected evolution of meteorological service provision for international air navigation over the next 10 to 15 years or more, in keeping with ICAO's vision for a seamless, globally interoperable air traffic management system. The MET Divisional Meeting will make recommendations on existing and foreseen future provisions, including the development of draft amendment 77 to Annex 3 (with intended applicability in November 2016). Further information on the MET Divisional Meeting is available at <http://www.icao.int/meetings/METDIV14/>.

## IAEA

4.3.5 The meeting recalled that the IAEA has an important role when a nuclear or radiological incident or accident has international consequences or when a state experiencing such an event asks for international assistance. The accident in Fukushima revealed the need of the international community for the IAEA's assessment of the situation and the possible prognosis of the accident. After a high level conference on the follow up of the Fukushima accident on the international level in Vienna, the IAEA Board of Governors approved the IAEA Action Plan on Nuclear Safety, which defines the expanded role of the IAEA on assessment and prognosis. This Action Plan has a general objective to improve nuclear safety, emergency preparedness and radiation protection of people and the environment worldwide. It addresses this by specifying actions which should be taken by the IAEA Member States and by the IAEA Secretariat in several categories such as IAEA peer reviews, emergency preparedness and response, and others. Under the topic of emergency preparedness and response the Action Plan calls upon the IAEA Secretariat and relevant international organizations to strengthen the international emergency preparedness and response network. Under the topic 'Communication and Information Dissemination' the IAEA Secretariat is requested "... to provide Member States, international organizations and the general public with timely, clear, factually correct, objective and easily understandable information during a nuclear emergency on its potential consequences, including analysis of available information and prognosis of possible scenarios based on evidence, scientific knowledge and the capabilities of Member States." Since then it was clarified that this applies also to radiological emergencies.

4.3.6 The meeting noted that the IAEA Secretariat identified its principal role on assessment and prognosis, which consists of (a) develop a reasonably bounding estimate of the potential accident progression; (b) determine whether the public is safe and identify protective and other response actions that should be considered; (c) determine whether emergency workers are safe; (d) identify actions to protect international trade and interests; (e) assess protective and other response actions being implemented, recommended or discussed by media; and (f) actively alert Member States in which response actions may need to be considered. A new IAEA guidance document on 'Actions to protect the Public in an Emergency due to severe conditions at a light water reactor' was published. This document is the basis for the development of procedures and checklists for IAEA responders. An associated training system has been established and during the upcoming exercises these procedures will be tested.

4.3.7 The meeting noted that the IAEA guidance documents on assessment of nuclear and radiological incidents and emergencies have been published since the 1990-ies. Since the accident in Fukushima only minor adaptations were made but the philosophy is still the same. Basically the assessment starts by looking at the emergency classification taken by a NPP, as the first protective actions and the off-site warning should be initiated based on this classification. Consequently the first off-site actions during a severe nuclear accident have to be taken based on the emergency classification and well before the start of a release in a restricted area around a NPP. Following, additional areas need to be identified for taking further protective actions, however this is done based on radiation measurements either within the plume or after plume passage. The same principle applies for long term protective actions which are assessed against the radiation

monitoring results either from ground contaminated or food/goods contamination levels. Reference criteria have been developed for light water reactors and are made available in the latest guidance documents.

4.3.8 The IAEA informed the meeting that atmospheric dispersion products are used by them mainly for the identification of areas in which environmental radiation monitoring is needed. The current standard products provide this on the international level. The Fukushima accident has shown that and the Action Plan request the IAEA to be in a position to say something on the near field as well. Therefore, the IAEA Secretariat will be interested in high resolution (near field) atmospheric dispersion products using local wind speeds and directions (if available) in order to identify the areas with higher deposition of radionuclides. As Fukushima has shown, specifically those areas in which precipitation took place, have higher deposition of radionuclides and in this respect the actual radar data would be of interest as well. Based on lessons learned during Fukushima Daiichi-NPP accident, the meeting invited the IAEA to produce a list of RSMC products and support needed by the IAEA (i.e. higher resolution, long diagnostic runs with more realistic source term, etc.).

4.3.9 Noting the importance of radar and precipitation data to help IAEA diagnose “hotspot” regions following a nuclear accident, the Secretariat informed the meeting that WMO has developed websites where weather radar and precipitation dataset are available, which are <http://wrd.mgm.gov.tr/> and <http://www.isac.cnr.it/~ipwg/data.html>, respectively.

4.3.10 The meeting recalled its discussions in past meetings on the possibility for the IAEA to share the list of (operational) nuclear power plants and their geographical coordinates. Interested RSMCs received a copy of this information at the meeting. However, due to the sensitivity of this information, it shall not be quoted in any public or international forum without permission of the IAEA and the concerned Member State. Its use should be restricted to the proper execution of official RSMC duties and not be further distributed.

4.3.11 Noting that during an IAEA exercise, a radionuclide was specified which was not available in the database of an RSMC, the IAEA provided a list of “mandatory” isotopes to the RSMCs.

4.3.12 The meeting recalled that the Convex-3 exercise is an international exercise that is planned and executed within the Joint Plan (international organizations) framework under the responsibility of the IACRNE. It noted that there have been already three coordination meetings in order to plan this exercise which will occur in November 2013 in Morocco. RSMC Toulouse in cooperation with RSMC Exeter, WMO Secretariat and the Morocco Meteorological Service have chosen real but archived met data in order to fit the constraints (it was asked to have a southerly wind in order to possibly cross the Mediterranean sea with the pollutant to Gibraltar). The historical data chosen are the ones from 28 February 2013, 03 UTC time of the explosion (IFS atmospheric model). The historical weather charts have been prepared by RSMC Toulouse and given to the Morocco Meteorological Service. No computation will be requested from RSMCs regarding the local impacts, only an acknowledgement of receipt will be asked. For the initiating event, the Morocco Meteorological Service will request also a specific small scale dispersion modelling run from RSMC Toulouse with the following procedure (<http://www.wmo.int/pages/prog/www/DPS/WMOTDNO778/Annex3-form-EER-alert.pdf>): RSMC Toulouse will furnish (via a dedicated website) the computation that will be prepared in advance (within the canned historical data) with a realistic delay of 45 minutes to 1 hour to the Morocco Met Service (PERLE model). Results of this exercise will be shared by the RSMC Toulouse to other RSMCs.

## **CTBTO**

4.3.13 At the meeting, CTBTO proposed a number of changes and possible improvements to the procedures for requesting and provision of the source-reception sensitivity (SRS) fields by the RSMCs. These proposals include:

- (a) Changes to the upload system of the SRS fields;
- (b) Cancellation of a PTS REQUEST FOR SUPPORT message;
- (c) Date issued entry at the PTS REQUEST FOR SUPPORT message;
- (d) Amendment to the description of the SRS fields in the *Manual on the GDPFS*;
- (e) Finer spatial and temporal grids for the meteorological inputs and for the output SRS fields;

which are described in Annex IV. The meeting agreed with proposals (b) to (d), and requested RSMCs to test and implement at their earliest convenience modifications to upload their SRS fields to CTBTO. It also requested CTBTO to contact RSMCs to investigate feasibility of enhanced spatial and temporal resolution of SRS fields and propose possible changes to the *Manual on the GDPFS*.

4.3.14 The meeting was informed that RSMC Washington will announce at the upcoming extraordinary session of CBS (September 2014) that it will start providing atmospheric transport modelling (backtracking) products to CTBTO, and will request official designation.

4.3.15 The meeting noted that the operational availability of radiological monitoring data for use in RSMC operational environment is very difficult to attain. These data may be available to some NMHSs, depending on the national arrangements with their radiological monitoring authorities. However, these are generally not passed on to or available at RSMCs. The meeting noted that NMHS should be encouraged to strengthen their contacts with radiological monitoring authorities and explore the possibility of making radiological data available to the RSMCs during an incident. At the same time, the meeting noted that, in a case of an incident, the IAEA collects radiological monitoring data and makes available these data on the IAEA USIE website, and RSMCs are encouraged to access this website.

4.3.16 The meeting noted the considerable work done towards a more robust transmission of CTBTO meteorological data on the GTS. With regard to CTBTO IMS stations to which no WMO station ID has been assigned yet, data transfer would continue through NMC Montreal (header: SNCN19 CWAO), while data for those stations with ID are transferred from CTBTO to NMC Vienna (header: ISAX30 LOWM), who encodes the data in BUFR and transfers to the GTS. The meeting noted that operational procedures have been developed and requested NMC Vienna to finalize and distribute communication protocol and contact information between NMC Vienna, CTBTO, WMO and Canadian Meteorological Centre. The meeting stressed the need for quality control of these data and recommended that the NMCs making use of these data for assimilation in their NWP systems provide feedback directly to CTBTO on the quality of its meteorological data.

#### **4.4 Improved product distribution / access methods**

##### ***Multiple copies of a single WNXX01 IAEA message on the WIS/GTS***

4.4.1 The meeting noted that multiple copies of a single WNXX01 IAEA message were received at a number of RSMCs during the last quarterly IAEA – RSMC test. RTH Offenbach, where the initial message is originated from, confirmed that only one message had been sent. The problem appears to be due to the redistribution of the message by different WIS/GTS switching centres. This can cause an undesirable loading of WMO communications circuits, especially in the case of a real event where many WNXX01 IAEA messages would be sent. In addition, looking at each copy to ensure that it doesn't contain new information is time consuming. Noting that there is a need for tracking down where the message is being modified, and that this is part of the routine management of the WIS/GTS, the meeting requested this issue be addressed within the WMO Secretariat in coordination with the switching centres, and report back to the Expert Team as soon as this issue is solved.

##### ***Common tool to help identify WMO Members and Regional Associations (RAs) for use by RSMCs and the IAEA***

4.4.2 The meeting noted that the Environmental Emergency Response Request for WMO RSMC Support by IAEA form in Appendix II-7 of the *Manual on the GDPFS* identifies lead RSMCs. It also noted that the IAEA selects the lead RSMCs based on the WMO Regional Association (RA) in which the source of the release (i.e. accident NPP) is located. Given that some WMO Member States are part of two WMO RA (e.g. Russia in RA II and RA VI), deciding on the lead RSMCs is not simply a matter of determining the State where the accident occurs. Determining the correct RA may be time consuming in certain situations and could result in a delayed transmission of the request or an incorrect determination of the lead RSMCs. In this context, and in order to accelerate the decision process and ensure that a single and common source of information is used by the RSMCs and the IAEA, the meeting proposed that a common tool be made available to the IAEA and the RSMCs to help identify WMO Member States and Regional Associations. Noting that WMO Secretariat is developing a GIS database (still in test) containing this information, the meeting requested the Secretariat to make it available to the IAEA and the RSMCs as soon as it has a more widely tested version. The meeting agreed that this database would also be useful for non-nuclear ERA.

#### 4.5 User's requirements for products and services

4.5.1 The meeting recalled that during the Fukushima NPP accident in March 2011, RSMCs provided standard transport model products to the IAEA and NMHSs based on the agreed procedures defined in the *Manual of the GDPFS*. These products were primarily run using the default scenario due to the uncertainty of the emissions coming from the Plant throughout the approximately eleven week period (from 11 March 11 to 23 May 2011). A default scenario assumes a unit source emission of  $^{137}\text{Cs}$  for six hours to produce 24-h integrated air concentrations and deposition out to 72 hours. These forecasts were updated every twelve hours as new meteorological forecasts became available by 21 March, however they did not carry over emissions from previous emissions into the new forecast, thereby making their interpretation difficult. As additional source strength information became available, it was impractical to rerun the simulations each time from the beginning of the accident.

4.5.2 In this context, the meeting noted that an alternative approach (described in Draxler, R.R., and G.D. Rolph (2012), Evaluation of the Transfer Coefficient Matrix (TCM) approach to model the atmospheric radionuclide air concentrations from Fukushima, *J. Geophys. Res.*, 117, D05107, doi: 10.1029/2011JD017205; <http://dx.doi.org/10.1029/2011JD017205>) was used after the accident by the WMO Task Team on Meteorological Analyses for Fukushima-Daiichi NPP Accident (see agenda item 4.10) to re-evaluate the atmospheric transport of radionuclides from Fukushima, allowing the end user to modify the source term and the model output products without having to rerun the transport model. The meeting was provided with background information on the use of this alternative approach (the Transfer Coefficient Matrix – TCM – approach). It noted that the advantage of the TCM approach is that the transport, dispersion, and deposition for any given species is completely independent of the actual source's emission of that species, and therefore they only need to be computed once.

4.5.3 The meeting noted that an initial demonstration of this system ([http://www.ready.noaa.gov/ready\\_fdnpp.php](http://www.ready.noaa.gov/ready_fdnpp.php)) was developed using a series of web pages that allows the end user to select up to four nuclides, their emission rates, their phase (particle type or gas), and their radioactive half-life. After entering this information the user selects a location (latitude/longitude, city name, or WMO ID) where the program will then extract the model results and produce graphs and maps of concentration and deposition at that location, thereby tailoring the results to locations of interest to the user. A more complicated interface ([http://www.ready.noaa.gov/ready\\_fdnppwmo.php](http://www.ready.noaa.gov/ready_fdnppwmo.php)) was developed as a result of the work of the Task Team (see agenda item 4.10), which allows the user to select not only the radiological species, but also one of several source terms and dispersion model simulations (CMC, JMA, NOAA, UKMET, ZAMG) used by the Task Team or an ensemble mean of several combinations of simulations. In addition, measurements taken at several locations in Japan are overlaid on the model results and statistics are provided to the user.

4.5.4 The meeting agreed on a first step prior to any possible decision in the future on the use of the TCM approach to provide operational atmospheric dispersion model products to NMHSs and the IAEA. This consists of the RSMCs that have not participated in the Task Team work to test the TCM approach, using the package provided by Mr Roland Draxler (US). The results would be added to the Task Team website. A report on the feasibility and usefulness in using the TCM approach in operational mode should be provided to the next meeting of the Expert Team.

## 4.6 Public information

4.6.1 The meeting recalled that Cg-16 requested CBS to review the EER procedures to strengthen aspects related to provision of specialized meteorological information to the general public, including proper representation of this information, in the *Manual on the GDPFS* (WMO-No. 485). While recognizing that the provision of information for the general public is a very sensitive issue and is not explicitly part of the ERA procedures, the meeting noted that this aspect has been of concern by the WMO, IAEA and ICAO Secretariats, and therefore stressed the need to address this issue in order to respond to Members. The meeting noted that CBS-15 provided a direction on the way forward, primarily focused on further assisting NMHSs in the interpretation of ERA-related products and their application for national purposes. The meeting also noted that, in order to address this issue of public information, the IAEA has prepared a publication on “Communication with the Public in a Nuclear and Radiological Emergency” (2012), which is available on the IAEA website at <http://www-pub.iaea.org/books/IAEABooks/8889/Communication-with-the-Public-in-a-Nuclear-or-Radiological-Emergency>.

4.6.2 In order to respond to the request by Cg-16 and CBS-15, the meeting stressed the need for:

- (a) incorporating in the *Manual on the GDPFS* (in the global and regional arrangements) a short and general statement on what NMHSs’ may do once they receive products from RSMCs;
- (b) further developing the WMO-TD. 778 on the use and interpretation of RSMC products, including examples, and guidance on how to communicate with the public (based on the IAEA publication);
- (c) expanding the text in the *Manual on the GDPFS* (in the global and regional arrangements) in relation to the RSMC support and advice to the WMO and the IAEA Secretariats in the preparation of public and media statements. Noting the WMO statements should address both weather and dispersion aspects, the meeting requested the WMO Secretariat to coordinate with the Member State concerned and with the RSMCs, as appropriate, for preparing a consensus statement. These WMO statements should declare that weather and dispersion products are provided to the relevant international organizations, in accordance with the Joint Plan, for the assessment of the impacts.

4.6.3 The meeting requested the chairperson of the ET-ERA, in collaboration with the WMO Secretariat and other members of the Expert Team, to address the aspects identified in paragraph 4.6.2.

## 4.7 Capacity development and outreach

4.7.1 The meeting noted that recognizing the increasing sophistication of the atmospheric transport models used in the RSMCs, and the importance of full and correct interpretation of this information by forecasters in NMHSs, CBS-15 requested Members who host RSMCs to consider the provision of appropriate training courses in the use and interpretation of their guidance and products. It also note that this request has been reiterated by the Regional Associations (RAs) II, IV and VI. The meeting recalled that workshops on the use and interpretation of RSMC products had been conducted in the past by RSMCs Montreal, Washington, Melbourne, Exeter and Toulouse, and that used materials may be still valid nowadays (just requiring small updates). However, noting that such face-to-face training workshops require significant human and

budgetary resources, and that may not reach a large audience, the meeting agreed that e-learning modules and web-based courses may be more appropriate. It requested the RSMCs (especially those collocated with WMO Regional Training Centres) to evaluate the existing materials and other possibilities, including the resources required to carry out this activity.

4.7.2 In addition, the meeting agreed with the directions provided by the Task Team on the Development of Operational Procedures for non-Nuclear ERA, in its 2012 meeting in Melbourne, which recommended that the WMO Bulletin article on ERA (January 2006) should be updated to further promote the ERA programme. It therefore requested the chairperson of the ET-ERA, in collaboration with the Secretariat, to revise the WMO Bulletin article on ERA.

## **4.8 Ensemble atmospheric transport modelling**

4.8.1 The meeting recalled that for many years, possible future ensemble modelling products of RSMCs during a nuclear emergency have been discussed. It also recalled that at 2010 meeting of the Coordination Group on nuclear ERA (in Beijing), RSMC Vienna agreed to contact JRC to coordinate necessary steps for undertaking a “private” RSMC nuclear ERA session using the ENSEMBLE system; and at 2011 meeting (in Vienna), a majority of RSMCs present agreed in principle to participate in the “private” RSMC ENSEMBLE session. Following up the actions from these two meetings, the RSMC Vienna organized an RSMC ensemble exercise on 18 April 2012. The selected scenario was a simulated accident at a US Nuclear Power Plant. Nine RSMCs participated in the exercise, which was designed as an “off-line” test with relaxed time schedule.

4.8.2 The meeting noted that the exercise demonstrated that RSMCs are able to deliver results to the ENSEMBLE platform in the correct format, since all but one RSMC participated. It was also demonstrated that the JRC ENSEMBLE platform offers a very good functionality to display and compare model results, and the needed flexibility to serve scientific as well as operational users. On the other hand, significant differences were found between the individual model results for air concentrations as well as deposition values. The meeting noted that the differences might be due to: (a) different input datasets used by some participants who joined the exercise in near-real-time and used meteorological forecast data as input to the dispersion model calculations while other RSMCs (who joined at a later stage) tended to use meteorological analysis data; and (b) different dispersion models, fed with input from different NWP models.

4.8.3 The meeting agreed that an Ensemble-based system would have a number of advantages. Besides the consideration of uncertainties in the dispersion calculations, it could be used by individual participants to inter-compare and validate their models. It therefore decided the next steps for a second RSMC ENSEMBLE exercise, to be organized by the RSMC Vienna. This is planned to be held in April/May 2014, and all RSMCs are invited to participate, using meteorological forecast data as input to the dispersion model calculations in a delay mode (few weeks to a month). Results should be generated in the Ensemble format, and if possible in GRIB format, and shared with the members of the Expert Team. More details of the second RSMC ENSEMBLE exercise and future tests are described in an Action in Annex III.

## **4.9 Review of current procedures and standards, with a view of developing proposed amendments to the Manual on the GDPFS (WMO-No. 485)**

4.9.1 The meeting recalled that the World Meteorological Congress, at its sixteenth session (May 2011), agreed that there are fundamental changes under way in the Basic Systems and therefore adopted an extended layout for the revised *Manual on the GDPFS*. The revised *Manual on the GDPFS* would facilitate introducing updates as frequently as required (to ensure that the content is kept up-to-date), and is being developed in accordance with quality management principles, which would ensure its sustainability as part of the WMO Quality Management Framework. The meeting noted that the ET-ERA chairperson, Mr Servranckx, had been tasked (at the meeting of the Coordination Group on nuclear ERA, in 2011) to work on the ERA aspects for the revised *Manual on the GDPFS*. A first draft was presented to the Expert Team for consideration.

4.9.2 The meeting noted that there were some inconsistencies between the current procedures and standards for emergency response in the case of a nuclear accident stated in the *Manual on the GDPFS* (WMO-No. 485), and ERA procedures described in the WMO/TD-No. 778, entitled “Documentation on RSMC Support for Environmental Emergency Response”. In addition, the meeting noted that there are a number of aspects that requires clarification in the *Manual on the GDPFS*, such as the “notification” by IAEA, the interval of contouring in the concentration and deposition maps, the role of NMHSs in ERA (see agenda item 4.6) and the RSMC support and advice to the WMO and the IAEA Secretariats in the preparation of public and media statements (see agenda item 4.6). Noting that the Task Team on the revision of the *Manual on the GDPFS* (TT-Manual) will meet in Geneva, from 17 to 19 December 2013, the meeting requested the chairperson of the ET-ERA, in collaboration with the WMO Secretariat and the member from Japan, to finalize the ERA aspects of the new Manual prior to its submission to the TT-Manual meeting, and to ensure consistency between the WMO-No. 485, the WMO/TD-No. 778, and the Joint Plan, whenever there is an update in the ERA procedures. All members of the Expert Team are welcome to provide any comments by end November 2013, as appropriate.

#### **4.10 Report on the work of the Task Team on Meteorological Analyses for Fukushima-Daiichi Nuclear Power Plant Accident, including the publication: “The World Meteorological Organization’s Evaluation of Meteorological Analyses for the Radionuclide Dispersion and Deposition from the Fukushima Daiichi Nuclear Power Plant Accident”**

4.10.1 The meeting noted that the WMO organized a small Task Team (TT) to respond to a request from the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) to assist them with the meteorological aspects of a dose assessment from the radiological releases from the Fukushima Daiichi nuclear power plant accident. The TT’s primary mission was to provide meteorological analyses and to determine how their use and the introduction of additional meteorological observational data, could improve atmospheric transport, dispersion and deposition calculations, a critical component to the dose computations. Various centres provided data (see paragraph 4.10.2), including the JMA 5km mesh mesoscale analysis datasets and high-resolution radar / rain gauge-analyzed precipitation data were used in these calculations. Although the TT would not be doing dose computations directly for the UNSCEAR assessment, the members agreed that the best way to evaluate the suitability of the various meteorological analyses for the assessment was to actually use the meteorological data in Atmospheric Transport Dispersion and Deposition Models (ATDM) and compare the model predictions against radiological monitoring data.

4.10.2 The meeting noted that the TT consisted of participants from the Canadian Meteorological Centre (CMC), the U.S. National Oceanic and Atmospheric Administration (NOAA), the Met Office UK (UKMET), the Japan Meteorological Agency (JMA), and the *Austrian Zentralanstalt für Meteorologie und Geodynamik* (ZAMG). Representatives from the European Joint Research Centre (Ispra, Italy) were later invited to participate in the data analysis phase of the effort. The meeting expressed its appreciation to the experts from several WMO Members, who actively participated in this work, especially to Mr Roland Draxler and WMO Secretariat (Mr Peter Chen) for their leadership and guidance throughout the work of this TT.

4.10.3 The meeting noted that the work of the TT has been completed, and the methodology and results are presented in Annex III to its final report, which is available on the WMO website at [http://www.wmo.int/pages/prog/www/CBS-Reports/documents/WMO\\_fnpp\\_final\\_AnnexIII\\_4Feb2013\\_REVISIED\\_17June2013.pdf](http://www.wmo.int/pages/prog/www/CBS-Reports/documents/WMO_fnpp_final_AnnexIII_4Feb2013_REVISIED_17June2013.pdf). This report will contribute to the assessment of the radiation doses and associated effects on health and environment attributable to the Fukushima accident, being conducted by the UNSCEAR. While noting that a complete report was expected for the 68<sup>th</sup> session of the General Assembly in September 2013, due to recent changes in the source term (September 2013), the final report may be delayed until early 2014.

4.10.4 The meeting noted that this late change in the source term resulted in differences in the atmospheric transport and dispersion models (ATDM) results presented in the final WMO report

(Annex III to the final report of the Task Team) and the summary journal paper (Roland Draxler, Dèlia Arnold, Masamichi Chino, Stefano Galmarini, Matthew Hort, Andrew Jones, Susan Leadbetter, Alain Malo, Christian Maurer, Glenn Rolph, Kazuo Saito, René Servranckx, Toshiki Shimbori, Efisio Solazzo and Gerhard Wotawa, World Meteorological Organization's Model Simulations of the Radionuclide Dispersion and Deposition from the Fukushima Daiichi Nuclear Power Plant Accident, accepted Journal of Environmental Radioactivity) of the same results written independently by the TT outside of the WMO-UNSCEAR cooperation framework. WMO Annex III (Task Team report) used the UNSCEAR recommended source term (September 2012) while the TT JER article used the published Terada source term. The recent changes (September 2013) to the UNSCEAR source term were to make it more like the Terada one. Therefore, the TT results presented in the JER article are much closer to the current UNSCEAR results than those shown in Annex III (Task Team report). Furthermore, the Cs-137 source was not affected, only the I-131 emissions and therefore only the results on page 65 in Annex III (Task Team report) do not reflect the current source term.

#### **4.11 Status of the revision of the WMO Technical Note 170: “meteorological and Hydrological Aspects of Siting and Operations of Nuclear Power Plants”**

4.11.1 The meeting was informed that a Task Team on the revision of the WMO Technical Note 170 (TT-TN170) has recently been established, involving relevant WMO Technical Commissions (CBS OPAGs on DPFS and IOS, CCI, CHy, and JCOMM) and the IAEA. The member from USA actively participates in the work of this Task Team, being responsible for the preparation of the CBS/DPFS-related part of the publication, including on ERA aspects. The meeting noted that the TT-TN170 developed the table of contents (aligned with the IAEA Specific Safety Guide: “Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Facilities” (SSG-18, 2011, jointly sponsored with WMO)), and a plan for the completion of the revision of this publication. The revised publication will provide scientific and technical guidance on the access to, and analysis, interpretation and use of, meteorological and hydrological information on hazards, including the relevant aspects of climate variability and change, to support the assessment of the associated impacts on the safety of nuclear installations as well as the planning and risk management efforts concerned, as described in the SSG-18.

4.11.2 The meeting noted that, in accordance with the Task Team work plan, the relevant groups within the participating Technical Commissions will be invited to review the new draft (i.e. revised) publication by early 2014. The meeting therefore requested the WMO Secretariat and the member from USA to send the draft publication to all members of the Expert Team for review, with an indication of the timelines.

### **5. NON-NUCLEAR ERA**

#### **5.1 Review of actions from previous meeting (Melbourne, Australia, 2012)**

5.1.1 The co-chairperson, Mr James Fraser, reviewed the progress made relative to actions from the meeting of the *CBS Task Team on the Development of Operational Procedures for non-Nuclear Emergency Response Activities* (TT-DOP-nNERA, Melbourne, November 2012). The meeting agreed to continue to maintain a record of progress and to carry forward this list of actions, including adding new actions that have been identified from this meeting. The meeting noted that there are a number of actions that are valid for both nuclear and non-nuclear, such as those related to the WMO-TD 778, ERA web pages, the WMO Bulletin on ERA, and capacity building and outreach. The updated list of actions on non-nuclear ERA (October 2013) for the ET-ERA is found in Annex V.

#### **5.2 Report on the Exercise (2013)**

5.2.1 The meeting noted that the TT-DOP-nNERA meeting (Melbourne, November 2012) worked on a revised set of draft operational procedures for non-nuclear hazards, such as smoke from large fires and large chemical releases. The TT-DOP-nNERA stressed that this new draft set of

operational procedures should be tested in an exercise, and it was agreed that the main objective of the exercise would be to test operational procedures for request/reply for RSMC support for a non-nuclear emergency, rather than evaluate the accuracy of the models. This exercise also aimed to demonstrate and illustrate to the NMHSs involved the use of ATM in a significant incident for supporting decision-making, and demonstrate to CBS the practicability of the developed procedures. The exercise took place on 1 October 2013 and involved the RSMC Montreal and the National Meteorological Service of Argentina (*Servicio Meteorológico Nacional*). The assumed scenario and the results of this preliminary exercise to test the draft operational procedures to request RSMC support for a non-nuclear ERA are provided in Annex VI.

5.2.2 Based on the results presented in Annex VI, the meeting recommended:

- Modification/improvement of the draft request form, with improved formatting and possibly including check boxes to select options describing the incident;
- Clarification with NMHSs regarding what procedures they should follow upon receipt of dispersion products;
- Development and publicising of training materials on dispersion products for use in NMHSs;
- Running a full exercise, using a similar Argentinean release scenario but with involvement of NMHSs in neighbouring countries, ICAO aviation experts and notification of all RSMCs
- Information sharing between RSMCs and/or WMO on use of enhanced mapping products such as the OpenStreetMap tiles used by RSMC Montreal.

5.2.3 The meeting requested the chairperson, the co-chairperson and the member from Argentina to continue to work on the above aspects, including the planning and running of a full exercise, involving other members of the Expert Team, as appropriate.

### **5.3 Review of the operational procedures, with a view of proposing amendments to the Manual on the GDPFS (WMO-No. 485)**

5.3.1 The meeting reviewed the draft operational procedures for non-nuclear ERA, which were developed at the TT-DOP-nNERA meeting (Melbourne, November 2012). The proposed amendments are presented in Annex VII. The meeting stressed the need for further testing and evaluation of these procedures prior to submitting them for inclusion in the new *Manual on the GDPFS*. In this context, the meeting requested the chairperson, the co-chairperson and the member from Argentina to report back to the Expert Team on the results of the full exercise (see agenda item 5.2) and any potential amendments required to the draft operational procedures, for review and comments. The meeting also requested them to develop the “users” interpretation guide for non-nuclear ATM products provided by RSMCs as part of the *Manual on the GDPFS*.

### **5.4 Cooperation with other international organizations**

5.4.1 The meeting noted that developing linkages with relevant international organizations has been a challenge; however it also noted that WMO is developing arrangements with WHO on a broader context of emergencies, and ICAO has already been engaged on aspects related to sand and dust storms, and volcanic ash.

#### **ICAO**

5.4.2 The meeting noted that the needs of international civil aviation for meteorological information are defined in ICAO Annex 3 — *Meteorological Service for International Air Navigation / WMO Technical Regulations [C.3.1]*, which includes, *inter alia*, requirements for meteorological information on the occurrence or expected occurrence of atmospheric sand and dust storms, volcanic ash, and toxic chemicals, which are threats to aviation.

5.4.3 The meeting also noted that Amendment 76 to Annex 3/Technical Regulations [C3.1] proposes the introduction of criteria defining moderate and heavy sand and dust storms. The proposed criteria, developed in consultation with WMO, will assist Meteorological Watch Offices in

the preparation of SIGMET (and AIRMET) information for flight information regions. Amendment 76 to Annex 3 will become applicable on 14 November 2013. The meeting noted that, in principle, developments such as SDS-WAS and the designation of RSMC(s)-ASDF are of interest to ICAO, since they can be expected to advance the (meteorological) capabilities of States where sand and dust storms occur, and could in the future be used to improve Meteorological Watch Offices' capability to prepare SIGMET (and AIRMET) information. However, such support is not currently required by international civil aviation and therefore the costs associated with their development and operation cannot be recovered through air navigation service charges.

5.4.4 The meeting noted that the presence of smoke is to be included in local routine and special reports and in METAR and SPECI for the aerodrome. At this stage, no ICAO provisions in addition to those already referred are envisaged in respect of the presence of smoke.

5.4.5 The meeting noted that ICAO established, in consultation with WMO, an International Volcanic Ash Task Force (IVATF) during the Eyjafjallajökull eruption to urgently address the issues that had caused significant disruption to civil aviation in Europe, the North Atlantic and beyond. Over a period of 2 years, and complementary to an existing ICAO International Airways Volcano Watch Operations Group (IAVWOPSG), the IVATF worked on approximately 40 tasks to advance the scientific understanding and operational response to volcanic eruptions and volcanic ash in the atmosphere. The meeting also noted that Amendment 76 to Annex 3/Technical Regulations [C3.1] proposes the introduction of a requirement for States with active or potentially active volcanoes to ensure that the volcano observatory monitors these volcanoes – the existing provision only requires the monitoring of *active* volcanoes. A revision of ICAO's air traffic control procedures when volcanic ash is reported or forecast is expected to become applicable in November 2014 through an amendment to PANS-ATM (Doc 4444). The meeting noted that ICAO greatly appreciates the continued support of WMO and its Technical Commissions, in particular CAeM and CBS, in the continued advancement of the scientific understanding and operational (emergency) response to volcanic eruptions and volcanic ash in the atmosphere.

5.4.6 The meeting noted that, in respect of updated guidance, the ICAO *Handbook on the International Airways Volcano Watch – Operations Procedures and Contact List* (Doc 9766) and *Manual on Volcanic Ash, Radioactive Material and Toxic Chemicals* (Doc 9691) have undergone comprehensive review and, where necessary, revision. In addition, new guidance in the form of a *Manual on Flight Safety and Volcanic Ash – Risk Management of Flight Operations with Known or Forecast Volcanic Ash Contamination* (Doc 9974) has been published to provide guidance which States may recommend to operators and regulatory authorities where volcanic ash contamination may be a hazard for flight operations.

5.4.7 The meeting noted that the presence of a toxic chemical cloud may be included in an aerodrome warning, issued by an aerodrome meteorological office. It noted that following consultation with and assistance from WMO, appropriate guidance has been included in the ICAO *Manual on Volcanic Ash, Radioactive Material and Toxic Chemicals* (Doc 9691). The guidance highlights that airborne toxic chemicals are highly localized events and the associated hazardous effects are usually sudden and short-lived in nature. For this reason, they are dealt with typically at a local level to ensure adequate, immediate emergency response. Since the main potential impact at an aerodrome would be if the source of the chemical release was nearby, local arrangements within a State are considered to be the most efficient means to deal with the hazard. The new guidance in Doc 9691 cross-references to appropriate WMO guidance on emergency response activities contained within WMO-TD. 778, in particular Annexes 8 (Guidance on response to chemical incidents - definition of requirements concerning chemical incidents), 9 (Role of national meteorological services (NMSs) in response to chemical incidents) and 10 (Guidance for development of the interface between a national meteorological service and other emergency response agencies in case of chemical incidents).

## 5.5 Capacity development and outreach

5.5.1 The meeting noted that there are a number of web-based training modules on operational dispersion for non-nuclear, e.g.:

HYSPLIT: <http://www.ready.noaa.gov/HYSPLIT.php>  
<http://www.hysplit.com>

UCAR/COMET Training: [https://www.meted.ucar.edu/training\\_module.php?id=33](https://www.meted.ucar.edu/training_module.php?id=33)

U.S. EPA: <http://www.epa.gov/scram001/dispersionindex.htm>  
[http://www.epa.gov/ttn/scram/dispersion\\_prefrec.htm](http://www.epa.gov/ttn/scram/dispersion_prefrec.htm)

CAMEO/ALOHA: <http://www.epa.gov/osweroe1/content/cameo/index.htm>

DTRA/HPAC: [http://dtra.mil/docs/system-documents/2013\\_dnws\\_catalog.pdf](http://dtra.mil/docs/system-documents/2013_dnws_catalog.pdf)

that could be made available to NMHSs to ensure proper use of ATM for non-nuclear ERA. In this context, the meeting recommended that these materials be publicized among the NMHSs and the inclusion of these links on the WMO-TD. 778.

5.5.2 The meeting reiterated the comments from the previous Melbourne 2012 meeting regarding the requirement of atmospheric transport and diffusion models for some form of driving meteorological current conditions and/or predictions (NWP) to produce a forecast of the dispersion plume. Non-Nuclear dispersion emergencies are often localized in nature (less than 50 km), therefore, the NWP should resolve important local-scale flow features that could impact the dispersion forecast. Background on properly representing local-scale weather for dispersion calculations are described in WMO-TD. 778. Such flows such as land-sea breezes, mountain valley flows or other orographically induced flows often require high resolution meteorological analyses or predictions (under 10 km grid spacing), which have been made to a number of NMHSs within the framework of the Global Data-processing and Forecasting System (GDPFS) programme. These are also discussed in WMO-TN170. The meeting noted that even when such grids are available, they may not be coupled with available dispersion models for easy use. Therefore, and noting the list of meteorological models available through the GDPFS (see individual Annual WWW Technical Progress Reports on the GDPFS and the Annual Numerical Weather Prediction (NWP) Progress Reports at [http://www.wmo.int/pages/prog/www/DPFS/ProgressReports/2012/2011\\_GDPFS-NWP.html](http://www.wmo.int/pages/prog/www/DPFS/ProgressReports/2012/2011_GDPFS-NWP.html) and the summary of the Status the WMO Forecasting Centres relative to Numerical Models at [ftp://ftp.wmo.int/Documents/PublicWeb/www/gdpfs/GDPFS-NWP\\_Annualreports10/STATUSTA2010.doc](ftp://ftp.wmo.int/Documents/PublicWeb/www/gdpfs/GDPFS-NWP_Annualreports10/STATUSTA2010.doc)), the meeting recommended that guidelines for NWP model configuration for use in operational dispersion modeling be identified from that list, and reference be provided on the WMO web site for ERA and as part of the WMO-TN170.

## 6. ERA WEBSITE CONTENT AND STRUCTURE

6.1 The meeting noted that the TT-DOP-nNERA meeting (Melbourne, November 2012) provided a direction for the possible ERA website content and structure, including nuclear and non-nuclear aspects. It stressed the need for assistance by a member of the Expert Team to perform this task, which needs to be partly done at the WMO Secretariat, in Geneva, and therefore requested its members to check within their Services on the possibility of contributing to this task.

## 7. ANY OTHER BUSINESS (AOB)

### 7.1 Links to the work of the CBS Task Team on the Provision of Meteorological Assistance to Humanitarian Agencies

7.1.1 The meeting was informed that *CBS Task Team on the Provision of Meteorological Assistance to Humanitarian Agencies* was held in Geneva, in July 2013. Under its Terms of

Reference (TORs), this Task Team had to work on several areas which broadly included: the requirements for products and services by Humanitarian Agencies (HA), the development of “Global and Regional Arrangements”, and dissemination aspects. The meeting was informed that the co-chairperson of the ET-ERA is a member of this Task Team, so that the global and regional arrangements for the provision of meteorological assistance to Humanitarian Agencies could be built upon the lessons learnt from the ERA programme.

## **7.2 Other business**

7.2.1 The meeting recalled its request to WMO and IAEA Secretariats to consider the possibility of organizing a users’ meeting regarding requirements in the second half of 2014, and suggested that WHO be also engaged in this meeting.

7.2.2 The meeting noted that the WMO Commission for Aeronautical Meteorology (CAeM) has established, in collaboration with the International Union of Geodesy and Geophysics (IUGG), a Volcanic Ash Scientific Advisory Group to address scientific volcanic ash aspects, and was wondering whether a similar group should be established for dispersion, possibly under CBS, CAS or jointly.

7.2.3 The meeting noted that any future RSMC with activity specialization in response to non-nuclear environmental emergencies does not have to be an existing / designated RSMC with activity specialization in nuclear environmental emergency response, however they may consider individually proposing their designation to CBS, once the procedures are adopted.

7.2.4 There were no other issues raised during the meeting.

## **8. CLOSURE OF THE MEETING**

8.1 The CBS Meeting of the Expert Team on Emergency Response Activities (ET-ERA) closed at 14:50 on Friday, 25 October 2013.

## AGENDA

1. **OPENING OF THE MEETING**
2. **ORGANIZATION OF THE MEETING**
  - 2.1 Adoption of the agenda
  - 2.2 Working arrangements
3. **INTRODUCTION**
  - 3.1 Outcomes of CBS-15 (2012) and EC-65 (2013), including DPFS structure and ET Terms of Reference
  - 3.2 Report of the chair and co-chair on nuclear and non-nuclear ERA, respectively
4. **NUCLEAR ERA**
  - 4.1 Review of actions from previous meeting (Vienna, Austria, 2011)
  - 4.2 Status of operational implementation / activities of RSMCs / RTH Offenbach
  - 4.3 Cooperation with other international organizations (IAEA, ICAO, CTBTO)
  - 4.4 Improved product distribution / access methods
  - 4.5 User's requirements for products and services
  - 4.6 Public information
  - 4.7 Capacity development and outreach
  - 4.8 Ensemble atmospheric transport modelling
  - 4.9 Review of current procedures and standards, with a view of developing proposed amendments to the Manual on the GDPFS (WMO-No. 485)
  - 4.10 Report on the work of the Task Team on Meteorological Analyses for Fukushima-Daiichi Nuclear Power Plant Accident, including the publication: "The World Meteorological Organization's Evaluation of Meteorological Analyses for the Radionuclide Dispersion and Deposition from the Fukushima Daiichi Nuclear Power Plant Accident"
  - 4.11 Status of the revision of the WMO Technical Note 170: "meteorological and Hydrological Aspects of Siting and Operations of Nuclear Power Plants"
5. **NON-NUCLEAR ERA**
  - 5.1 Review of actions from previous meeting (Melbourne, Australia, 2012)
  - 5.2 Report on the Exercise (2013)
  - 5.3 Review of the operational procedures, with a view of proposing amendments to the Manual on the GDPFS (WMO-No. 485)
  - 5.4 Cooperation with other international organizations
  - 5.5 Capacity development and outreach
6. **ERA WEBSITE CONTENT AND STRUCTURE**
7. **ANY OTHER BUSINESS (AOB)**
  - 7.1 Links to the work of the CBS Task Team on the Provision of Meteorological Assistance to Humanitarian Agencies
  - 7.2 Other business
8. **CLOSURE OF THE MEETING**

## LIST OF PARTICIPANTS

<p>Mr René <b>SERVANCKX (Chairperson)</b>          Canadian Meteorological Centre (CMC)          Meteorological Service of Canada          Environment Canada          2121 Trans-Canada Highway          DORVAL, Quebec H9P 1J3  <b>Canada</b></p>	<p>Tel: + (1 514) 421 4704          Fax: + (1 514) 421 4679          Email: <a href="mailto:rene.servranckx@ec.gc.ca">rene.servranckx@ec.gc.ca</a></p>
<p>Ms Martina <b>SUAYA</b>          National Weather Service          25 de mayo 658          1002 Buenos Aires  <b>Argentina</b></p>	<p>Tel: + (54 11) 5167 6767          Fax: + (54 11) 5167 6767          Mobile: + (54 11) 6020 5001          Email: <a href="mailto:msuaya@smn.gov.ar">msuaya@smn.gov.ar</a></p>
<p>Mr James <b>FRASER</b>          Bureau National Operations Centre          Bureau of Meteorology          GPO Box 1289          Melbourne VIC 3001  <b>Australia</b></p>	<p>Tel: + (613) 9669 4039          Fax: + (613) 9662 1222          Email: <a href="mailto:j.fraser@bom.gov.au">j.fraser@bom.gov.au</a></p>
<p>Mr Günther <b>WINKLER</b>  <b>IAEA</b>          Vienna International Centre          PO Box 100          1400 Vienna  <b>Austria</b></p>	<p>Tel: + (43 1) 2600 22745          Fax: + (43 1) 26007 22745          Email: <a href="mailto:g.winkler@iaea.org">g.winkler@iaea.org</a></p>
<p>Dr Gerhard <b>WOTAWA</b>          Zentralanstalt für Meteorologie und          Geodynamik (ZAMG)          Hohe Warte 38          A-1191 VIENNA  <b>Austria</b></p>	<p>Tel: + (43 1) 36026 2007          Fax: + (43 1) 369 12 33          Email: <a href="mailto:gerhard.wotawa@zamg.ac.at">gerhard.wotawa@zamg.ac.at</a></p>
<p>Ms Monika <b>KRYSTA</b>  <b>CTBTO</b>          Vienna International Centre          P.O. Box 1200          1400 Vienna  <b>Austria</b></p>	<p>Tel: + (43 1) 2603 06405          Fax:          Email: <a href="mailto:Monika.krysta@ctbto.org">Monika.krysta@ctbto.org</a></p>
<p>Mr Nils <b>EK</b>          Canadian Meteorological Centre (CMC)          Meteorological Service of Canada          Environment Canada          2121 Trans-Canada Highway          DORVAL, Quebec H9P 1J3  <b>Canada</b></p>	<p>Tel: + (1 514) 421 7207          Fax: + (1 514) 421 4679          Email: <a href="mailto:nils.ek@ec.gc.ca">nils.ek@ec.gc.ca</a></p>

<p>Mr Greg <b>BROCK</b>  999, rue University, Montreal  Quebec, H3C 5H7  <b>ICAO</b>  <b>Canada</b></p>	<p>Tel: + (1 514) 954 8194  Fax: + (1 514) 954 6759  Email: <a href="mailto:gbrock@icao.int">gbrock@icao.int</a></p>
<p>Dr Zhenxin <b>SONG</b>  China Meteorological Administration (CMA)  National Meteorological Centre  46 Zhongguancun Nandajie  Haidian District  BEIJING 100081  <b>China</b></p>	<p>Tel: + (86 10) 6840 0477  Fax: + (86 10) 6840 0479  Email: <a href="mailto:songzx@cma.gov.cn">songzx@cma.gov.cn</a></p>
<p>Ms Gwenaëlle <b>HELLO</b>  Météo-France  Ave Coriollis, 42  31057 TOULOUSE  <b>France</b></p>	<p>Tel: + (33) 561 07 82 04  Fax: + (33) 561 07 82 09  Email: <a href="mailto:gwenaelle.hello@meteo.fr">gwenaelle.hello@meteo.fr</a></p>
<p>Dr Hubert <b>GLAAB</b>  Deutscher Wetterdienst (DWD)  P.O. Box 100465  63004 OFFENBACH  <b>Germany</b></p>	<p>Tel: + (49 69) 8062 2747  Fax: + (49 69) 8062 3721  Email: <a href="mailto:Hubert.glaab@dwd.de">Hubert.glaab@dwd.de</a></p>
<p>Mr Masami <b>SAKAMOTO</b>  Japan Meteorological Agency (JMA)  Numerical Prediction Division  1-3-4 Otemachi, Chiyoda-ku  TOKYO 100-8122  <b>Japan</b></p>	<p>Tel: + (81 3) 3211 8408  Fax: + (81 3) 3212 2057  Email: <a href="mailto:masami.sakamoto-a@met.kishou.go.jp">masami.sakamoto-a@met.kishou.go.jp</a></p>
<p>Dr Valery S. <b>KOSYKH</b>  RPA "Typhoon"  FEERC of Roshydromet  4, Pobedy str., 249038  Obninsk, Kaluga Region  <b>Russian Federation</b></p>	<p>Tel: +7 (48439) 71808  Fax: +7 (48439) 71674  Email: <a href="mailto:vsk@feerc.ru">vsk@feerc.ru</a></p>
<p>Mr Anton <b>MUSCAT</b>  Met Office  Fitzroy Road  Devon EX13PB  EXETER  <b>United Kingdom</b></p>	<p>Tel: (+44 1392) 886 033  Fax: (+44 1392) 884 549  Email: <a href="mailto:anton.muscat@metoffice.gov.uk">anton.muscat@metoffice.gov.uk</a></p>
<p>Mr Roland <b>DRAXLER</b>  NOAA Air Resources Laboratory  NCWCP / R / ARL  College Park, MD 20740  <b>United States of America</b></p>	<p>Tel: + (1 301) 683 1372  Fax: + (1 301) 683 1370  Email: <a href="mailto:roland.draxler@noaa.gov">roland.draxler@noaa.gov</a></p>

<p>Mr Jeffery <b>McQUEEN</b>  Environmental Modeling Center  NOAA – National Centers for  Environmental Prediction  World Weather Building  CAMP SPRINGS, Maryland (MD) 20746-  4325  <b>United States of America</b></p>	<p>Tel:  Fax:  Email:</p>	<p>+(1 301) 763 8000 ext 7226  +(1 301) 763 8545  <a href="mailto:jeff.mcqueen@noaa.gov">jeff.mcqueen@noaa.gov</a></p>
<p>Mr Glenn <b>ROLPH</b>  NOAA Air Resources Laboratory  NCWCP / R / ARL  College Park, MD 20740  <b>United States of America</b></p>	<p>Tel:  Fax:  Email:</p>	<p>+(1 301) 683 1376  +(1 301) 683 1370  <a href="mailto:glenn.rolph@noaa.gov">glenn.rolph@noaa.gov</a></p>
<p>Ms Barbara <b>STUNDER</b>  NOAA Air Resources Laboratory  NCWCP / R / ARL  College Park, MD 20740  <b>United States of America</b></p>	<p>Tel:  Fax:  Email:</p>	<p>+(1 301) 683 1374  +(1 301) 683 1370  <a href="mailto:barbara.stunder@noaa.gov">barbara.stunder@noaa.gov</a></p>
<p><b>WMO Secretariat</b>  7 bis avenue de la Paix  Case postale 2300  1211 GENEVE 2  <b>Switzerland</b></p>		<p><b>WWW website:</b>  <a href="http://www.wmo.int/web/www/www.html">www.wmo.int/web/www/www.html</a></p>
<p>Ms Alice <b>SOARES</b></p>	<p>Tel:  Fax:  Email:</p>	<p>+(41 22) 730 8449  +(41 22) 730 8128  <a href="mailto:asoares@wmo.int">asoares@wmo.int</a></p>

**UPDATED LIST OF ACTIONS ON NUCLEAR ERA (OCTOBER 2013)  
FOR THE ET-ERA**

**ACTION 1: ALL RSMCs, RTH Offenbach and WMO Secretariat**

**Update to Annex 4, WMO TD-No. 778**

**DUE DATE: 1 March 2014**

All will maintain the information regarding their respective Centres up-to-date in their mandatory annexes in the WMO Technical Note 778 on Environmental Emergency Response. The documentation should provide summary information on NWP model domains and resolution, and schedule regarding update cycles of NWP outputs that are used to feed the ATM. The WMO Secretariat will update the information on

<http://www.wmo.int/pages/prog/www/DPS/WMOTDNO778/Annex4.html>

**ACTION 2: WMO Secretariat**

**Plan to migrate from fax distribution of products to email/internet distribution of products**

**DUE DATE: ASAP**

Engage WMO Regional Offices and relevant groups within Regional Associations in follow up to circular letter from WMO Secretary-General that requested all Permanent Representatives to provide confirmation or nomination of contacts for its Delegated Authority, and for its Operational NMHS Contact Point, including name, title, telephone and fax number, and only one operational e-mail address.

**ACTION 3: All RSMCs**

**Common Web-pages**

1. RSMC Exeter to inform RSMCs, WMO and IAEA of the address of its mirrored Web-site and protocol to post products by the other RSMCs.
2. All RSMCs to add RSMC Exeter Web link on their respective mirrored Web-site.
3. All RSMCs, where local policy permits, to include an "all products" web link on mirrored-web page where an archive of modelling results will be maintained.
4. A meta-data Web page and directory will be used to post non-standard / initial response products and files, including GRIB-2 files.
5. NMC Vienna, and RSMCs Washington and Toulouse to work on producing basic products in GRIB, GRIB-2, BUFR and post on meta-data web link and distribute the information to the all RSMCs.
6. All RSMCs to explore producing basic products in geo-referenced format preferably shape files, KML or other file formats (with suitable viewer). Post on meta-data Web link.

**ACTION 4: RSMCs Beijing, Melbourne, Obninsk, Tokyo and Toulouse**

**Test TCM approach**

**DUE DATE: Q4/2014**

Apply the TCM approach used by WMO Task Team the Fukushima meteorological analyses. Results will be added to NOAA ARL's TT-Fukushima Website. Roland Draxler will provide software package.

**ACTION 5: RSMC Washington**

**Report on TCM approach**

**DUE DATE: next meeting ET-ERA**

Report on the feasibility of using the TCM approach in operational mode.

**ACTION 6: RSMC Washington (Jeff McQueen) WMO Secretariat**

**Revision of WMO Technical Note 170**

**DUE DATE: as needed**

Distribute draft document and request comments from Expert Team members with timeline.

**ACTION 7: Chair, Co-Chair and WMO Secretariat**

**Update to WMO Bulletin article on ERA**

**DUE DATE: Q3/2014**

Update WMO Bulletin article on ERA (January 2006) to further promote the programme.

**ACTION 8: IAEA and WMO SECRETARIAT**

**Cooperation agreement between IAEA and WMO**

**DUE DATE: 2015**

Pursue revision of the cooperation agreement between WMO and IAEA and consider how to provide support and technical assistance to IAEA/IEC in relation to atmospheric dispersion calculations and their interpretation, as well as the provision of weather forecasts.

**ACTION 9: WHO and WMO SECRETARIAT**

**Cooperation between WHO and WMO**

**DUE DATE: 2015**

Discuss the nature and the scope of the cooperation between the two agencies in the event of a nuclear emergency, in order to develop a joint Concept-of-Operations or Memorandum of Understanding between relevant departments of WMO and WHO.

**ACTION 10: RTH Offenbach**

**WNXX01 IAEA messages**

**DUE DATE: Q1/2014**

Document WNXX01 IAEA bulletins transmission and notification procedures with examples for inclusion in WMO TD-778 and on WMO ERA web pages.

**ACTION 11: WMO Secretariat**

**GIS database**

**DUE DATE: when available**

Provide a GIS database of WMO RA and States to IAEA and RSMCs.

**ACTION 12: WMO Secretariat**

**Eliminate multiple copies of WNXX01 IAEA message**

**DUE DATE: ASAP**

Coordinate with switching centres and report back to the Expert Team once issue is solved.

**ACTION 13: Chair, Co-Chair, RSMC Tokyo, WMO Secretariat and members ET-ERA**

**Review of Manual on the GDPFS**

**DUE DATE: 2 December 2013**

1. Review / finalize nuclear ERA aspects of new Manual with respect to nuclear ERA prior to its submission to TT-Manual meeting (mid-December 2013). All members of the Expert Team are welcome to provide any comments throughout the period, as appropriate.

2. That WMO's role as the technical authority for atmospheric dispersion modelling be strengthened in the revised *Manual on the GDPFS*.

**ACTION 14: Members of ET-ERA and WMO Secretariat**

**Public information**

**DUE DATE: 2 December 2013 if possible for (a) and (c); depends on availability of members for (b)**

- (a) Add to the Manual to the *Manual on the GDPFS* (in the global and regional arrangements) a short and general statement on the role of NMHSs once they receive products from RSMCs;
- (b) Further develop the WMO-TD. 778 on the use and interpretation of RSMC products, including examples, and guidance on how to communicate with the public (based on the IAEA publication);
- (c) Expand the text in the *Manual on the GDPFS* (in the global and regional arrangements) in relation to the RSMC support and advice to the WMO and the IAEA Secretariats in the preparation of public and media statements. The statements should address both weather and dispersion aspects. WMO Secretariat to coordinate with the Member State concerned and with the RSMCs, as appropriate, for preparing a consensus statement.

**ACTION 15: ICAO, WHO and IAEA**

**Response from IACRNE**

**DUE DATE: when available**

Answer to Expert Team on ERA regarding the questions raised by the CG-NERA (Vienna, November 2011) to IACRNE on possible guidance on radioactive clouds for aviation interests.

**ACTION 16: IAEA, RSMC Vienna and RSMC Montreal**

**Vertical and horizontal extent of radioactive plume**

**DUE DATE: Q4/2014**

Based on a realistic source term for a major event (Chernobyl or Fukushima), and to assist in the development of guidance on radioactive clouds for aviation interests, examine the horizontal and vertical extent of the radioactive plume for a few cases.

**ACTION 17: ALL RSMCs, RTH / RSMC OFFENBACH and WMO Secretariat**

**Annual Report**

**DUE DATE: REPORT FOR 2013 (2014) BY FEBRUARY 2014 (2014)**

All RSMCs and RTH Offenbach will produce and share an annual report to cover the calendar year. The report should be submitted to the Chairman of the Coordination Group by the end of February of the following year, for posting on the WMO Web-site for the ERA programme.

The contents of the Annual Report shall include, but not limited to:

- Introduction
- Operational contact information
- Responses and information on dissemination of products (fax, web-page access, which products were sent and time delay from point of notification)
- Exercises and routine tests
- Lessons learned from recent experiences
- Operational issues / challenges
- Summary / status of the operational atmospheric transport and dispersion model(s)
- Plans for the coming year

*WMO Secretariat will post the 2013 and 2014 reports on the ERA web pages.*

**ACTION 18: RSMCs and IAEA - RSMC Obninsk to lead coordination**

**Time of arrival products**

**DUE DATE: 2014**

**“Time of Arrival” Product Tests**

1. Consult with RSMCs about possible approaches for the TOA (“time of Arrival of Pollutant”) product beyond a few days (Q2/2014)
2. Conduct a test (Q4/2014) of the TOA with RSMCs once parameters are defined.

**ACTION 19: Chairperson in coordination / collaboration with WMO Secretariat and RSMCs**

**Updates to WMO TD-778 and WMO ERA web pages**

**DUE DATE: Depends on availability of members**

Check, review and update the ERA web pages and WMO TD-778. Produce and update as needed pdf version of WMO TD-778.

### **ACTION 20: RSMCs**

#### **RSMC tests with ENSEMBLE – RSMC Vienna to lead**

**DUE DATE: Q3/2014**

- RSMCs to start posting, on a voluntary basis, their modelling results in JRC Ispra ensemble format on the meta-data link of common Web pages.
- RSMC Vienna to be informed so that it can collate the results.
- RSMC Vienna will coordinate a RSMC-ENSEMBLE exercise for all RSMCs using forecasts and to be held in Q3/2014. The exercise will not be conducted in near real time. RSMCs will have 3 weeks to respond.

### **ACTION 21: IAEA and WMO Secretariat**

#### **Users' requirements meeting**

**DUE DATE: possibly in May 2014**

Organize a small users' meeting on requirements for RSMC products with NCAs, WHO and possibly other international organizations. This could be held around the time of the National Competent Authorities meeting in May 2014.

### **ACTION 22: IAEA**

#### **Wish list of RSMC products and support**

**DUE DATE: Q2/2014**

Based on lessons learned during Fukushima Daiichi, produce a list of RSMC products and support needed by the IAEA (i.e. higher resolution, long diagnostic runs with more realistic source term, etc.) and not currently defined in the Manual on the GDPFS.

### **ACTION 23: ALL**

#### **Quarterly IAEA – RSMC tests**

2014		2015	
20. Feb	Region VI and I	19. Feb	Region V
15. May	Region II	21. May	Region VI and I
21. Aug	Region IV and III	20. Aug	Region II
20. Nov	Region V	19. Nov	Region IV and III

Information on the planned tests for 2014 and 2015 will be published on the IAEA USIE Web site. GTS message will be sent with each quarterly test. Distribution of products will be done by Lead RSMCs to their region(s) of responsibility. IAEA will explore the possibility of coordination conference with RSMCs and IAEA to be considered and propose technical means of doing this.

### **ACTION 24: NMC VIENNA, CTBTO, WMO and Canadian Meteorological Centre (RSMC Montreal)**

#### **Transmission of CTBTO meteorological data on WMO GTS**

**DUE DATE: Ongoing**

1. NMC Vienna to continue take-over of transmission of data from Canadian Meteorological Centre to the WMO GTS.
2. WMO to provide identifiers to NMC Vienna as they become available.
3. NMC Vienna to finalize and distribute communication protocol and contact information between NMC Vienna, CTBTO, WMO and Canadian Meteorological Centre.

### **ACTION 25: CTBTO and RSMCs**

#### **SRS fields for CTBTO**

**DUE DATE: Ongoing**

1. RSMCs to test and implement at their earliest convenience modifications to upload their SRS to CTBTO.

2. CTBTO will contact RSMCs to investigate feasibility of enhanced spatial and temporal resolution of SRS fields and propose possible changes to the Manual on the GDPFS.

**ANNEX IV****PROPOSED AMENDMENTS TO THE PROCEDURES BY CTBTO****Changes to the upload system of the SRS fields**

The server which currently hosts the uploads of the SRS fields from the WMO RSMCs will be replaced with two new servers equipped with a considerable amount of disk space. One of the new servers will ensure the operational applications while the other one will be destined for the testing purposes.

This upgrade will be accompanied by changes to the upload mechanism. The new mechanism will be based on sftp. Each WMO RSMC will have a static username and password. The introduction of the new upload mechanism will require some script development on the RSMCs' side and subsequent testing. The WMO RSMCs will also have the possibility of downloading the SRS fields uploaded by all the RSMCs for a period of up to 30 days after an upload.

These modifications will imply changes to the PTS REQUEST FOR SUPPORT message. The changes are intended to be limited to the configurable lines in the body of the message as specified in the NOTIFICATION MAIL MESSAGE SENT OUT BY THE PTS TO WMO RSMCs in APPENDIX II-9-1 of the Manual. In particular, the changes proposed by the CTBTO will not affect the number of lines, nor their order.

The changes, with respect to the currently issued PTS REQUEST FOR SUPPORT message will be the following.

Section **Data upload** will take the following form

Data upload:  
[sftp://\\*\\*\\*\\*\\*](#)  
 yourusername  
 yourpassword

where 'sftp://\*\*\*\*\*' will be replaced with an sftp address on the new server. The entries 'yourusername' and 'yourpassword' will literally appear in the body of the message as placeholders since the username and password will be specific to each RSMC and will remain unchanged.

The form of the section **Download of information** will read

Download of information:  
[https://\\*\\*\\*\\*\\*](#)  
 Username  
 Password

where the https address, username and password will change to reflect the new location of the information.

In addition, CTBTO intends to abandon the present authentication procedure via posting the body of the PTS REQUEST FOR SUPPORT messages on CTBTO's website. Consequently, in section **For authentication purposes, this mail message is also available on the web site** the following will be posted

For authentication purposes, this mail message is also available on the web site  
**OBSOLETE – NO LONGER USED**

In the future this insecure authentication mechanism will be replaced by digitally signed e-mails.

The new servers hosting the future uploads are already available for testing. A paper version of the instructions on how to use those servers, as well as the RSMC-specific usernames and passwords, have been distributed at the meeting. The WMO RSMCs are invited to test the new upload mechanism starting from 1 November 2013. At present, CTBTO aims at completing the testing phase by 20 December 2013.

### **Cancellation of the PTS REQUEST FOR SUPPORT message**

In some very rare circumstances CTBTO needs to cancel its PTS REQUEST FOR SUPPORT message and we propose to introduce a short procedure of cancelling request messages.

In fact, a message as simple as having

```
===== PTS CANCELS REQUEST FOR SUPPORT =====
```

in the subject line and

```
===== PTS CANCELS REQUEST FOR SUPPORT =====
Date issued: YYYYMMDD hhmm
```

in its body could be issued.

The PTS REQUEST FOR SUPPORT message to be cancelled is identified by the Date issued information.

### **Date Issued entry at a PTS REQUEST FOR SUPPORT message**

At present, the body of the PTS REQUEST FOR SUPPORT message is produced automatically and the entry 'Date issued' reflects the time the message is created. The procedure of sending it out, however, involves human intervention. In order to account for the time needed to accomplish this procedure the entry 'Date issued' in the message is always manually aligned with the time instant the message is sent out.

On the other hand, according to the Manual on the GDPFS, APPENDIX II-9, the upload of the requested SRS fields is expected 'within 24 hours of reception' and not within 24 hours of 'Date issued'. Consequently, the way it is formulated now, the 'Date issued' information is not relevant to the estimate of the end of a 24-hour period within which the RSMCs respond with an upload of the SRS fields.

### **Amendment to the description of the SRS fields in the Manual of the GDPFS**

The format of the source-receptor sensitivity (SRS) fields is specified in the Manual on the Global Data-processing and Forecasting System (GDPFS). The text makes an explicit reference to the header of a file containing a requested SRS field. The description which can be found in the text at present is, however, not conform to the physical form of the header encoded in the files. In fact, a reference to the header entries at the position 11 and 12, namely horizontal grid space in x direction and horizontal grid space in y direction, is missing.

The amendment consists in replacing the current text, which can be found in APPENDIX II-9 and reads:

Line 1: Header line (station longitude, latitude, start of the measurement interval (YYYYMMDD hh), end of the measurement interval (YYYYMMDD hh), release strength (Bq), number of hours backward, output every "k" hours, time average of output, station name)

with

Line 1: Header line (station longitude, latitude, start of the measurement interval (YYYYMMDD hh), end of the measurement interval (YYYYMMDD hh), release strength (Bq), number of hours backward, output every "k" hours, time average of output, horizontal grid space in x direction, horizontal grid space in y direction, station name)

### **Finer spatial and temporal grids for the meteorological inputs and for the output SRS fields**

#### **NOTE: THIS REQUIRES FURTHER DISCUSSIONS WITHIN ET-ERA. SEE ACTION 24 IN ANNEX III.**

At present, the SRS fields at CTBTO are computed in two copies according to the source of the meteorological fields driving the simulations. The horizontal grid spacing of the meteorological fields used operationally is 1.0x1.0 degrees. As far as their temporal frequency is concerned

1. ECMWF meteorological fields are available every 3 hours
2. NCEP meteorological fields are available every 6 hours

CTBTO is currently working on a transfer of the operational computations of the SRS fields to a new hardware, which provides more computational power and an increased storage space. CTBTO envisages to transition to a new configuration of the operational system. This new configuration shall use the meteorological fields at a finer horizontal spatial grid and at a higher temporal frequency than present:

1. ECMWF meteorological fields shall be used at the horizontal grid spacing of 0.5x0.5 degrees and at 1 hour temporal frequency
2. NCEP meteorological fields shall ideally be used at the horizontal grid spacing of 0.5x0.5 degrees and at the highest available temporal frequency

The output grid of the SRS fields will be aligned with the spatial grid and temporal frequency of the ECMWF meteorological fields.

**ANNEX V**

**UPDATED LIST OF ACTIONS ON NON-NUCLEAR ERA (OCTOBER 2013)  
FOR THE ET-ERA**

**Area of Requirement: Development and testing of operational procedures**

**ACTION 1: Chairperson and Co-Chairperson, NMHS Argentina, ALL RSMCs and WMO Secretariat**

**Complete the drafting of operational procedures for significant non-nuclear incidents, including the minimum information on the characteristics of the ATM, and circulate it among TT members and other relevant experts, especially those responsible for the existing RSMCs**  
**DUE DATE: Early November 2013**

1. ET-ERA Chairperson, Co-chairperson and the member from Argentina to complete next draft of operational procedures with improved formatting and possibly including check boxes to select options describing the incident.

**DUE DATE: Early November 2013**

2. Secretariat to circulate the draft to RSMCs for comments

**DUE DATE: November 2013**

3. RSMCs to provide feedback

**ACTION 2: Chairperson and Co-Chairperson, NMHS Argentina, RSMC Montreal**

**Conduct full exercise comprising a simulated request from NMHS to RSMC for assistance during a large chemical fire. Further testing of non-nuclear ERA RSMC support procedure**

**DUE DATE: November 2013**

1. Engage NMHSs Uruguay & Brazil and regional ICAO office beforehand

**DUE DATE: November 2013**

2. RSMCs, NMHSs Argentina, Uruguay and Brazil to conduct full exercise. .

**DUE DATE: Late November 2013**

3. Chairperson, the co-chairperson and the member from Argentina to adjust and review request form as needed and to report back to the Expert Team on the results of the full exercise and any potential amendments required to the draft operational procedures, for review and comments. The meeting also requested them to develop the "users" interpretation guide for non-nuclear ATM products provided by RSMCs as part of the *Manual on the GDPFS*.

**Area of Requirement: Capacity building and ERA web-page**

**ACTION 3: RSMCs**

**Share information on improving mapping products**

**DUE DATE: Ongoing**

RSMCs to share information and techniques regarding generation of improved high-resolution mapping products for display of results

**ACTION 4: WMO Secretariat**

**Assist NMHSs in the interpretation of ERA-related products and their application by publicizing aspects covered by the WMO-TD. 778**

**DUE DATE: As soon as the WMO-TD. 778 is updated**

WMO Secretariat to send out a circular letter to WMO Members and an e-mail to the ERA contact points informing/publicizing the aspects covered by the WMO-TD. 778

**ACTION 5: TT members, RSMCs and WMO Secretariat**

**Advise the Secretariat on available n-NERA dispersion modelling capabilities from institutions in their RA area that can be ported to NMHSs**

**DUE DATE: Ongoing**

TT members, RSMCs to advise; Secretariat to post it on the WMO web site for ERA

**ACTION 6: WMO Secretariat**

**Enable access to web-based training modules**

**DUE DATE: Ongoing**

Publicize web-based training modules by inclusion of these links on the WMO-TD. 778.

**ACTION 7: Chairperson and Co-Chairperson, TT Members**

**Review and update the WMO web site for non-nuclear ERA, including updating the glossary**

**DUE DATE: November 2013**

1. ET-ERA Chairperson and co-chairperson to coordinate and identify TT members that could contribute and establish timelines;

**DUE DATE: December 2013**

2. TT members to check within their Services on the possibility of contributing to this task.

**DUE DATE: July 2014**

3. TT members to review and update the WMO website for non-nuclear ERA, including updating the glossary

**ACTION 8: WMO Secretariat and TT members**

**Promote the non-Nuclear programme via the WMO Bulletin**

**DUE DATE: Once the operational procedures for non-nuclear ERA are in place**

Update the WMO Bulletin article on ERA (January 2006) to further promote the programme

**ACTION 9: Jeff McQueen and WMO Secretariat**

**Enabling dispersion modelling capacity building**

**DUE DATE: Ongoing**

Develop guidelines for NWP model configuration for use in operational dispersion modeling, and provide reference on the WMO web site for ERA and as part of the WMO-TN170

**ACTION 10: Jeff McQueen and WMO Secretariat**

**Capacity building in NMHSs**

**DUE DATE: Ongoing**

Demonstrate transfer of the dispersion modelling capability to candidate NMHSs

**Area of Requirement: Work with International Organizations**

**ACTION 11: WMO Secretariat**

**Engage with relevant international organizations to determine requirements**

**DUE DATE: Ongoing**

Engage with relevant international organizations to promote the usefulness of ERA products and determine requirements

**ACTION 12: WMO Secretariat**

**Make international organizations aware of nNERA procedures**

**DUE DATE: Once the operational procedures have been established**

Make relevant international organizations aware of the operational procedures for non-nuclear ERA

**ACTION 13: WMO Secretariat**

**Publicise outcomes of nNERA exercise**

**DUE DATE: After the exercise**

Share the information of the outcomes / report of the exercise, which should include an item on potential implications to other relevant international organizations.

**ANNEX VI****SCENARIO AND SUMMARY OF THE RESULTS  
OF A PRELIMINARY NON-NUCLEAR EXERCISE****Scenario**

A smoke from industrial fire scenario was proposed and the location for the simulated fire was chosen to be the Campana-Zarate petrochemical plant in Argentina, which is located close to the Uruguay border. In the event of a major fire, trans-boundary impacts and/or effects on large population centres, such as the nearby cities of Buenos Aires and Rosario City, are quite likely.

Incident scenario was expected to include the following features:

- Use a real scenario, and run with real weather data on the decided date (one run for a few days);
- Involve NMHSs of Argentina, Uruguay and Brazil; inform other NMHSs in RA III and ICAO (to highlight the potential impacts to aviation);
- NMHS in Argentina will make one request, and one RSMC only (Washington or Montreal) will provide its products for one model run, while all RSMCs will be informed and produce their products to demonstrate the procedures, but will not share the information.

It was decided to hold a small preliminary test involving only NMHS Argentina and RSMC Montréal and to delay the plan for a more complete test to a later date. The limited test was conducted on 1 October 2013, with NMHS Argentina sending a request form to RSMC Montreal for an incident scenario involving a chemical fire at the Campana-Zarate petrochemical plant (located at 34.158° S, 58.948° W) commencing from 1445 UTC. The submitted request form is included in Appendix I to this Annex.

**RSMC response**Timeline

- 1505 UTC: Request for products form sent by NMHS Argentina via email.
- 1524 UTC: Request received in the RSMC Montreal email box (19 minute transmission delay).
- 1527 UTC: The reception was confirmed by RSMC Montreal via an email to NMHS Argentina.
- 1610 UTC: After completion of the dispersion calculations, an email response containing web links to modelling results and details was sent from RSMC Montreal to NMHS Argentina.

Output products

Two types of products were generated by RSMC Montreal for the release scenario. The first was a set of charts showing surface to 500m relative concentrations (dilution factors) as a function of time. These show the pollution plume dispersion every 10 minutes for the duration of the 12 hour forecast. Samples of these plots at 3-hourly intervals are shown in Figure 1 of Appendix II to this Annex.

The full set of animated images can be seen at

[http://eer.cmc.ec.gc.ca/people/eer/CDIOZ0mKSSPBHBnshzvh/60\\_Argentina\\_test/anim.html](http://eer.cmc.ec.gc.ca/people/eer/CDIOZ0mKSSPBHBnshzvh/60_Argentina_test/anim.html) and the individual images can be seen at [http://eer.cmc.ec.gc.ca/people/eer/CDIOZ0mKSSPBHBnshzvh/60\\_Argentina\\_test/](http://eer.cmc.ec.gc.ca/people/eer/CDIOZ0mKSSPBHBnshzvh/60_Argentina_test/).

Also supplied were charts showing Lagrangian particle height and position as a function of time, 3-hourly snapshots of which are shown in Figure 2 of Appendix II to this Annex

[http://eer.cmc.ec.gc.ca/people/eer/O3aDZuyldMI3nZZTrGk8/60\\_Argentina\\_test/anim.html](http://eer.cmc.ec.gc.ca/people/eer/O3aDZuyldMI3nZZTrGk8/60_Argentina_test/anim.html) and the Individual images can be seen at [http://eer.cmc.ec.gc.ca/people/eer/O3aDZuyldMI3nZZTrGk8/60\\_Argentina\\_test/](http://eer.cmc.ec.gc.ca/people/eer/O3aDZuyldMI3nZZTrGk8/60_Argentina_test/).

These charts are colour-coded to indicate the height of the individual particles (blue near the surface, cyan 100-200m, green 200-300m, orange 300-400m and red 400-500m. Note that in this particular case there is very little wind direction variation with altitude (i.e. wind shear) below 500m and this is why we see mostly red in the particle-height map as the other colours are hidden under the red particles.

## **Summary of the results and considerations**

### Request Timeline

This exercise used a slightly modified version of the request form which stipulated *“If RSMC does not confirm reception of request within 20 minutes, the requester shall phone the RSMC”* whereas the original draft procedures stated that *“The requester shall confirm reception of email at RSMC by phone”*. As it turned out, there was a 19 minute transmission delay before reception of the email which contributed significantly to the overall response time of 65 minutes.

The time step between the individual charts in the RSMC Montreal output products was 10 minutes. While this resulted in high quality animations, it may have extended the overall response time to some extent.

### Products

Feedback from the Argentina NMHS was very positive regarding the detailed map backgrounds used in the RSMC Montreal dispersion products. The inclusion of roads and town names were considered important to help put the location and extent of the pollutant plumes into context for users of the products. This is particularly true for localised events of short duration where there may be no coastlines or borders on the map to orient the user. Because of this, the simplified charts containing coastlines and borders only which are generated by most RSMCs for nuclear requests may not be suitable for shorter-range non-nuclear requests.

Self-contained dispersion maps are a basic product that should be viewable by any NMHS. However, some users may also be capable of displaying Geographical Information System (GIS) format files (e.g. shapefiles, GeoTIFF files, or KML/KMZ files for display in Google Maps). Shapefiles were initially specified in the minimum list of products in the draft procedures but a more general option (GIS-format) is now used. No GIS products were generated for this particular exercise.

### Notification of NMHSs

This exercise demonstrated the potential for international trans-boundary impacts resulting from the atmospheric transport of pollutants as, in this particular case, the hypothetical pollutant plume was forecast to cross the Uruguayan border within 2 hours of the incident start time.

For this preliminary exercise, the Uruguayan NMHS was not involved and the output products were not distributed to them but in a real event the NMHSs of all affected countries may need to be notified along with the original requesting NMHS. This is mentioned on the modified request form.

### NMHS training

Distribution of dispersion products to NMHSs within an affected Region raises various issues. Feedback from the Argentina NMHS suggested that meteorologists in general may not be familiar with dealing with these kinds of events and some training will be required on how to fill out the request form and what actions should be taken upon receipt of the products. This was discussed at the Melbourne 2012 meeting where it was agreed that training material for NMHS users need to be developed and make it available on the WMO ERA Web pages.

## Request Form

Feedback from the Argentina NMHS also stressed the importance of language and the ease (or difficulty) with which the request form can be filled out by States that may not necessarily use English as their first language. This is an important issue that the Team should discuss. Some possible ways to deal with this include:

- a) The Word form could be multilingual (e.g. for RAs III and IV using English, Spanish, Portuguese and French), and/or,
- b) Providing the form on an interactive Web page with a toggle for language (we could have as many languages as needed!). The person could fill the form in one language (e.g. Spanish) and the person at the RSMC would look at it in another (e.g. English).

Advice may be needed on the technical implementation of such a solution, e.g. would there be a single form page containing code for display of all required languages or should there be a separate version of the form page for each individual language? Use of multi-lingual pages would require development and maintenance effort on behalf of WMO, RSMCs and individual NMHSs.

To minimize writing (which could be a problem to decode from one language to another), it may be desirable to use check boxes with multiple choice options, e.g.

<b>Brief description of event:</b>		Comments
Explosion	<input type="checkbox"/>	.....
Fire	<input type="checkbox"/>	.....
Chemical Emission	<input type="checkbox"/>	.....
Other	<input type="checkbox"/>	.....
<b>Type of pollutant:</b>		
Fuel	<input type="checkbox"/>	.....
Gas	<input type="checkbox"/>	.....
Chemical Species	<input type="checkbox"/>	.....
Forest Fire	<input type="checkbox"/>	.....
Unknown	<input type="checkbox"/>	.....

Feedback from the Argentina NMHS also suggested that the RSMC contact details (i.e. email and phone number) should be included in the template. This would necessitate each Regional Association or even each RSMC having its own template.

## Aviation

The pollutant plume simulated in this exercise would have potentially impacted several regional airports near the cities of Carmelo and Dolores in Uruguay. The output products have been provided to ICAO contacts for their consideration and any comments regarding the usefulness of the products for aviation purposes.

## Update requests

It is possible that some incidents may continue for extended periods, particularly for smoke releases from forest fires. Extended incidents may require additional updates to the forecast products as the numerical guidance used to drive the dispersion model gets updated (typically every 6 or 12 hours for most RSMCs). However, for this preliminary exercise, the duration of the release was specified as 6 hours only and only a single request was sent.

If updated dispersion products are required, the simplest solution may be for the NMHS to make a second request indicating that this is update to the first one. It could be helpful for RSMCs to

indicate when new numerical guidance is expected to be available when sending the output products from an initial run.

**APPENDIX I TO ANNEX VI: Request form used for October 2013 non-Nuclear exercise**

**REQUEST FORM TO ACTIVATE RSMC SUPPORT FOR A NON-NUCLEAR EMERGENCY**

**ENVIRONMENTAL EMERGENCY RESPONSE ALERT  
REQUEST FOR WMO RSMC SUPPORT BY AUTHORIZED PERSON<sup>1</sup>**

1. This form should be sent by e-mail to the RSMC 24/7 operational contact in the Regional Association when support is needed for releases that have the potential for long-range impacts (distances greater than 50 km). The RSMC operational contact information is:

**rsmc.montreal@ec.gc.ca**

2. If RSMC does not confirm reception of request within 20 minutes, the requester shall phone the RSMC.

**Tel:**

3. The RSMC shall make available its products as soon as possible but within 2 hours. An email will be sent by the RSMC with information on where to access the products. The requester will confirm reception by email.

**DATE AND TIME OF REQUEST: 01/OCT/2013 15:00 UTC**

**1) MANDATORY INFORMATION:**

- Name, title, organization, Country, phone number and email of requester:

**Senior forecaster on duty: MS MARTINA SUAYA**

**EMAIL: msuaya@smn.gov.ar**

**National Weather Service, Argentina**

**54 11 51676767 ext: 18236**

- Brief description of event: *Explosion and fire at a petrochemical complex*
- Date and Start time of release (specify local time or UTC): *01 October 2013 1445 UTC*
- Location of release (as accurately as possible) in order of preference:
  - Latitude and longitude coordinates (as precise as possible; specify units as decimal degrees or degrees, minutes and seconds)  
*34.1580 South, 58.9480 West*
  - Address, city, Country  
*Zarate, Argentina*

**2) OTHER INFORMATION: If known, the following would be useful for the modelling and should be provided as well:**

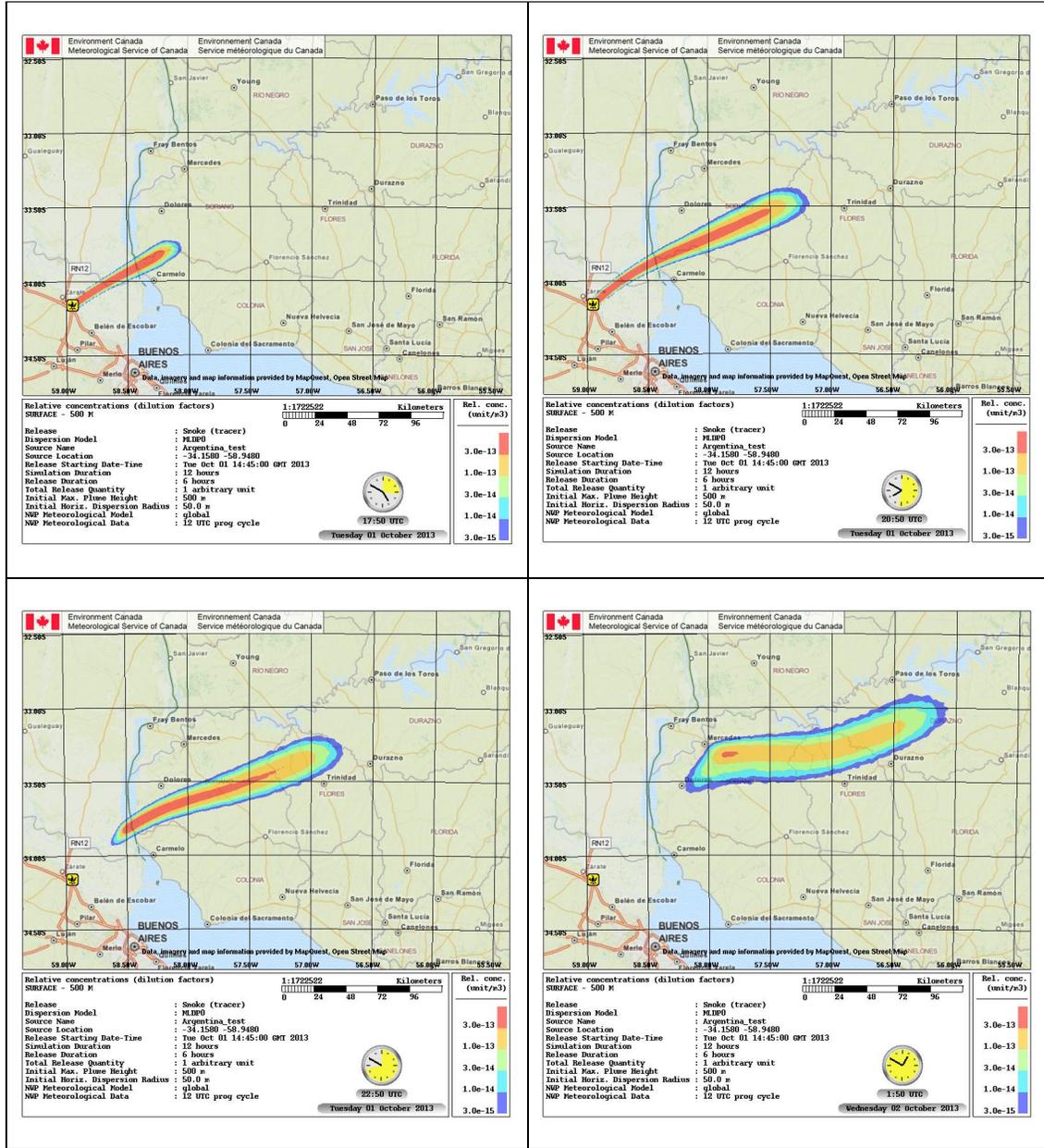
- Name of location (name of chemical plant, factory, etc.)  
*Zárate Campana petrochemical complex*

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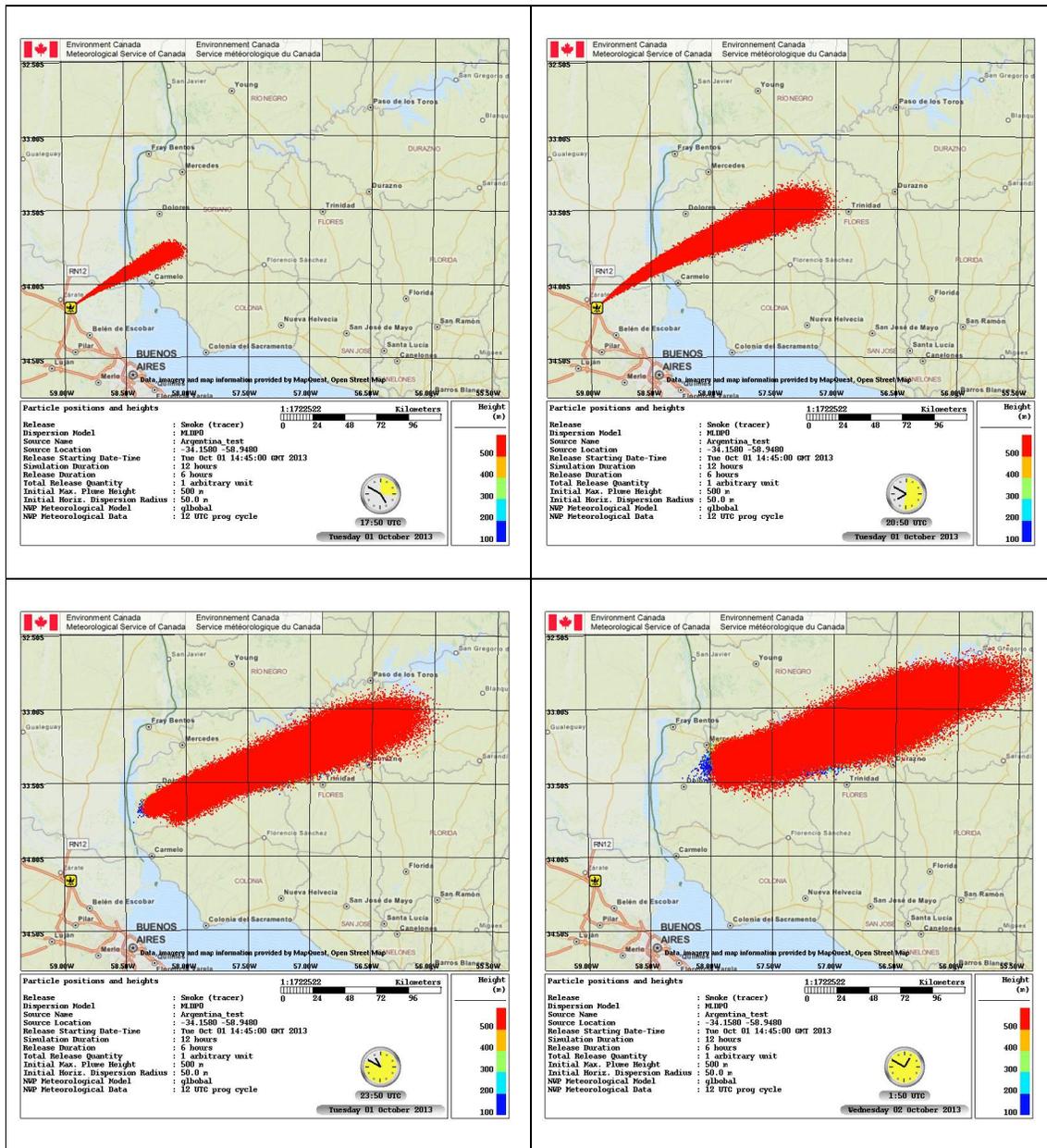
<sup>1</sup> The person authorized by the Permanent Representative of the WMO Member to request RSMC Support or from a relevant international organization

- Meteorological conditions at location at the start of the release (wind speed and direction / weather / cloudiness):  
*20/10kt, no significant weather, N=8/8 Cl=6 h=600mt*
- Name of pollutant(s) to be modelled if known. *If unknown, a tracer will be used.*  
*Unknown, but a large smoke cloud is drifting from the complex*
- Quantity (mass) or release rate (mass per unit time) of pollutant. *If unknown, one unit mass will be used.*  
*Unknown*
- Expected release duration. *If unknown, modeller will use default parameters or make a reasonable assumption.*  
*6 hours*
- Duration of simulation for the dispersion model run. *If not provided, modeller will use default parameters or make a reasonable assumption.*  
*12 hours*
- Size of area of interest (for example, within 300 km of source). *If not provided, modeller will use default parameters or make a reasonable assumption.*
- Base above the surface, dimension of release area and maximum height in meters reached by the pollutant (top of smoke plume for example). *If not provided, modeller will make a reasonable assumption.*  
  
*Base is near surface. Maximum height estimated at 500 m.*
- If quantity (mass) and name of pollutant(s) are provided, what concentrations should be displayed on modelling outputs? Please specify.
- Any other information that may be useful:  
**THIS IS A TEST**

**APPENDIX II TO ANNEX VI: Examples of products for a smoke cloud from a simulated explosion at the Zárate Campana petrochemical complex near Buenos Aires, Argentina.**



**Figure 1:** Dispersion charts showing the relative smoke concentrations (i.e. dilution factors) averaged between the surface and 500m for selected times after the start of the exercise a) +3 hours, b) +6 hours, c) +9 hours and d) +11 hours. The specified release duration was for the first 6 hours of the 12 hour simulation.



**Figure 2:** Dispersion charts showing the relative smoke concentrations (i.e. dilution factors) averaged between the surface and 500m for selected times after the start of the exercise a) +3 hours, b) +6 hours, c) +9 hours and d) +11 hours.

**ANNEX VII**

**PROPOSED AMEDMENTS TO THE DRAFT OPERATIONAL PROCEDURES  
FOR NON-NUCLEAR ERA**  
*(highlighted text)*

**ACTIVATION OF SUPPORT FOR NON-NUCLEAR EMERGENCY RESPONSE**

Environmental emergencies can be caused by a broad range of events with various temporal and spatial scales involving the release of hazardous substances into the environment. The scope of non-nuclear ERA includes: smoke from large fires, emissions from volcanic eruptions, and large chemical releases. Volcanic ash activities are covered under activity 2.2.6. Atmospheric Sand and Dust storms forecasts are covered under activity 2.2.10.

NMHSs may request RSMC support for releases that have the potential for long-range impacts. Long range is defined as distances greater than 50 km.

NMHSs or relevant international organizations requesting RSMC support shall:

- Request via the authorized person that an RSMC in the Regional Association concerned provides products relating to events in which hazardous non-nuclear contaminants have been released into the atmosphere.
- Requests should be made by e-mailing (faxing as backup) the completed form in Appendix A.II.2.2.9e to the appropriate Regional Centre(s) and confirming reception by phone.
- Provide the RSMCs with the essential information specified on the request form.
- NMHSs ~~only~~ will distribute the products within their State based on their national arrangements. **Depending on the situation, NMHSs may distribute products to other NMHSs if appropriate**

**REQUEST FORM TO ACTIVATE RSMC SUPPORT**

**ENVIRONMENTAL EMERGENCY RESPONSE ALERT  
REQUEST FOR WMO RSMC SUPPORT BY AUTHORIZED PERSON<sup>1</sup>**

4. This form should be sent by e-mail to the RSMC operational contact in the Regional Association when support is needed for releases that have the potential for long-range impacts (distances greater than 50 km). The RSMC operational contact information is available on [http://www.wmo.int/pages/prog/www/DPFSERA/transport\\_model\\_products.htm](http://www.wmo.int/pages/prog/www/DPFSERA/transport_model_products.htm) **(Note: Need to create web page for non-Nuclear RSMC contact details)**
5. **If RSMC does not confirm reception of request within 20 minutes, the requester shall phone the RSMC. The requester shall confirm reception of email at RSMC by phone.**
6. **The RSMC shall make available its products as soon as possible but within 2 hours. An email will be sent by the RSMC with information on where to access the products. The requester will confirm reception by email. The RSMC may decide to distribute the products to other NMHSs if appropriate.**

**DATE AND TIME OF REQUEST:**

**1) MANDATORY INFORMATION:**

---

<sup>1</sup> The person authorized by the Permanent Representative of the WMO Member to request RSMC Support or from a relevant international organization

- Name, title, organization, Country, email and phone number of requester:
- Brief description of event:
- Date and Start time of release (specify local time or UTC):
- Location of release (as accurately as possible) in order of preference:
  - Latitude and longitude coordinates (as precise as possible; specify units as decimal degrees or degrees, minutes and seconds)
  - Address, city, Country

**2) OTHER INFORMATION: If known, the following would be useful for the modelling and should be provided as well:**

- Name of location (name of chemical plant, factory, etc.)
- Meteorological conditions at location at the start of the release (wind speed and direction / weather / cloudiness):
- Name of pollutant(s) to be modelled if known. *If unknown, a tracer will be used.*
- Quantity (mass) or release rate (mass per unit time) of pollutant. *If unknown, one unit mass will be used.*
- Expected release duration. *If unknown, modeller will use default parameters or make a reasonable assumption.*
- Duration of simulation for the dispersion model run. *If not provided, modeller will use default parameters or make a reasonable assumption.*
- Size of area of interest (for example, within 300 km of source). *If not provided, modeller will use default parameters or make a reasonable assumption.*
- Base above the surface, dimension of release area and maximum height in meters reached by the pollutant (top of smoke plume for example). *If not provided, modeller will make a reasonable assumption.*
- If quantity (mass) and name of pollutant(s) are provided, what concentrations should be displayed on modelling outputs? Please specify.
- Any other information that may be useful, e.g. attach image of plume, weblinks to news articles.

### MINIMUM LIST OF PRODUCTS

Smoke from forest, or grass or peat fires (default values in Appendix A.II.2.2.9c will be used for source parameters not provided)

- Forecast duration 36 hours
- Relative concentrations<sup>1</sup> from surface to 200 m<sup>2</sup>
- Hourly images and Shapefile

<sup>1</sup> Absolute concentrations may be provided if an estimate of the total mass released or actual mass rate are provided.

<sup>2</sup> Unless specified otherwise

- Contouring to be determined based on specifics of the event  
 Contouring at 4 values (1.0E-17 to 1.0E-14 for a 1-unit release)

Smoke / chemical from industrial fire (default values for parameters not provided)

- Forecast duration 12 hours
- Relative concentration<sup>1</sup> from surface to 200 m<sup>2</sup>
- Hourly images and Shapefile
- Contouring to be determined based on specifics of the event

Chemical releases not involving fire (default values for parameters not provided)

- Forecast duration 12 hours
- Relative concentration<sup>1</sup> from surface to 200 m<sup>2</sup>
- Hourly images and Shapefile
- Contouring to be determined based on specifics of the event or the request

Backtracking

- Produce backtrajectories from point of interest for low levels based on specifics of the event or the request
  - Hindcast to 36 hour
- Image and Shapefile

All products shall include a list of parameters that were used for the dispersion modelling as listed in Appendix A.II.2.2.9f.

The RSMC will perform a quick assessment of the products before they are issued, and may provide a short explanatory message if any issues of concern are noted.

**NOTE: Additional products (e.g. GIS-format files) may be provided to requesting NMHSs if possible**

#### DEFAULT EMISSION SOURCE PARAMETERS

Scenario	Type of Event	Material released	Rate of Emission	Vertical Distribution
Forest, grass or peat fires	Smoke	Tracer	One unit per hour over 36 hours	Constant from surface to 500 m
Major industrial fire	Smoke / chemical	Tracer	One unit per hour over 6 hours	Constant from surface to 500 m
Chemical release not involving fire	Chemical	Tracer	One unit per hour over 6 hours	Constant from surface to 20 m
Other events	Variable	Tracer	One unit per hour over duration of release	Variable