

## SECTION 4 of WMO/TD-No. 778

*(Appendix II-7 to the Manual on the GDPFS, Supplement 11 (2007))*

### USERS INTERPRETATION GUIDE FOR ATMOSPHERIC TRANSPORT MODEL PRODUCTS PROVIDED BY RSMCs

#### Standards in the Provision of International Services by RSMCs for Nuclear Environmental Emergency Response

4.1 The Delegated Authority requests support from WMO Regional Specialized Meteorological Centres (RSMC) for atmospheric transport modelling products by using the form entitled "Environmental Emergency Response — Request for WMO RSMC Support by Delegated Authority". The Delegated Authority then sends the completed form immediately to the RSMCs as per the regional and global arrangements and ensures receipt of the form by phone. This will initiate a joint response from the RSMCs in their region of responsibility.

The International Atomic Energy Agency (IAEA) requests support from WMO RSMCs for atmospheric transport modelling products by using the form agreed between WMO and IAEA. The IAEA then sends the completed form immediately, by fax and by e-mail (preferred), to the RSMCs as per the regional and global arrangements and ensures receipt of the form by phone. The lead RSMCs shall confirm receipt of the IAEA request by fax or e-mail (preferred) to IAEA. This will initiate a joint response from the RSMCs in their region of responsibility. The IAEA sends an information copy of its Request Form by fax or by e-mail (preferred) to RTH Offenbach. When the lead RSMCs' products become available, the lead RSMCs shall send an announcement to the IAEA that their respective products are available and the products' location (RSMC's dedicated website), by fax or by e-mail (preferred).

The designated RSMCs shall implement agreed standard procedures and products by:

- (a) The provision of the following standard set of basic products within two to three hours of reception of a request and according to the general rules for displaying results;
- (b) The adoption of the following forecast periods for the numerical calculations;
- (c) The adoption of a joint response approach;
- (d) The adoption of the general rules for displaying results.

#### Default values to be used in response to a request for products for the unspecified source parameters<sup>1</sup>

- (a) Uniform vertical distribution up to 500 m above the ground;
- (b) Uniform emission rate during six hours;
- (c) Starting date/time: date/time specified at «START OF RELEASE» on request form or, if not available, then the «Date/Time of Request» specified at the top of the request form;

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<sup>1</sup> The adoption of default values is based on the understanding that some runs of the transport/dispersion models need to be carried out with default parameters because little or no information (except location) will be available to the RSMC at an early stage. RSMCs are, however, requested to conduct and propose subsequent model runs with more realistic parameters as they become available (products based upon updated parameters will be provided on request only or confirmed from IAEA or a Delegated Authority). This may, for example, refer to a more precise assumption of the vertical distribution or the need to conduct a model run for the release of noble gases.

- (d) Total pollutant release 1 Bq (Becquerel) over 6 hours;
- (e) Type of radionuclide Cs 137.

### **Basic set of products**

Five maps consisting of:

- (a) Three-dimensional trajectories starting at 500, 1500 and 3000 m above the ground, with particle locations at 6h intervals (main synoptic hours up to the end of the dispersion model forecast);
- (b) Time-integrated air borne concentrations in Bq.s m<sup>-3</sup> within the layer 500 m above the ground, for each of the three forecast periods;
- (c) Total deposition (wet + dry) in Bq m<sup>-2</sup> from the release time to the end of the dispersion model forecast.

A joint statement that will be issued as soon as available.

### **Forecast periods for numerical calculations**

The initial set of products will cover the period from T, the start time of the release, through a forecast of 72 hours from t, the start time of the current output from the operational NWP model.

The first 24-hour period for integrated exposures in the dispersion model will start at the nearest synoptic time (0000 or 1200 UTC) prior to or equal to T. Subsequent 24-hour integrations of the dispersion model will be made up to, but not exceeding, the synoptic time nearest to t+72.

If T is earlier than t, the first response will use hindcasts to cover the period up to t.

### **Joint response and joint statements**

A joint response means that the two collaborating RSMCs shall immediately inform each other of any request received; initially both should produce and send the standard set of products (charts) independently and then move rapidly towards providing fully coordinated response and services for the duration of the response. Following the initial response, the RSMCs shall develop and provide, and update as required, a "joint statement" to describe a synopsis of the current and forecast meteorological conditions over the area of concern, and the results from the transport models, their differences and similarities and how they apply to the event.

## **4.2 General rules for displaying results**

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

### **General guidelines for all maps:**

- (a) Provide labelled latitude and longitude lines at 10° intervals and sufficient geographic map background (shore lines, country borders, etc.) to be able to locate precisely the trajectories and contours;
- (b) Indicate the source location with a highly visible symbol (●, ▲, ✕, \*, ■, etc.);
- (c) Indicate the source location in decimal degrees (latitude - N or S specified, longitude - E or W specified, plotting symbol used), date/time of release (UTC), and, the meteorological model initialization date/time (UTC);

- (d) Each set of maps should be uniquely identified by at least product issue date and time (UTC). And issuing centre
- (e) Previously transmitted products from the dispersion model need not be re-transmitted.
- (f) Indicate with a legend if this is an exercise, requested services or an IAEA notified emergency

**Specific guidelines for trajectories map:**

- (a) Distinguish each trajectory (500, 1500, 3000 m) with a symbol (▲, ●, ■, etc.) at synoptic hours (UTC);
- (b) Use solid lines (darker than map background lines) for each trajectory;
- (c) Provide a time-height (m or hPa) diagramme, preferably directly below the trajectory map, to indicate vertical movement of trajectory parcels.

**Specific guidelines for concentration and deposition maps:**

- (a) Adopt a maximum of four concentration/deposition contours corresponding to powers of 10;
- (b) A legend should indicate that contours are identified as powers of 10 (i.e.,  $10^{-12}$ ). If grey-shading is used between contours, the individual contours must be clearly distinguishable after facsimile transmission and a legend provided on the chart;
- (c) Use solid dark lines (darker than map background lines) for each contour;
- (d) Indicate the following input characteristics: (i) source assumption (height, duration, isotope, amount released); (ii) the units of time integrated concentration ( $\text{Bq}\cdot\text{s m}^{-3}$ ) or deposition ( $\text{Bq m}^{-2}$ ). In addition, charts should specify: (i) "Time integrated surface to 500 m layer concentrations"; (ii) "Contour values may change from chart to chart"; and if the default source is used; (iii) "RESULTS BASED ON DEFAULT INITIAL VALUES";
- (e) Indicate, if possible, the location of the maximum concentration/deposition with a symbol on the map and include a legend indicating the symbol used and maximum numerical value;
- (f) Indicate the time integration starting and ending date/time (UTC).

The RSMCs will normally provide the products in the ITU-T T4 format suitable for both group 3 facsimile machines and transmission on parts of the GTS. The RSMC may also make use of other appropriate technologies.

**Guidance and explanations on models and specific products issued by each RSMC**

4.3 *Annex 4 presents information about the models and explanations on the specific products issued by each RSMC for the default release scenario.*

4.4 *A word of caution is needed about the interpretation of the model outputs. The default scenario is based on a hypothetical source as specified in paragraph 4.1 above. For an IAEA notified emergency, the source information may remain unknown. The users should bear these in mind when analyzing the outputs. Although the models are run from high quality NWP models, inherent uncertainties must be considered as a result of the default scenario conditions and the atmospheric conditions. The interpretation of the model outputs must be done with this in*

*mind, given the fact that the source strength and duration are usually not known. The interpretation should be done with the help of an experienced meteorologist having a strong background in synoptic meteorology and also desirably with a background in atmospheric dispersion. For an IAEA notified emergency or when better estimates of the source are available, caution is advised as to the interpretation of the outputs. This being said, model outputs offer the best available guide in a first response situation to the question of long-range atmospheric dispersion and transport of radioactive clouds. Radiological observations should be used as soon as they become available to provide collaborative information with model outputs.*

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