International Civil Aviation Organization

FIFTH MEETING OF THE ASIA/PACIFIC METEOROLOGICAL HAZARDS TASK FORCE (MET/H TF/5)

Seoul, Republic of Korea, 18 – 20 March 2015

Agenda Item 3: Guidance material

THE ASIA/PACIFIC REGIONAL GUIDANCE ON THE ISSUANCE OF SIGMET FOR RADIOACTIVE CLOUD

(Presented by the Rapporteur, MET/H TF, Ad Hoc Group)

SUMMARY

This paper discusses the guidance on the issuance of SIGMET for radioactive clouds.

1. INTRODUCTION

1.1 The sixteenth edition to Annex 3, *Meteorological Service for International Air Navigation*, introduced the Radioactive Cloud (RDOACT CLD) as a phenomenon for the SIGMET in November 2007. The first SIGMET for radioactive cloud was issued in March 2011, in response to the accidental release of a radioactive cloud from the Fukushima Nuclear power plant in Japan. The Fukushima plant was damaged by the great earthquake and tsunami on March 11.

1.2 While Annex 3 is amended to allow for the provision of SIGMET for radioactive cloud, it is also recognized that there would be a need to develop guidance on how to provide this information. Therefore, the Forth Meeting of the Asia/Pacific Meteorological Hazards Task Force (MET/H TF/4) agreed to form an ad-hoc group comprising China (Rapporteur), Hong Kong-China and Japan to develop guidance for possible inclusion in the Regional SIGMET Guide on the issuance of SIGMET for radioactive cloud (Agreed action 4/6 refers).

2. DISCUSSION

2.1 Sources of information to issue SIGMET for radioactive cloud

2.1.1 From the local authority, such as State Emergency, Nuclear and Radiation Safety Center and etc., the Meteorological Watch Offices (MWO) may get the information of the release of radioactive material into the atmosphere.

2.1.2 The World Meteorological Organization (WMO) has designated "Regional Specialized Meteorological Centers" (RSMCs) with the specialization to provide atmospheric transport model products for environmental emergency response (*Manual on Volcanic Ash,*

Radioactive Material and Toxic Chemical Clouds, Doc 9691). During nuclear incidents the RSMCs provide real-time 24/7 specialized atmospheric dispersion model products for Environmental Emergency Response (EER). The RSMC's atmospheric transport model products are sent to the WMO Member States, other RSMCs, the WMO and the IAEA. There are 8 RSMCs over the world, and three of them in Asia/Pacific region, which are Beijing, Melbourne and Tokyo.

2.1.2.1 Standard products of RSMC provide seven maps consisting of:(according to the *RSMC SUPPORT FOR ENVIRONMENTAL EMERGENCY RESPONSE* (WMO/TD-No.778))

(a) Three-dimensional trajectories starting at 500, 1 500 and 3 000 m above the ground, with particle locations at six-hour intervals (main synoptic hours up to the end of the dispersion model forecast);

(b) Time-integrated airborne concentrations within the layer 500 m above the ground, in Bq s m–3 for each of the three forecast periods;

(c) Total deposition (wet + dry) in Bq m–2 from the release time to the end of each of the three forecast periods.

2.1.2.2 The shortages of the products of RSMCs:

(a) It would be uncertain about the concentrations in the products of RSMCs. The default value (radioactive release of 1 Bq (Becquerel) over six hours) would be used in transport/dispersion models, due to little or no information (except location) available to the RSMC at an early stage. RSMCs are, however, requested to conduct 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).

(b) The temporal resolution of RSMCs is not sufficient for issuing SIGMET. The intervals of forecast trajectories are 6 hours. The intervals of forecast 24-hourly average exposure maps are available every 24 hours. But the period validity of SIGMET for radioactive cloud is valid for only 4 hours.

(c) The products of RSMC are lacking of vertical extent information of radioactive materials. Although a time-height (m or hPa) diagram is provided to indicate vertical movement of trajectory parcels (not the forecast concentration), the vertical extent of radioactive cloud is still unknown.

2.1.3 Other relevant information of radioactive materials release incident: information from owner or operator of the nuclear facility, local radioactive measurements, dispersion modeling results, Information from International Atomic Energy Agency (IAEA).

2.2 Criteria to issue SIGMET for radioactive cloud

2.2.1 For safe protection of human (pilots, crews, passengers), a threshold of total concentration that would start impacting health is necessary. Inter-Agency Committee on Radiological and Nuclear Emergencies (IACRNE) is tasked to establish that. As could be seen from the discussion of the previous IAVWOPSG (IAVWOPSG/8), efforts are still on-going to establish that.

2.2.2 According to the survey undertaken in 2014 in response to MET/H TF/3 Action Agreed 3/1, only 1 State has specified thresholds for issuance of SIGMET (MET/H TF/4 – WP/03).

2.3 **Some initial thoughts on the guidance on the issuance SIGMET for radioactive cloud in current situation**

2.3.1 To err on the safe side, MWOs should issue the SIGMET for radioactive cloud, once the release of radioactive materials can be confirmed and is likely to affect its FIR. Some initial thoughts on the guidance on the issuance of SIGMET for radioactive cloud are listed below.

2.3.2 It is noted that RSMCs would need time to prepare the EER products. Even if the EER products are produced, due to the lack of source term information during the initial phase, it would be very difficult to determine where the line for protection should be drawn.

2.3.3 Drawing from the Fukushima experience, the SIGMET information should be consistent with the action taken by the national/local radioactive protection authority, otherwise the inconsistency may cause significant disturbance. For States where there is no national/local radioactive protection authority, the ad-hoc group noted the establishment of an urgent protective action zone as recommended by IAEA in its requirements document *IAEA GS-R-2 Preparedness and Response for a Nuclear or Radiological Emergency*, which is 5 to 30 km radius, and would suggest to adopt a 30 km radius as a default.

2.3.4 Once EER product and a reasonable estimate of the source term are available, for States where there is no national/local radioactive protection authority, the EER product, supplemented by local information where available could form the basis of the SIGMET. Again drawing from the Fukushima experience, a 0.1 micro Sv per hour could be considered for adoption as the threshold for the boundary of radioactive cloud.

2.3.5 However, according to the Recommendation 2/8 of MET/14, provisions for information on the release of radioactive material into the atmosphere will be developed in the MET Panel/an appropriate ICAO expert group. It would be desirable to refer the issues above to the MET Panel/an appropriate ICAO expert group and develop guidance in accordance with the provisions on the long term.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information provided in this paper; and

b) discuss any relevant matters as appropriate, such as the threshold value for SIGMET, vertical extent of radioactive materials, etc.

– – – – – – – – – – –

ATTACHMENT

Figure 1. 8 RSMCs

Figure 2. RSMC Beijing

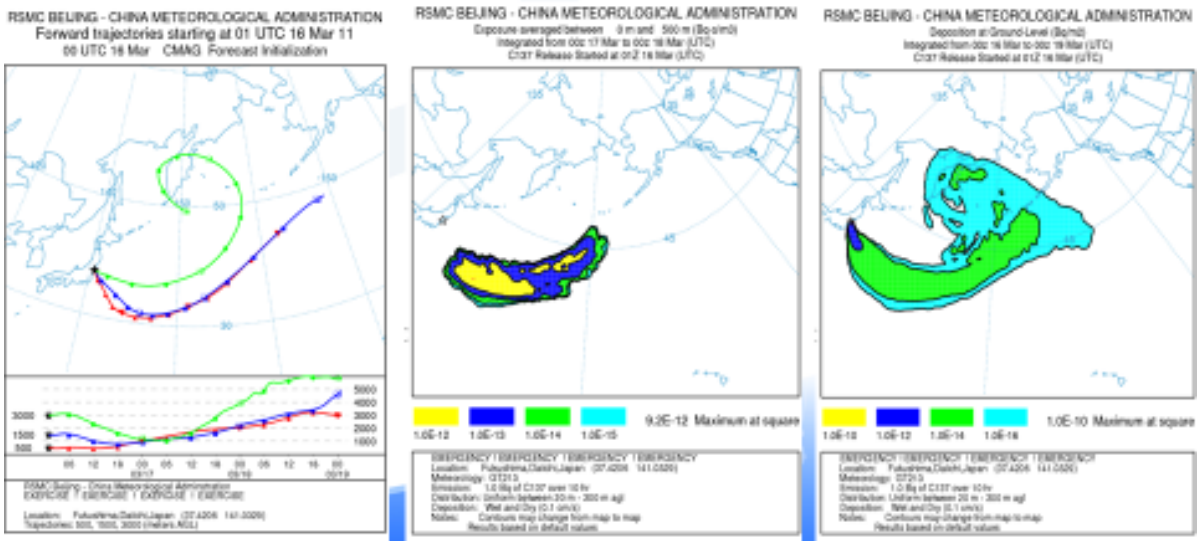

Figure 3. The products issued by RSMC Beijing

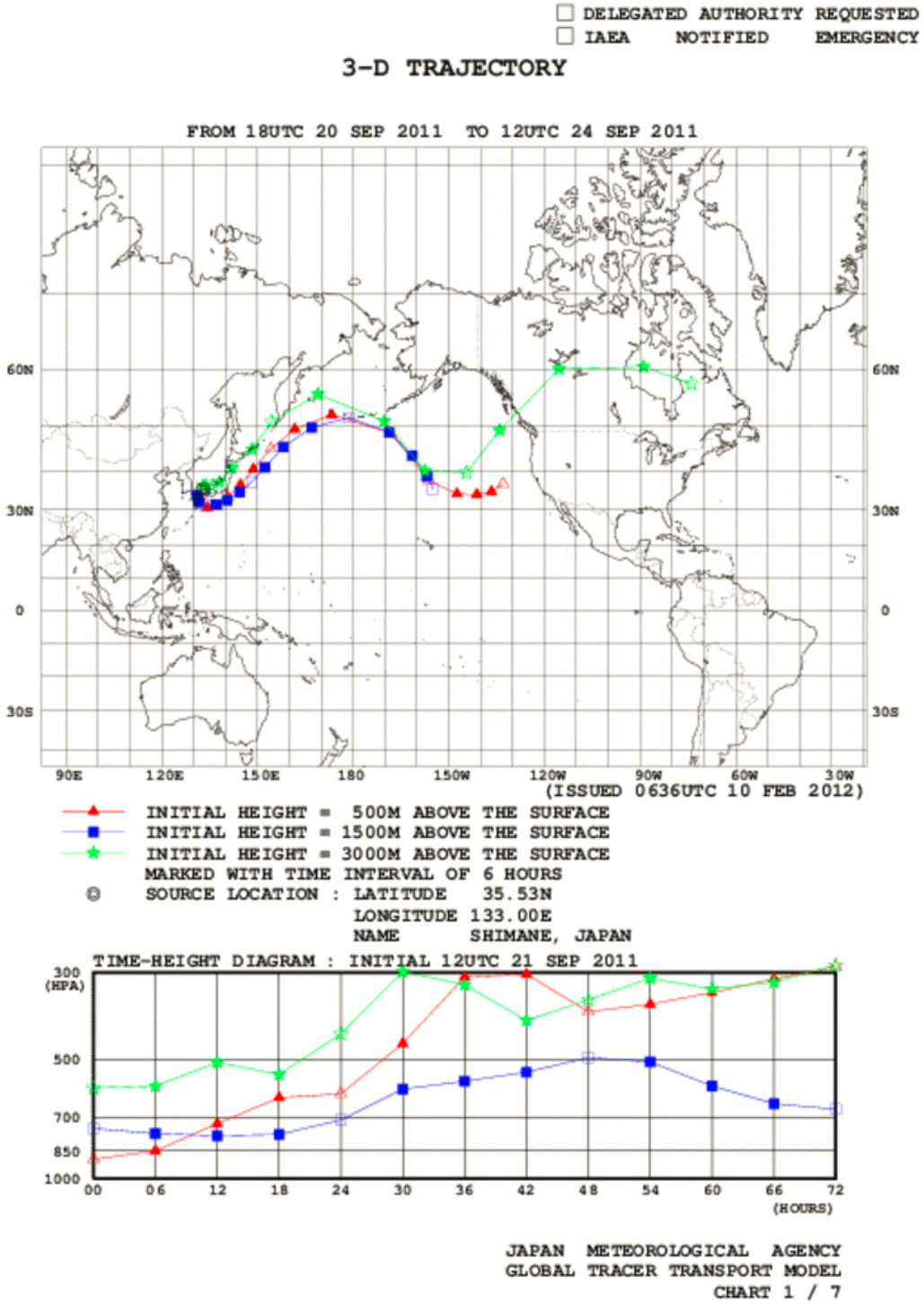

Figure 4. The charts of 3-D trajectories issued by RSMC Tokyo

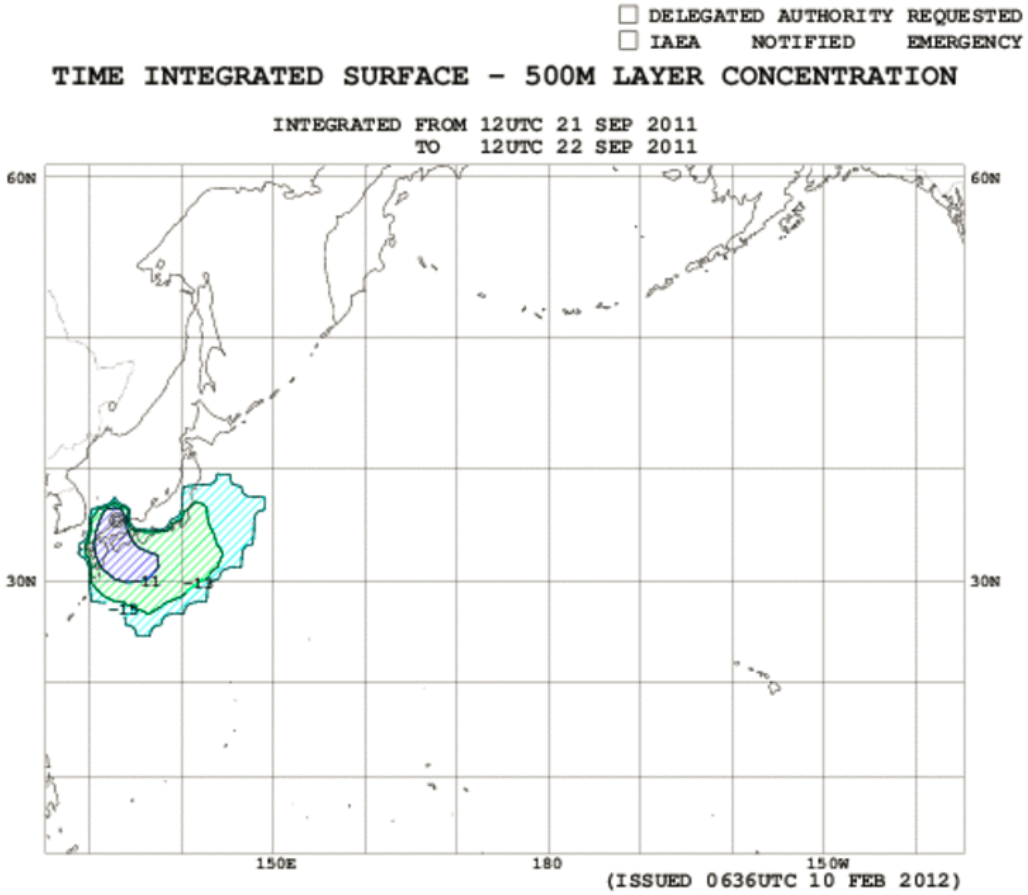

Figure 5. The chart of time integrated pollutant concentrations issued by RSMC Tokyo