Annex II of Technical Volume 4
LOCAL AND REGIONAL METEOROLOGICAL CONDITIONS IN EAST JAPAN DURING 11–23 MARCH 2011

The World Meteorological Organization (WMO) established a task group to consider the meteorological factors influencing the assessment of doses from the releases from the Fukushima Daiichi accident. This involved consideration of the weather patterns during the period of releases and the summary in this annex is drawn directly on this analysis, presented in Ref. [II–1]. The task group also undertook a detailed evaluation of the meteorological analyses for radionuclide dispersion and deposition arising from the accident [II–2], which included a comparison of the results of different Atmospheric Transport Dispersion and Deposition Models (ATDM) and with environmental monitoring data.

II–1. SUMMARY OF WEATHER PATTERNS

A weak pressure passed over East Japan from 9 to 11 March 2011. A high pressure system then moved eastwards along the south coast of Honshu from 11 to 13 March, followed by a weak low pressure system which moved eastwards off the south coast from 13 to 15 March. This then moved towards the north-east and developed rapidly after 15 March. Subsequently, a low pressure system passed over Honshu from 20 to 22 March (Fig. II–1).

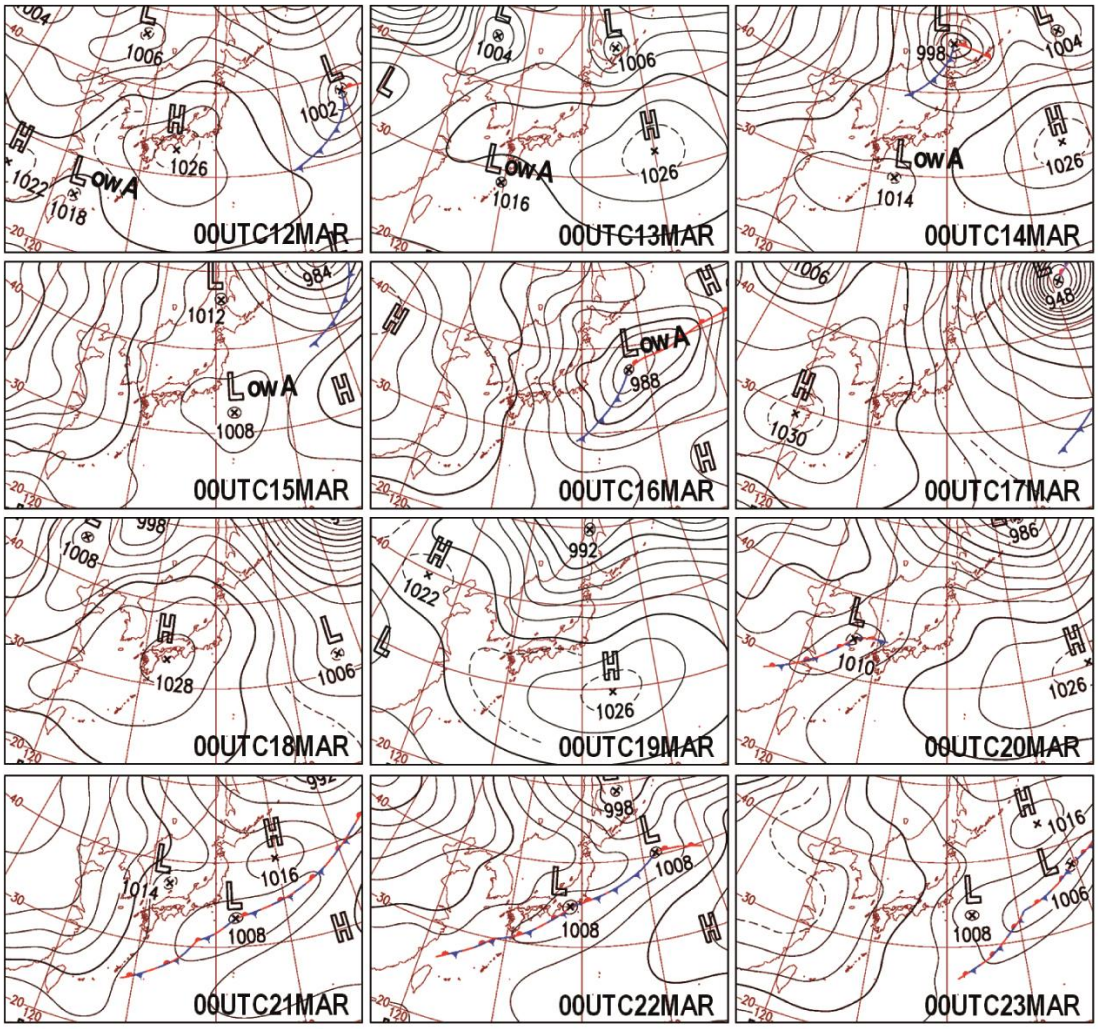


FIG. II–1. Surface weather chart at 00:00 UTC (09.00 JST) from March 15 to 17 March 2011 (upper row) and from 21 to 23 March 2011 (lower row) [II–3] (Illustrations courtesy of Meteorological Research Institute).

II–2. PATTERN OF PRECIPITATION OVER EAST JAPAN

Light rains were observed in the morning of 12 March and from 15 March to the morning of 17 March, due to passage of weak low pressure systems over East Japan and towards the east (off the south coast of Honshu), respectively. Moderate rains occurred in the Kanto area from 20 to 23 March from a low pressure system which passed over Honshu (Fig. II–2).

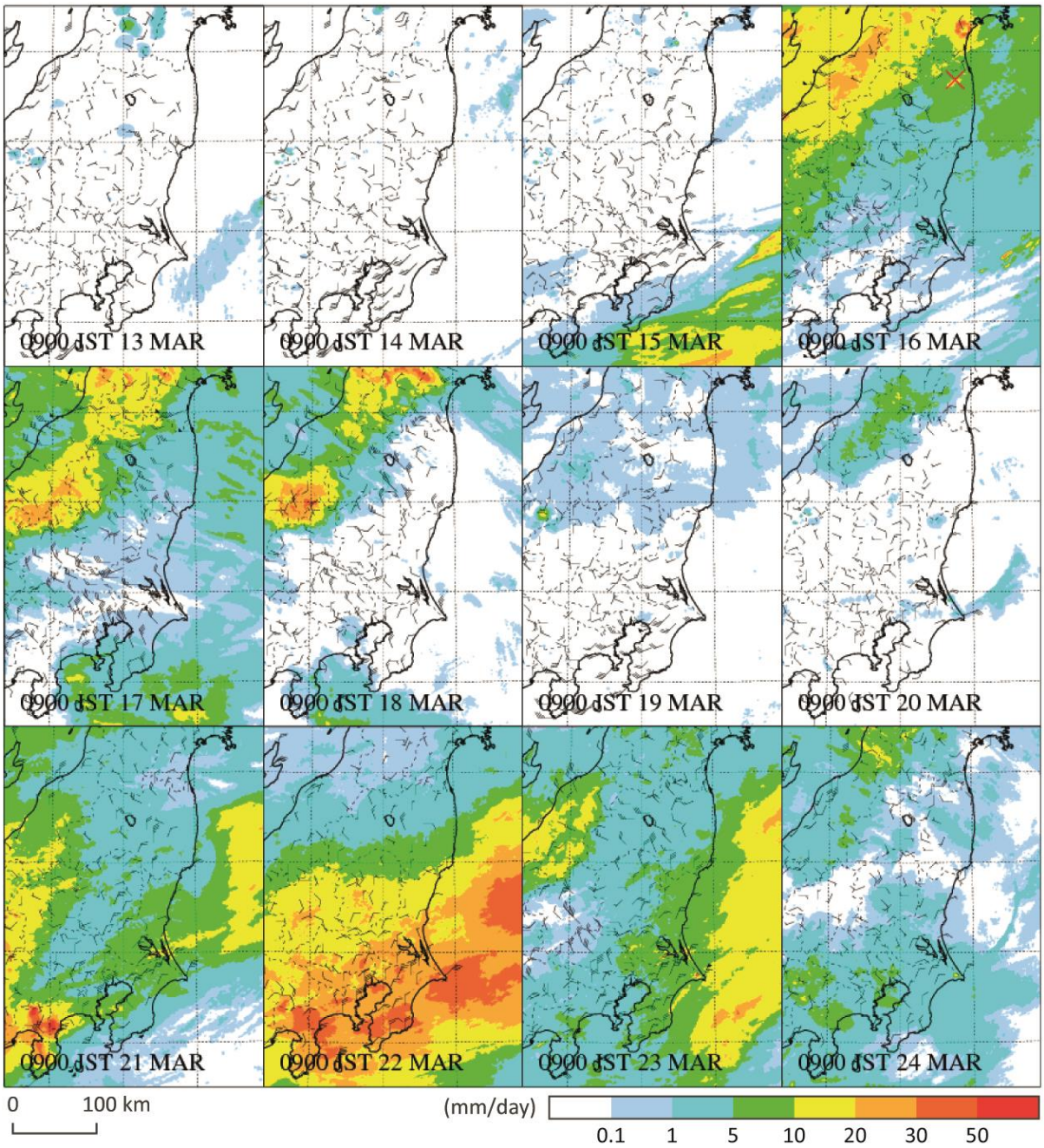


FIG. II–2. Twenty-four hour accumulated precipitation amount and observed surface winds at 00:00 UTC (09:00 JST) for 15–24 March 2011 [II–3] (Illustrations courtesy of Meteorological Research Institute).

II–3. MESOSCALE ANALYSIS OF WIND PATTERNS

Winds of 950 hPa[1] were from a westerly direction until the morning of 15 March, when they changed to come from a NN-Easterly direction during the daytime. After 15:00 JST on 15 March, the wind direction changed again to come from an ES-Easterly direction before it changed to come from the North after 00:00 JST on 16 March (Fig. II–3).

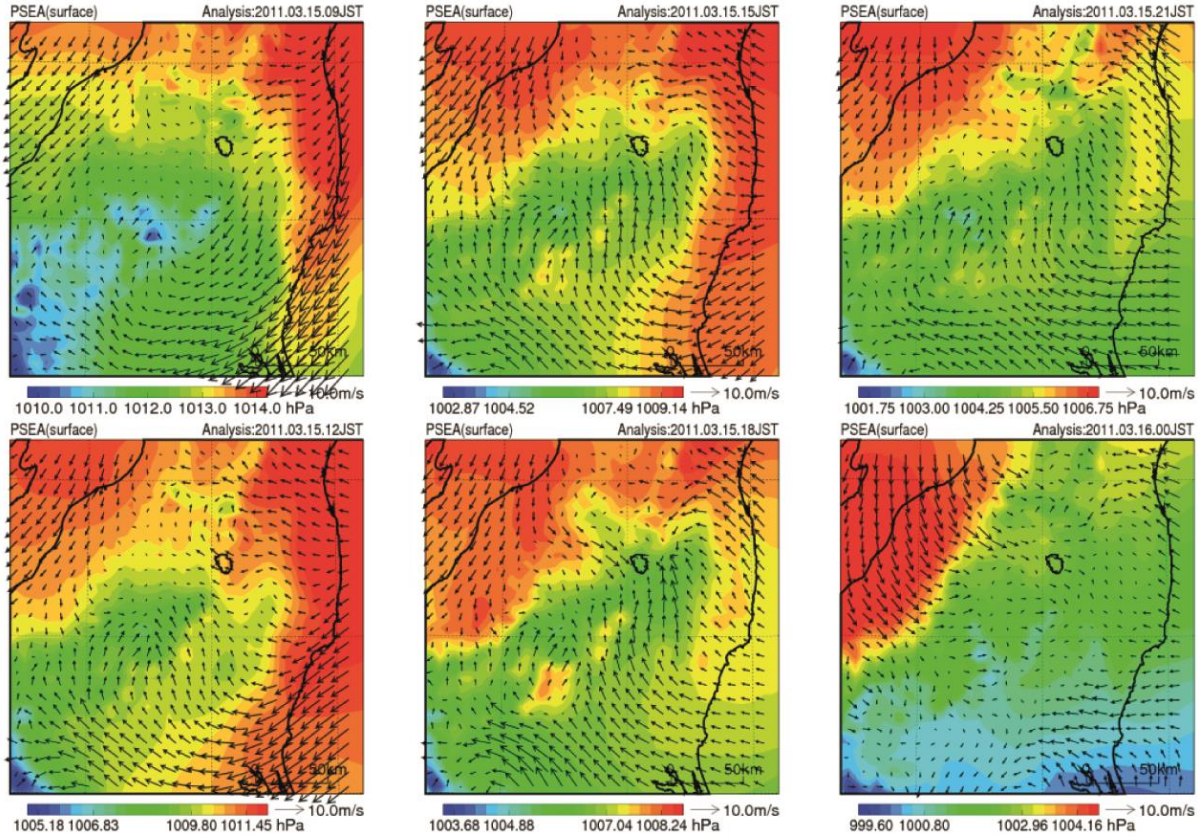


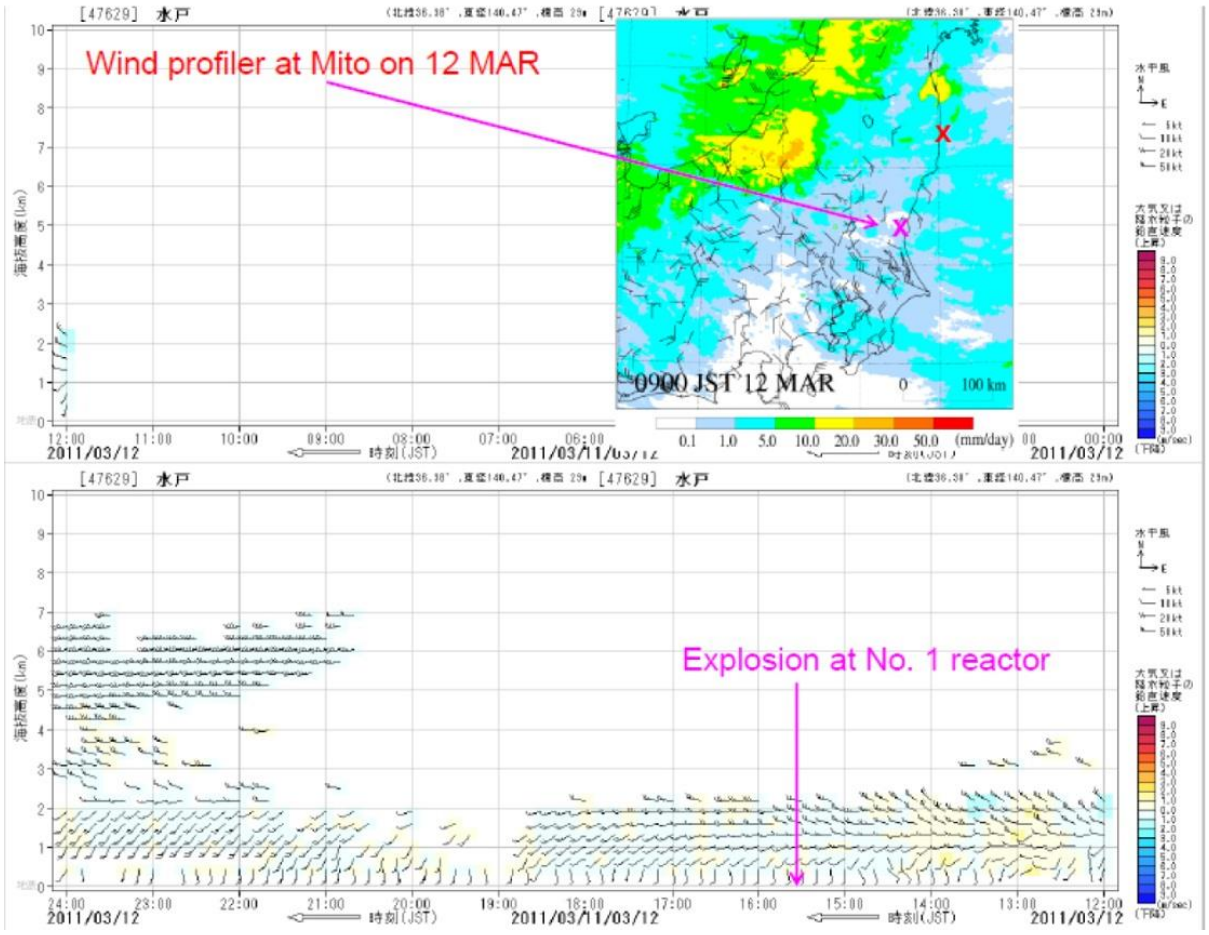
FIG. II–3. Winds of 950 hPa (arrows) and mean sea level pressure (colour shade) by mesoscale analysis of JMA for 00:00 UTC (09:00 JST)–15:00 UTC (00:00 JST), 15 March 2011 [II–3] (Illustrations courtesy of Meteorological Research Institute).

II–4. WIND PROFILER (MITO) RESULTS CLOSEST TO THE FUKUSHIMA DAIICHI NPP, 12-20 MARCH 2011

The winds below a height of 7 km were determined at the wind profiler (mito) closest to the Fukushima Daiichi NPP, for the period 12–20 March 2011.

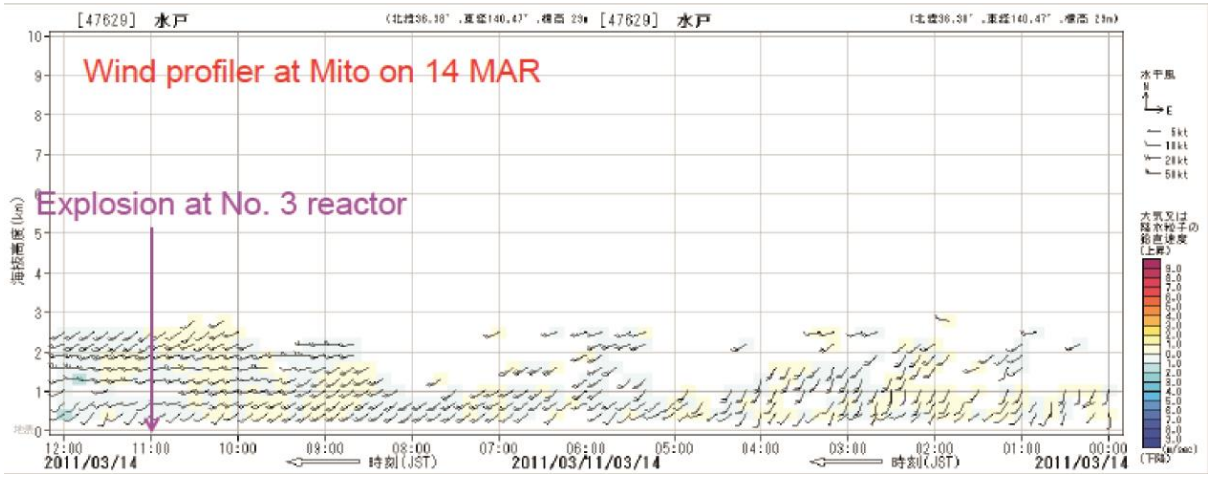
On the afternoon of 12 March, when the hydrogen explosion occurred at the reactor of Unit 1, the wind direction was southerly (from the south) below 1 km but westerly (from the west) above 1 km. During the morning of the 14 March, when the hydrogen explosion occurred at the reactor of Unit 3, the low level wind direction was from the south-west. During the morning of the 15 March, when the containment vessel was breached at the reactor of Unit 2, the low level winds (below 1 km) were from the north-east (Fig. II–4).

[1] Hectopascal (hPa) is an SI unit used for atmospheric pressure; 1000 hPa is equal to 1 bar.



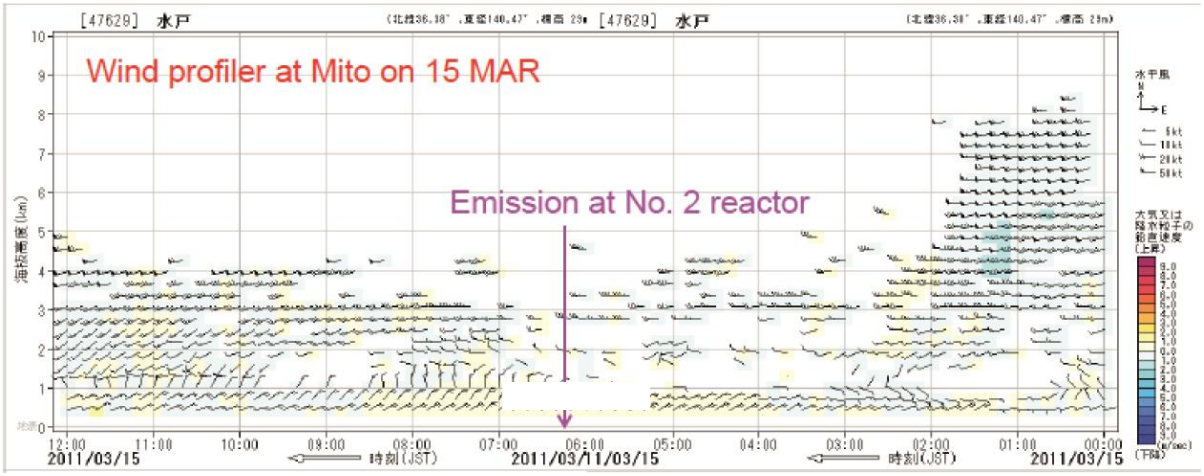
(a)

FIG. II–4(a). Time series of winds below 7 km observed by a JMA wind profiler at the nearest point (Mito) to the Fukushima Daiichi NPP from 12:00 JST to 24:00 JST, 14 March 2011; horizontal wind direction (barbs) and vertical speed of precipitation or air (colour shade) [II–3] (Illustrations courtesy of Meteorological Research Institute).



(b)

FIG. II–4(b). Time series of winds below 7 km observed by a JMA wind profiler at the nearest point (Mito) to the Fukushima Daiichi NPP from 00:00 JST to 24:00 JST, 14 March 2011; horizontal wind direction (barbs) and vertical speed of precipitation or air (colour shade) [II–3] (Illustrations courtesy of Meteorological Research Institute).



(c)

FIG. II–4(c). Time series of winds below 7 km observed by a JMA wind profiler at the nearest point (Mito) to the Fukushima Daiichi NPP from 00:00 JST to 24:00 JST, 15 March 2011; horizontal wind direction (barbs) and vertical speed of precipitation or air (colour shade) [II–3] (Illustrations courtesy of Meteorological Research Institute).

REFERENCES

[II–1] WORLD METEOROLOGICAL ORGANIZATION, Meeting of the WMO Task Team on Meteorological Analyses for the Fukushima Daiichi Nuclear Power Plant Accident, Geneva, 30 November–2 December 2011, Final Rep., WMO, Geneva (2011).

[II–2] WORLD METEOROLOGICAL ORGANIZATION, Evaluation of Meteorological Analyses for the Radionuclide Dispersion and Deposition from the Fukushima Daiichi Nuclear Power Plant Accident, WMO, Geneva (2013).

[II–3] SAITO, K., et al., Contribution of JMA to the WMO Technical Task Team on Meteorological Analyses for Fukushima Daiichi Nuclear Power Plant Accident and Relevant Atmospheric Transport Modelling at MRI. Tech. Rep. MRI, 76, 225pp. DOI: 10.11483 (in press).