

24 MARCH 2011 17:00 UTC



IAEA

International Atomic Energy Agency

Incident and Emergency Centre

Subject: Status of the Fukushima Daiichi nuclear power plant

The Incident and Emergency Centre (IEC) is continuing to monitor the status of the nuclear power plants in Japan following the earthquake.

Based on information received by 00:30 UTC on March 24, 2011 the following updated information related to the reactor units at the Fukushima Daiichi Nuclear Power Plant is provided:

Status of the Fukushima Daiichi Nuclear Power Plant

AC Power—Units 1 to 4

The restoration work of off-site power is still in progress. Power distribution panels (Power Center) in Units 2 and 4 have been connected to the off-site electricity supply. Individual components are being checked prior to being energised. The lighting in units 1 and 3 control room has been restored. Some instrumentation was recovered for units 1, 2 and 4. Workers for Unit 3 and 4 were temporarily evacuated due to black smoke which appeared from Unit 3 at 07:20 UTC on 23. Workers returned to work from 20:35 UTC on March 23 when no more smoke was confirmed. Due to the extent of damage inflicted by the earthquake and tsunami, it is not possible to estimate when equipment may be returned to service.

AC Power—Units 5 and 6

Power has been restored to a transformer and is being provided to Unit 5 and Unit 6 houseloads.

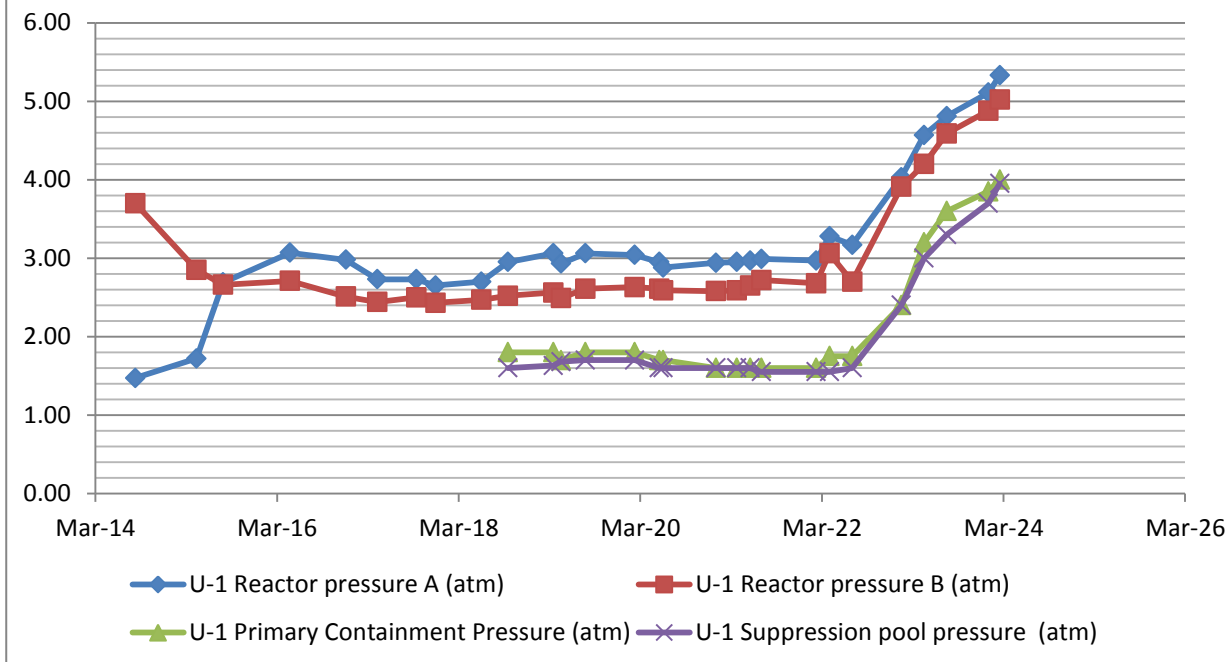
Unit 1

Seawater continues to be injected into the reactor pressure vessel (about 10 m³/h as of 17:35 UTC on March 23). The temperature at the feed water nozzle of Reactor Pressure Vessel (RPV) is decreased to 243°C and at the bottom of RPV to 229 °C (previous measurements 305 °C and 306 °C respectively).

The dose rate in containment vessel (D/W) and suppression chamber (S/C) has decreased slightly to 44 Sv/h and 27.9 Sv/h, respectively. Lighting in the Central Operation Room was recovered (02:30 March 24th).

The pressure history in the RPV and Containment Vessel and presented in the following graph.

Fukushima Daiichi Unit-1 Reactor Vessel, Containment Vessel & Suppression Pool Pressure

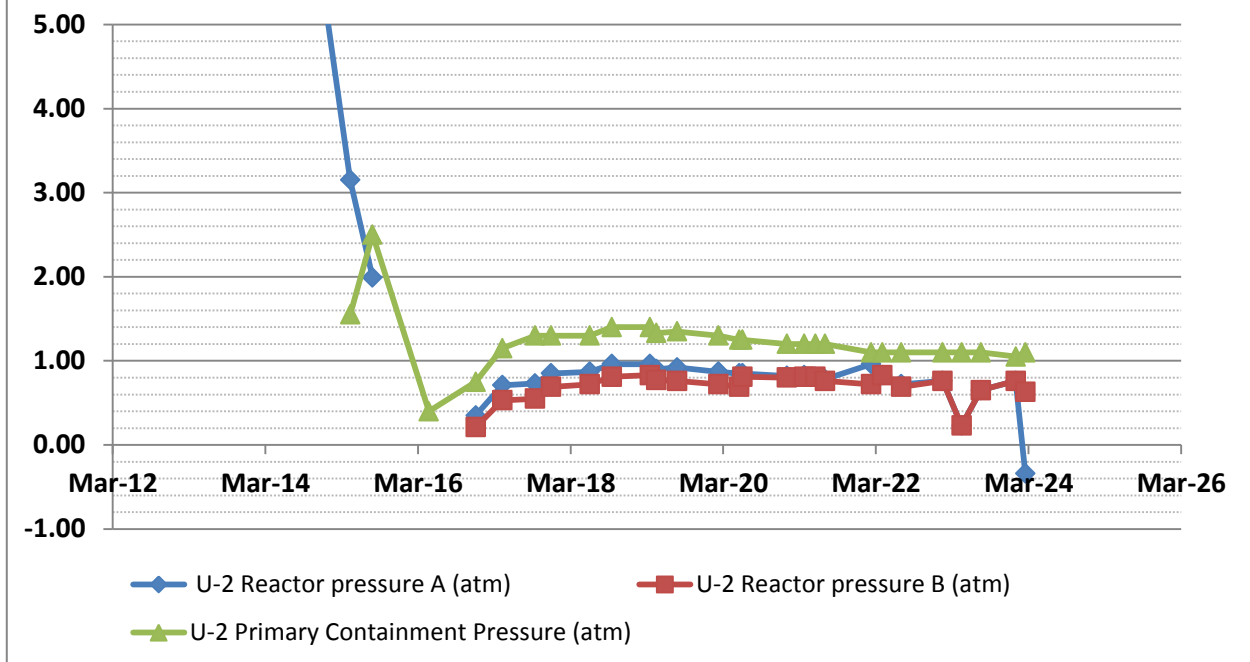


Unit 2

Injection of seawater (18 t) to the Spent Fuel Pool was carried out. The cumulative total amount of water sprayed is now 58 t. Seawater injection to RPV continues with a flow rate of 11 m³/h. The RPV temperature at the feed water nozzle and at the bottom head of RPV are stable (102 °C and 109 °C respectively).

The dose rates in the containment vessel (D/W) and the suppression chamber (S/C) are decreased slightly to 49.3 Sv/h and 1.49 Sv/h, respectively. The spent fuel pool temperature is 47 °C. The RPV and Containment Vessel pressure is shown in the following graph.

Fukushima Daiichi Unit-2 Reactor Vessel and Containment Vessel Pressure



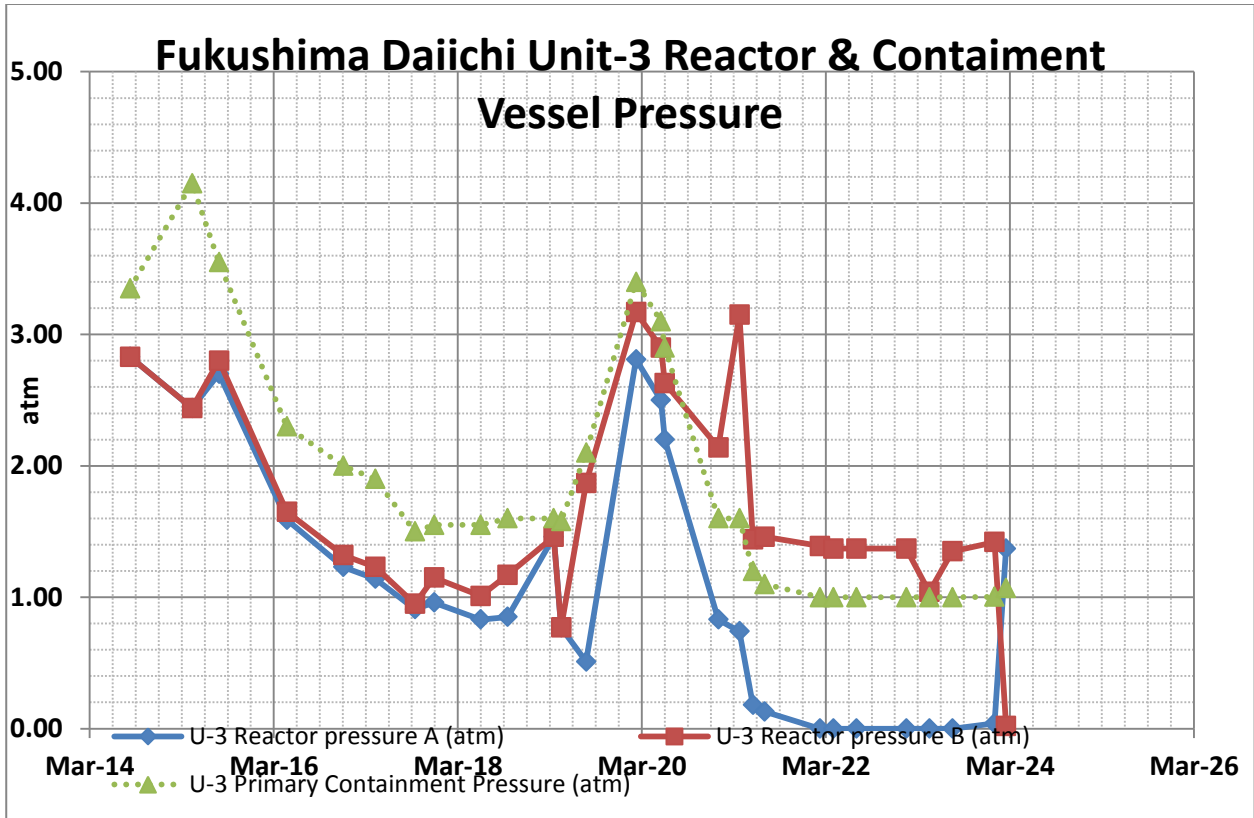
(Note: U-2 Reactor pressure A unreliable)

Unit 3

Seawater continues to be injected into the RPV and sprayed over the spent fuel pool as needed. The cumulative amount of water sprayed to Unit 3 is 3927t. The RPV temperature at feed water nozzle decreased to 80.7°C and at the bottom of RPV to 185.4°C (previous measurement 304.8°C and 225.5°C respectively). Seawater injection to the Spent Fuel Pool via the Cooling and Purification Line was started and 4~5t of the seawater was confirmed to injected (March 24).

Radiation exposure on 3 TEPCO related workers was confirmed. They were working in the basement unit 3 turbine building where contaminated water was on the floor. The radiation exposure of the 3 workers were 180.07 mSv, 179.37 mSv, and 173.0 mSv. Two of the workers had severely contaminated their feet and were transferred to the Fukushima Prefecture Medical University.

The RPV and Containment Vessel pressure is presented in the graph below.



(Note: U-3 Reactor pressure A reliable and Unit-3 Reactor pressure B unreliable)

Unit 4

Water was poured into the spent fuel pool at a rate of 50 m³/h using a concrete pump for 3 hours on 22nd March . Starting from 01:00 UTC till 04:02 UTC on March 23, 130 t of water was poured in using a concrete pump truck at 50 m³/h. The cumulative amount of water sprayed to Unit 4 is 535 t.

Unit 5

The reactor remains in cold shutdown. The reactor water temperature increased to 71.4°C as RHR pump has stopped when power was switched from temporary to normal. Spent Fuel Pool water temperature increased slightly to 47.2°C.

Unit 6

The reactor remains in cold shutdown. Power was switched from the diesel generator to off-site power. The RPV water temperature decreased to 24.1 °C. Spent Fuel Pool water temperature is increased slightly to 26.0°C.

Units 1, 2, 3, 4, 5 and 6 - Plant Status

Parameter / Indications	Unit	Fukushima Daiichi					
		Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Reactor Pressure Vessel Pressure	MPa	<u>0.533</u> (A) <u>0.502</u> (B)	<u>-0.034</u> (A) <u>0.063</u> (B)	<u>0.137</u> (A) <u>0.002</u> (C)	-	0.108	0.109
	atm	<u>5.33</u> (A) <u>5.02</u> (B)	<u>-0.34</u> (A) <u>0.63</u> (B)	<u>1.37</u> (A) <u>0.02</u> (B)	-	1.08	1.09
Containment Vessel (Drywell) Pressure	kPa	<u>400</u>	<u>110</u>	<u>107</u>	-	-	-
	atm	<u>4.00</u>	<u>1.10</u>	<u>1.07</u>	-	-	-
Reactor Pressure Vessel Level	mm (above the top of active fuel)	-1700 (A) -1700 (B)	<u>-1150</u> (A) (B) not available	<u>-1900</u> (A) -2300 (B)	-	<u>1925</u>	<u>2360</u>
Suppression Pool Temperature	°C	No Data	No Data	No Data	No Data	No Data	No Data
Suppression Pool Pressure	kPa	<u>395</u>	Below the scale	Below the scale	-	-	-
	atm	<u>3.95</u>					
Adding water to Reactor Pressure Vessel	<ul style="list-style-type: none"> • Adding • Not adding • Unknown 	Seawater continues to be injected into the reactor pressure vessels as needed.			-	Injection to RPV and the Spent Fuel Pool using make up water	Injection to RPV and the Spent Fuel Pool using make up water
Date/Time of Data Acquisition		<u>March 24</u> <u>2:00 UTC</u>	<u>March 23</u> <u>24:00 UTC</u>	<u>March 24</u> <u>1:20 UTC</u>	-	<u>March 24</u> <u>2:00 UTC</u>	<u>March 24</u> <u>2:00 UTC</u>

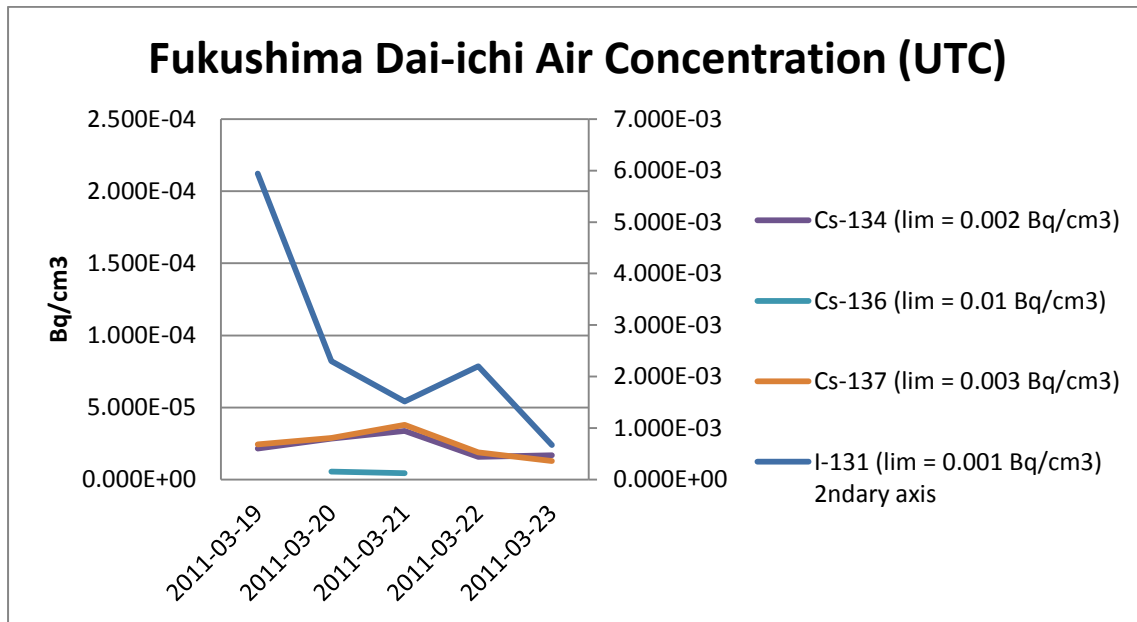
* All pressures are absolute pressure (pressure including normal atmospheric pressure)

** (A) and (B) refer to two measurement channels

Radiation Monitoring Data

Daiichi NPP – On-Site Monitoring

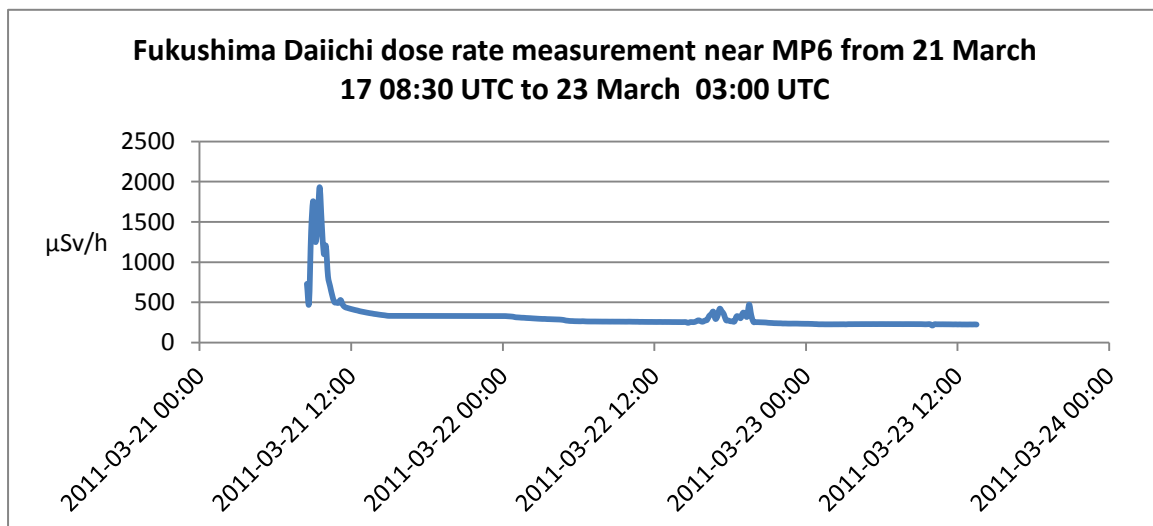
New data from 23rd March has come in for radionuclide concentrations in air at the Daiichi site. Samples were collected north of the Administration Building in the midday period on each of March 19, 20, and 21; and from the main gate on March 22 and 23. Concentrations of I-131, I-132 and I-133 were measured as well as concentrations of Cs-134, Cs-136 and Cs-137. NISA's concentration limits in air for each of these radionuclides is shown in parenthesis.



Note 1: The data for I-131 should be read from the right hand scale; the other radionuclides should be read from the left hand scale.

Note 2: Monitoring point for 19-21 March was the administrative building north; for 22-23 March the measurement point was close to the main gate.

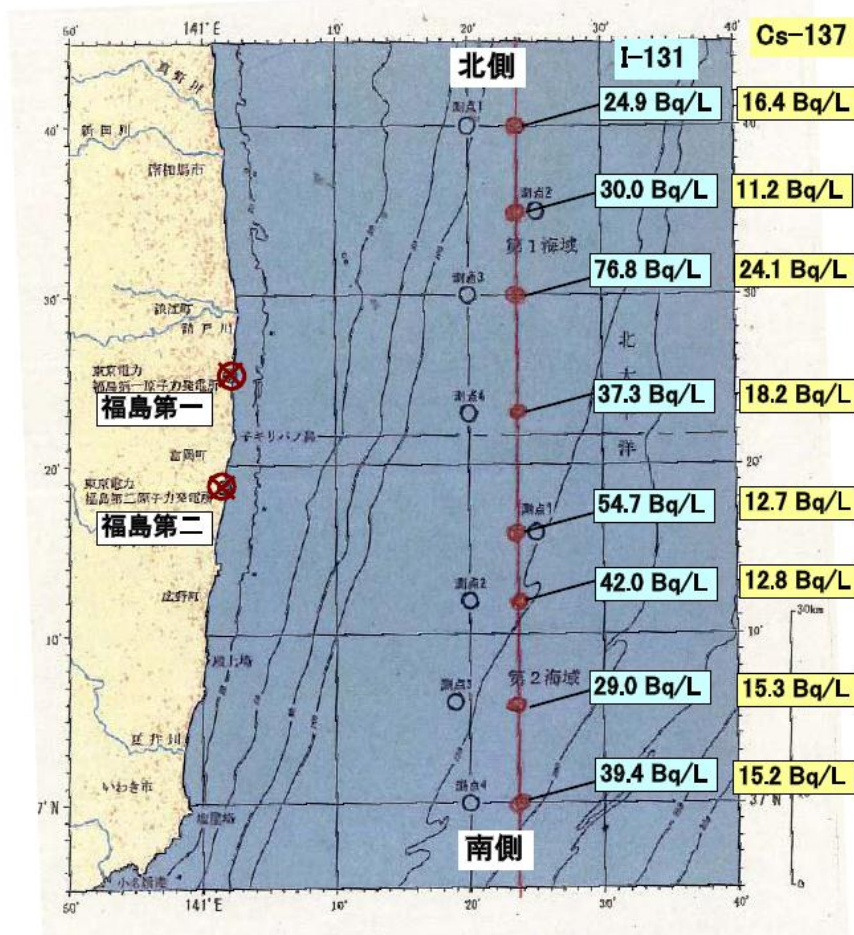
With regards to the on-site Dose Rates, these appear to be trending downwards as can be seen below.



Monitoring in the Marine Environment

On March 22, MEXT announced an action plan for monitoring coastal waters near the Fukushima Daiichi NPP site. Air and seawater samples were collected on March 23 in coastal waters along transects that are separated by 10 kilometer intervals – sampling was performed along each transect to a distance of about 30 kms offshore. The results published on March 24 03:00 UTC are presented below.

Sampling Point	Sampling Date and Time (UTC)	Seawater concentration (Bq/L)		Dose Rate (microSv/h)	Dust in Air Radionuclide Concentration (Bq/m ³)	
		I-131	Cs-137		I-131	Cs-137
1-1	22-Mar 23:10	24.9	16.4	0.034	0.133	0.00676
1-2	23-Mar 00:00	30.0	11.2	0.038	0.0623	0.0694
1-3	23-Mar 00:30	76.8	24.1	0.049	0.0936	--
1-4	23-Mar 01:15	37.3	18.2	0.054	0.0866	0.016
2-1	23-Mar 02:20	54.7	12.7	0.035	--	--
2-2	23-Mar 03:00	42.0	12.8	0.030	--	--
2-3	23-Mar 03:37	29.0	15.3	0.040	--	--
2-4	23-Mar 04:32	39.4	15.2	0.040	--	--



The maximum permissible concentration in water are 40 Bq/L for I-131 and 90 Bq/L for Cs-137. Results have been sent to IAEA experts from the Marine Environmental Laboratory in Monaco for analysis.

Deposition Data by Prefecture

Meaningful depositions of I-131 and Cs-137 have been reported in 6 prefectures. As the Table below illustrates, deposition rates vary appreciably from one day to the next. If rainfall occurs, there can be substantial changes in deposition (i.e. wet deposition). This may explain the increased deposition in Tokyo between the March 20-21 and March 21-22 measurements. New and updated data is underlined.

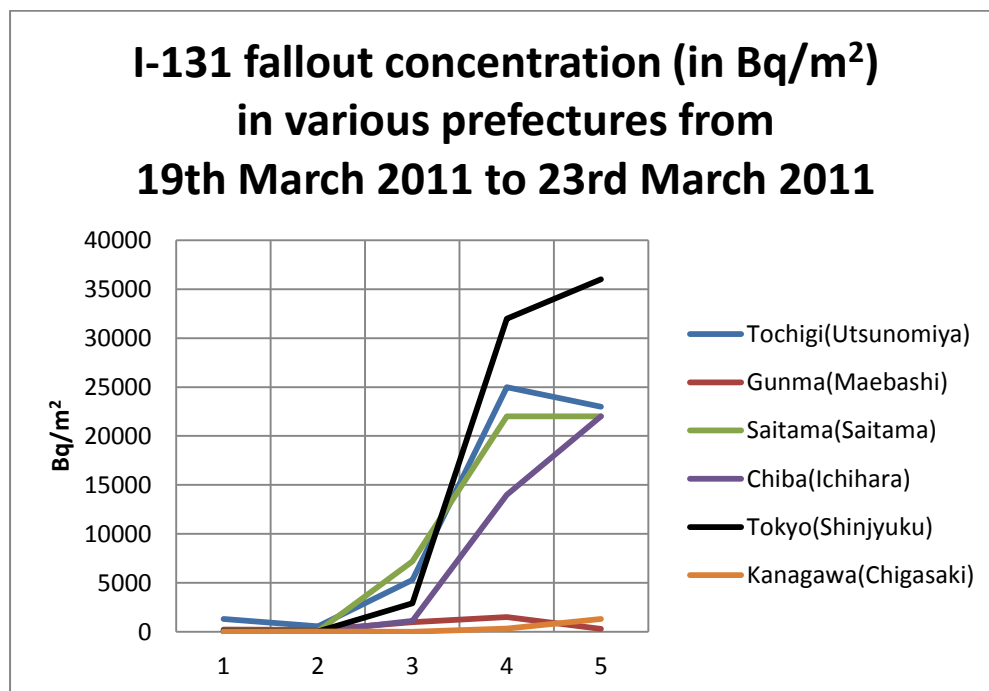
Deposition (Bq/m²) measured during a 24 hour period, from 9:00 to 9:00

Location	Mar 18-19		Mar 19-20		Mar 20-21		Mar 21-22	
	I-131	Cs-137	I-131	Cs-137	I-131	Cs-137	I-131	Cs-137
Tochigi(Utsunomiya)	1300	62	540	45	5300	250	25000	440
Gunma(Maebashi)	230	84	190	63	990	87	1500	72
Saitama(Saitama)	64	ND	66	ND	7200	790	22000	1600
Chiba(Ichihara)	21	ND	44	3.8	1100	110	14000	2800
Tokyo(Shinjyuku)	51	ND	40	ND	2900	560	32000	5300
Yamanashi(Kouhu)	175	ND	ND	ND	ND	ND	4400	400

Deposition (Bq/m²) measured during a 24 hour period, from 9:00 to 9:00

Location	Mar 22-23			
	I-131	Cs-137		
Tochigi(Utsunomiya)	23000	99		
Gunma(Maebashi)	310	ND		
Saitama(Saitama)	22000	320		
Chiba(Ichihara)	22000	360		
Tokyo(Shinjyuku)	36000	340		
Yamanashi(Kouhu)	110	26		

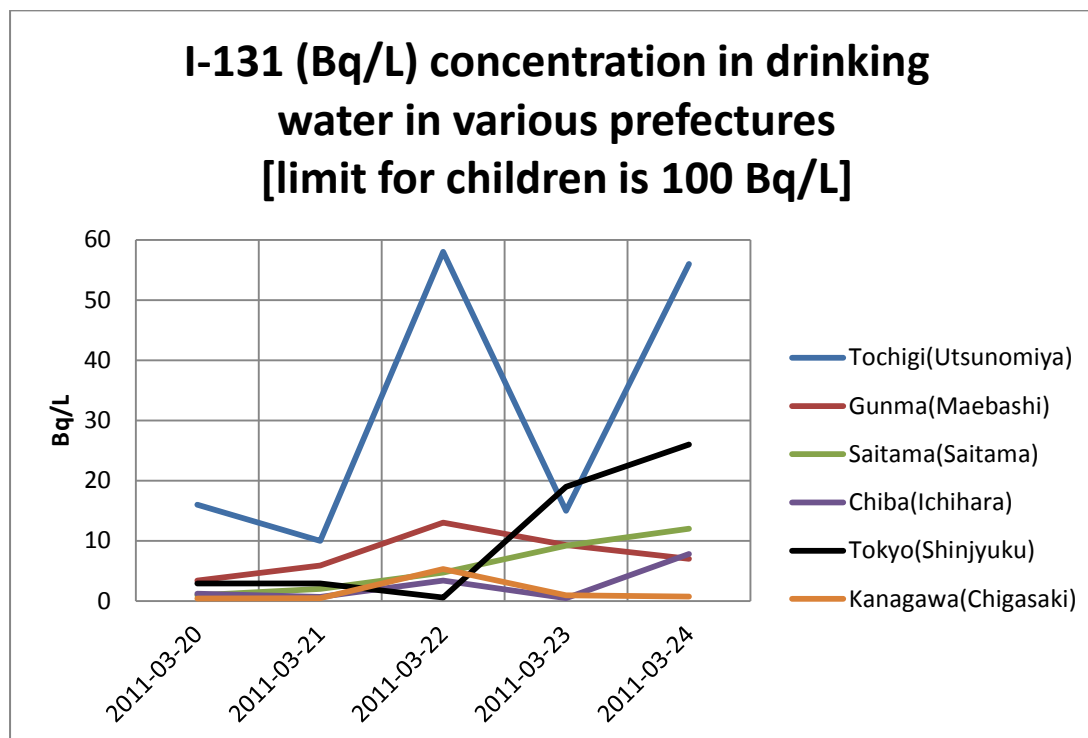
ND = not detected.



Radioactivity in food, milk and drinking water by Prefecture

Concentration of I-131 and Cs-137 in food and milk have been reported in 6 prefectures. The values are mostly obtained "ad-hoc" and do not allow for a meaningful analysis. On another hand, meaningful data obtained for drinking water in 6 prefectures, as shown below, show a

pattern similar to the deposition trend shown in the previous page. It can be argued too that the rainfall could have an impact on those figures.



IAEA Radiation Monitoring

On March 23, the IAEA radiation monitoring team took additional measurements at distances from 30 to 73 km from the Fukushima nuclear power plant. Results from gamma dose-rate measurements in air ranged from 0.2 to 6.9 microsievert per hour. The beta-gamma contamination measurements ranged from 0.02 to 0.6 Megabecquerel per square meter.

The second IAEA monitoring team has now arrived in Japan. The two teams in Japan will continue to work closely with the Japanese authorities. Monitoring will be undertaken in the areas of Fukushima and Tokyo. Measurements will be taken to determine more precisely the actual composition of the radionuclides that have been deposited.

Canada radiation monitoring data

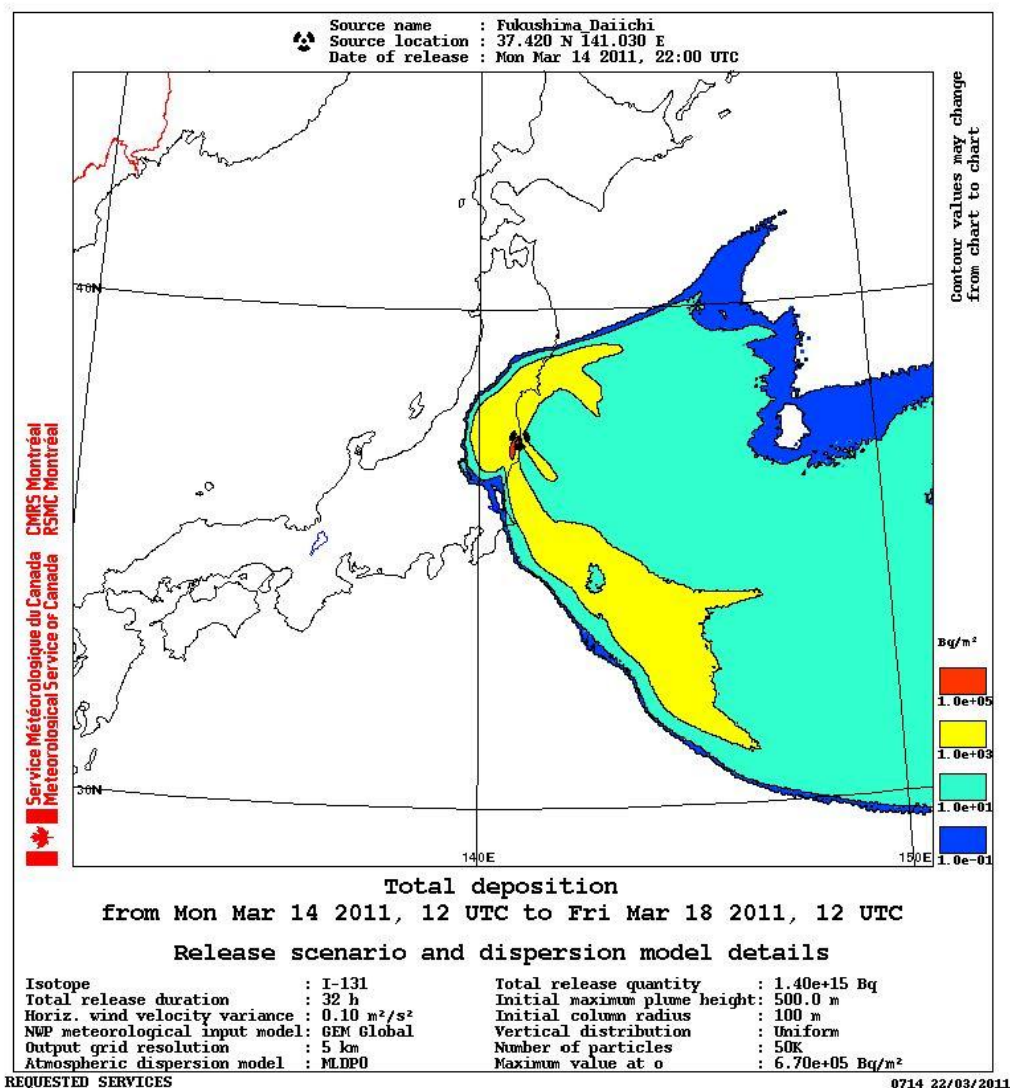
According to the information received from Canadian competent authority, Canada has identified the presence of low concentrations of Iodine-131 in air samples collected at five different locations of the Canadian-based CTBTO sampling stations. From 18 to 22 March, concentrations between 0.55 and 3.63 millibecquerels per cubic metre (mBq/m³) were recorded on Vancouver Island, which is located on the west coast of Canada and is the closest sampling location to Japan. An air concentration of 4.26 mBq/m³ was recorded in Ottawa on 22 March. Lower concentrations were also recorded in Resolute Bay, St. John's and Yellowknife.

Caesium-137 and Caesium-134 have been identified at very low concentrations in air samples from Vancouver Island on each day from 18 to 22 March, and in Ottawa on March 22. The Caesium-137 to Caesium-134 ratio, calculated from six samples, is approximately 1.0 (range from 0.95 to 1.15).

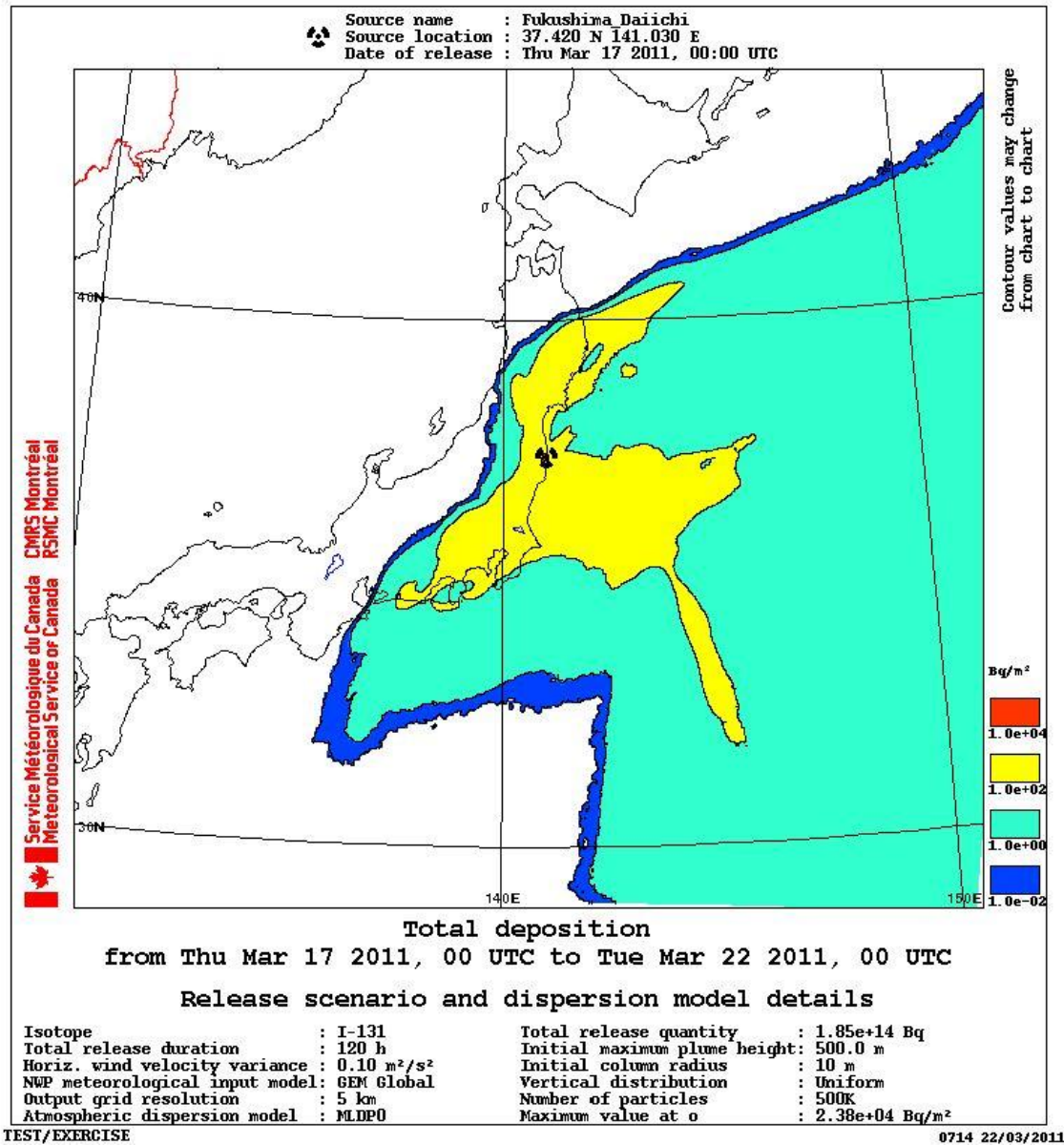
During this period, no increase in external gamma dose rate was recorded at any of the 72 fixed sampling locations at Canadian national monitoring network.

Meteorological products by RSCM Montreal based on an IAEA estimated source term

IAEA and the Canadian Meteorological Centre, which also hosts the RSCM Montreal, have been working together on a series of simulations of atmospheric dispersion and transport modelling based on emission sequences. These emission sequences appear to be reflected in the on-site monitoring data so far available for the Fukushima Daiichi NPP. RSCM in Montreal provided meteorological products, more specifically integrated air concentration (Bq*s/m3) and ground deposition (Bq/m2) maps for I-131 and Cs-137, calculated for the period of 14 March 22:00 UTC to 21 March 24:00 UTC. The calculations used an estimated release profile based on the indications of the dose rate meters on the site, whereas the meteorological input used for the model calculations were real observed data. The monitoring data show a first phase of release with three events of 8 to 4 hours in the interval 14 to 16 March (an estimated 1.4E+15 of I-131 and 1.4E+14 of Cs-137) followed by a steady release with a constant rate starting from 17 March and on-going (daily rate of 3.6E+12 of Cs-137 and 3.7E+13 of I-131). The temporal variation of the calculated contamination patterns for both radionuclides show a good degree of correlation with the field measurements, such as the timing of the detection of I-131 and Cs-137 in the Tokyo area.



Picture: The pattern of accumulated deposition of I-131 from 14 March to 18 March resulting from three intermittent releases from the Daiichi NPP units, with the last release ending 16 March. The image shows predicted deposition as far South of the Daiichi NPP as about midway between Tokyo and the NPP



Picture: Accumulated I-131 deposition as of 22 March resulting from a continuous release starting on 17 March. The different weather conditions may have caused the plume from this release to move South on 20 March and deposit radioactive material in the Tokyo area starting 21 March.

Comparison between the day when significant deposition activity of I-131 was detected at the cities in the table correlates well with the observed deposition pattern for the two release episodes and the temporal deposition distribution from those releases.

Deposition by Prefecture , Bq/m2

Location	18-19 March		19-20 March		20-21 March		21-22 March		22-23 March	
	I-131	Cs-137	I-131	Cs-137	I-131	Cs-137	I-131	Cs-137	I-131	Cs-137
Ibaraki	880	86	490	48	93000	13000	85000	12000	27000	420
Tochigi(Utsunomiya)	1300	62	540	45	5300	250	25000	440	23000	99
Gunma(Maebashi)	230	84	190	63	990	87	1500	72	310	ND
Saitama(Saitama)	64	ND	66	ND	7200	790	22000	1600	22000	320
Chiba(Ichihara)	21	ND	44	3.8	1100	110	14000	2800	22000	360
Tokyo(Shinjyuku)	51	ND	40	ND	2900	560	32000	5300	36000	340

A file with more charts of the RSMC Montreal products presented here will be posted on the ENAC web page.

Florian Bacu

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24-March-2011 06.00 UTC