

J3.2

Detailed source term estimation and atmospheric dispersion analysis for the Fukushima Dai-ichi Nuclear Power Plant accident

G. Katata*, **M. Chino***, H. Terada*, T. Kobayashi*, M. Ota*,
H. Nagai*, and M. Kajino**

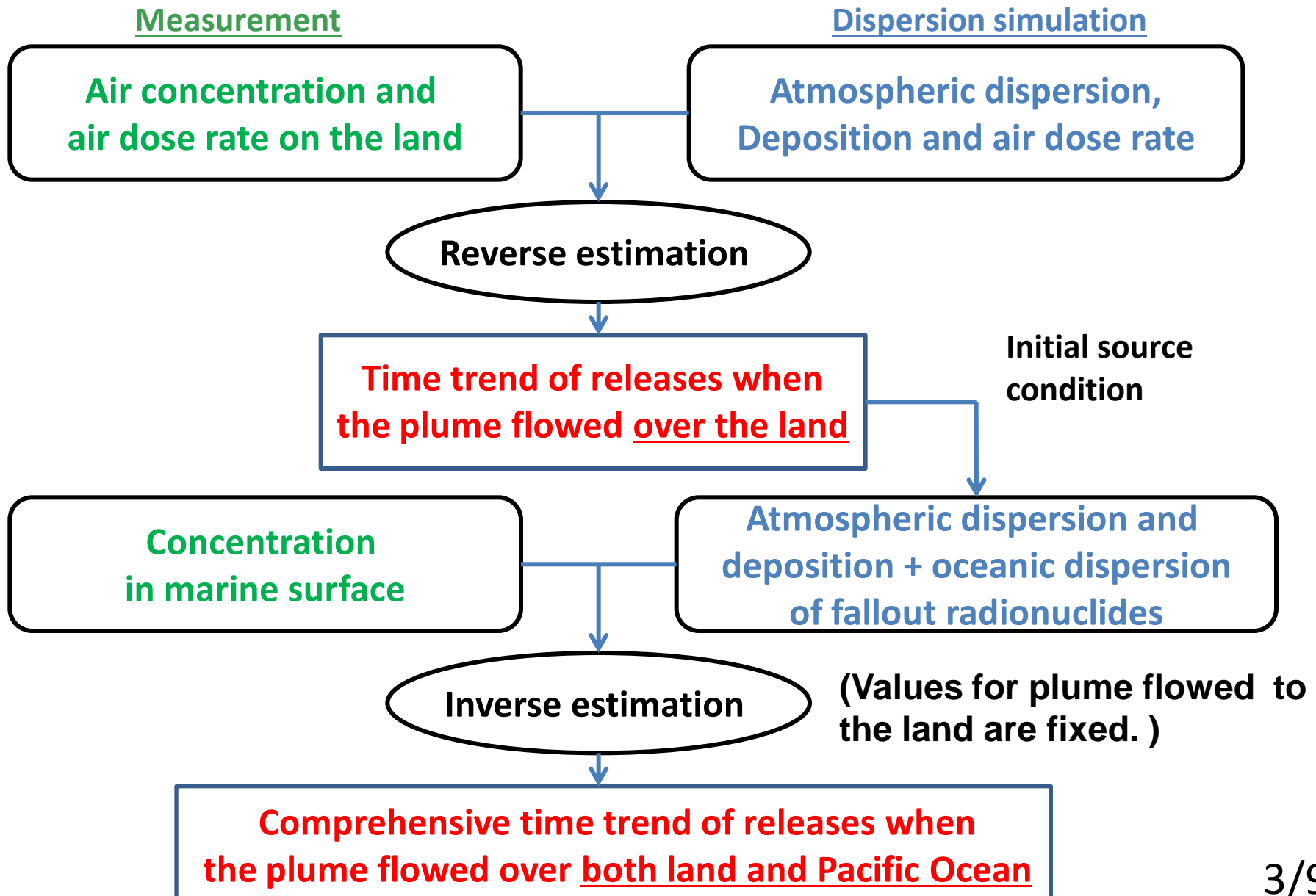
*Japan Atomic Energy Agency, Japan

**Meteorological Research Institute, Japan

- From the initial stage of the Fukushima Daiichi Nuclear Power Station (FNPS1) accident, we have been carrying out reverse estimations of source term by the combination of atmospheric dispersion model and environmental monitoring data.
(Chino et al., 2011; Katata et al. 2012a, b; Terada et al. 2012; Kobayashi et al. 2013)
- New monitoring information available after the above work:
 - Air dose rates from automatic monitoring posts of Fukushima Pref. during the period from Mar. 12 -16 2011.
 - Deposition distributions of I-131 and Cs-137 at Apr. 3 2011 derived from the US-DOE & MEXT airborne survey . (Torii et al. 2013)
 - Concentrations of Cs-134 and Cs-137 in marine surface over the Pacific Ocean observed during the period from Apr. 2 to May 17 2011.

Source term is re-estimated by coupling new monitoring data and a combination of atmospheric and oceanic dispersion models

Estimation Flow of Release Rates



Atmospheric Model (WSPEEDI-II)

Initial and boundary conditions: GSM from Japan Meteorological Agency

Meteorological model: MM5 of PSU/NCAR

Dispersion model: GEARN of Japan Atomic Energy Agency

Oceanic Model (SEA-GEARN)

Initial and boundary conditions: FNMOC, OISST, TOPEX/Poseidon, WOD2001

Ocean model: AFES and OIFES of JAMSTEC

Dispersion model: SEA-GEARN of Japan Atomic Energy Agency

Relation with plant events

U1 Wet vent. 14:30-15:00
Hydrogen explosion 15:36
12 Mar.

U3 Wet vent.
9:24, 12:30
13 Mar.

U3
Hydrogen
explosion
11:01 14
Mar.

U2 D/W pressure: Drop
7:00-11:25 15 Mar.

U2 SRV
opening:
21:30,
23:25,
01:02 14-
15 Mar.

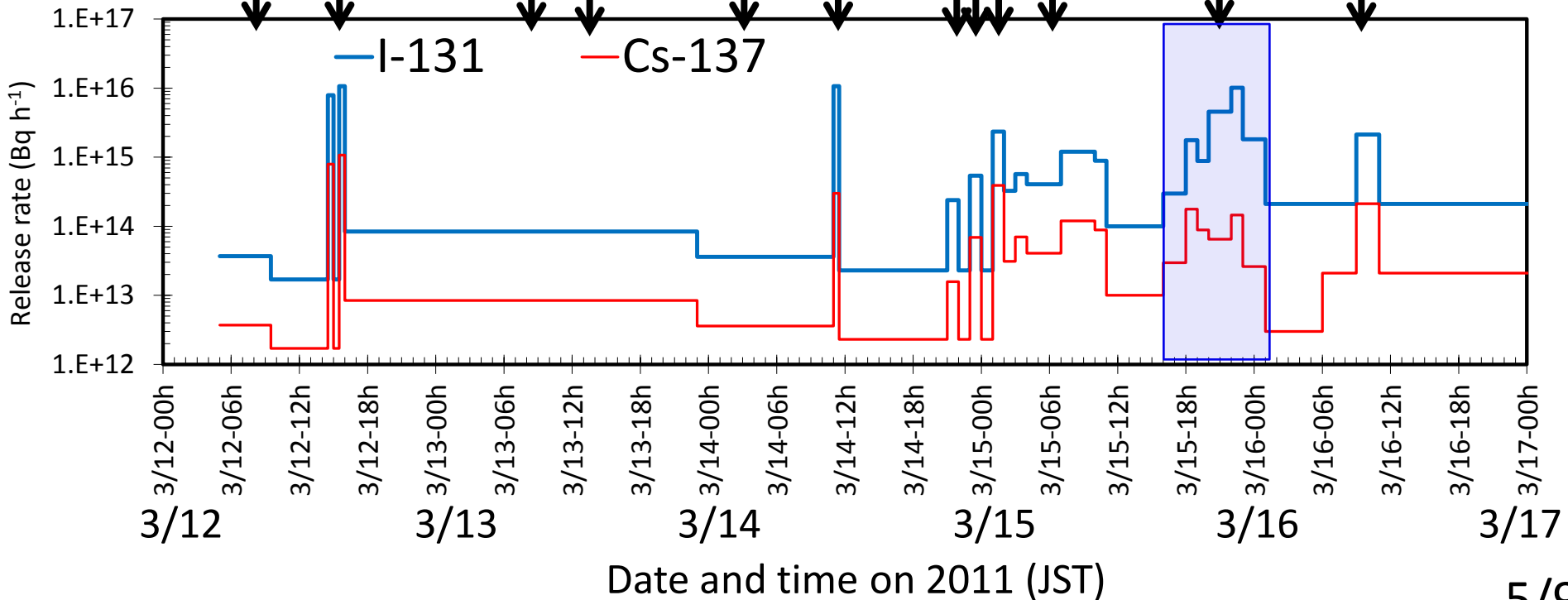
U3 Wet vent.:
16:05 15 Mar.,
U2,U3 D/W
pressure: Drop
16:00 15 Mar.-
01:00 16 Mar.

U3 D/W
pressure:
Drop 09:00-
12:00 16 Mar.

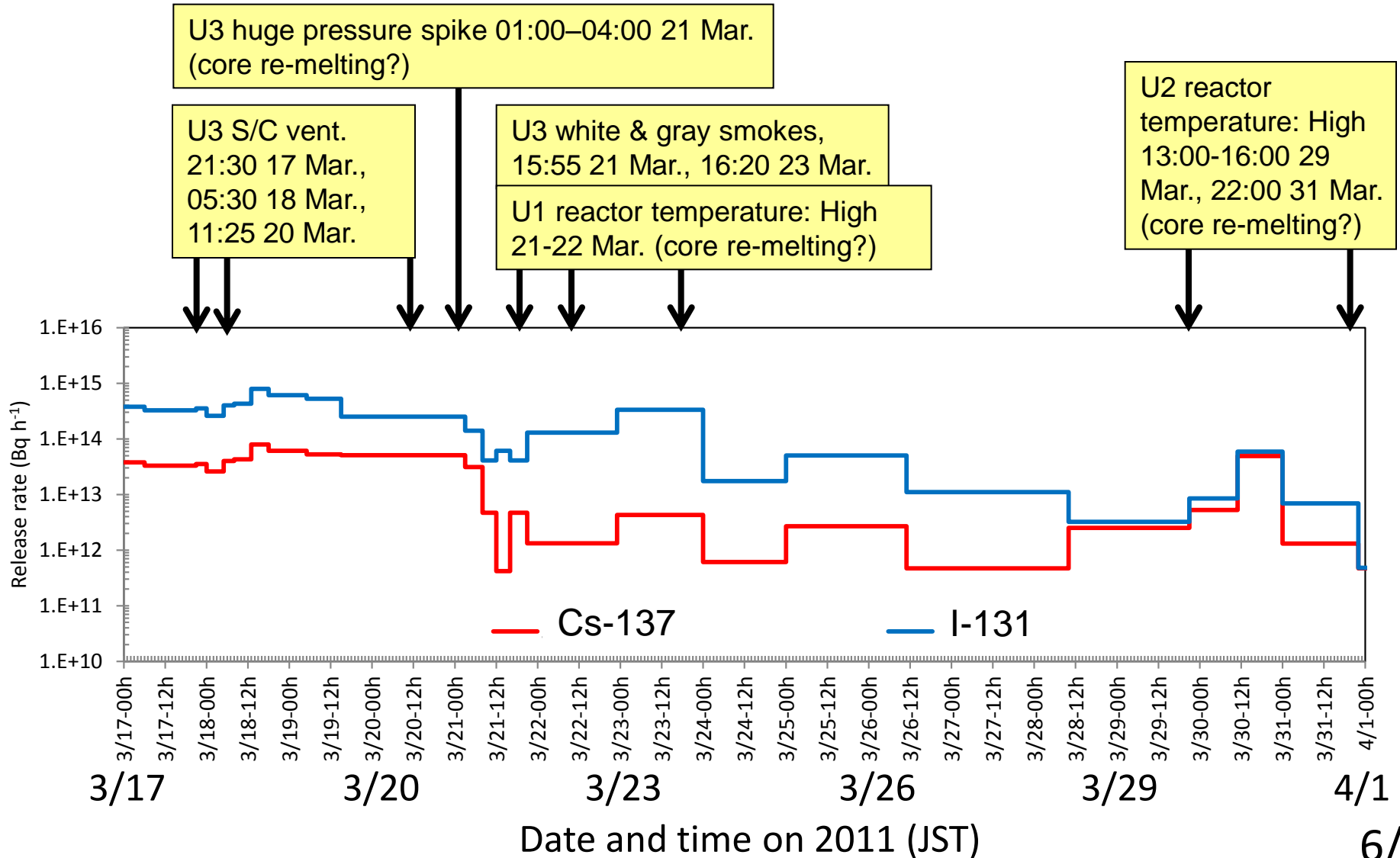
U1 D/W
pressure:
High 12 Mar.

U3 D/W
pressure:
High Morning
13 Mar.

U3 Wet vent.
5:20 14 Mar.

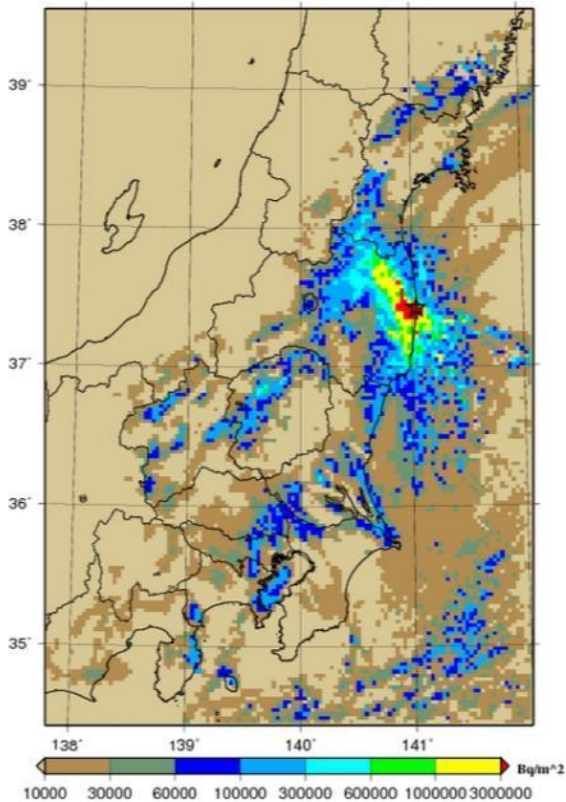


Relation with plant events

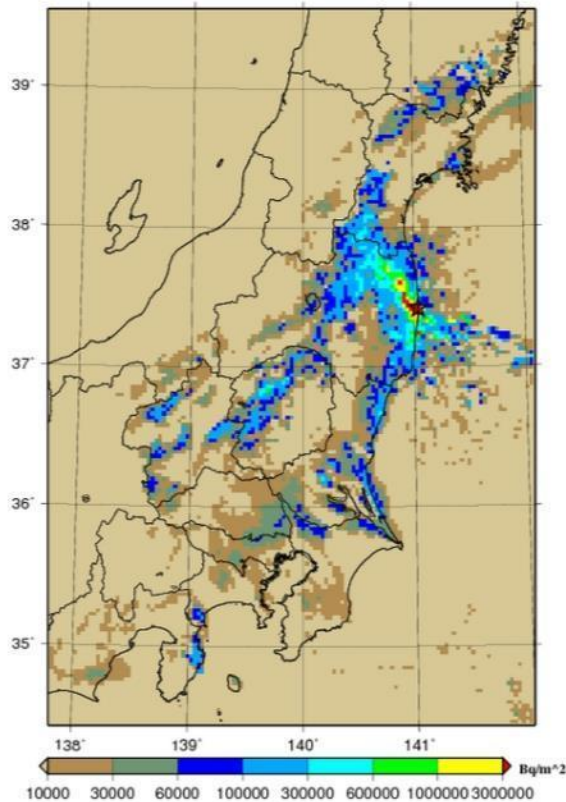


WSPEEDI-II calculations (1 Apr. 2011)

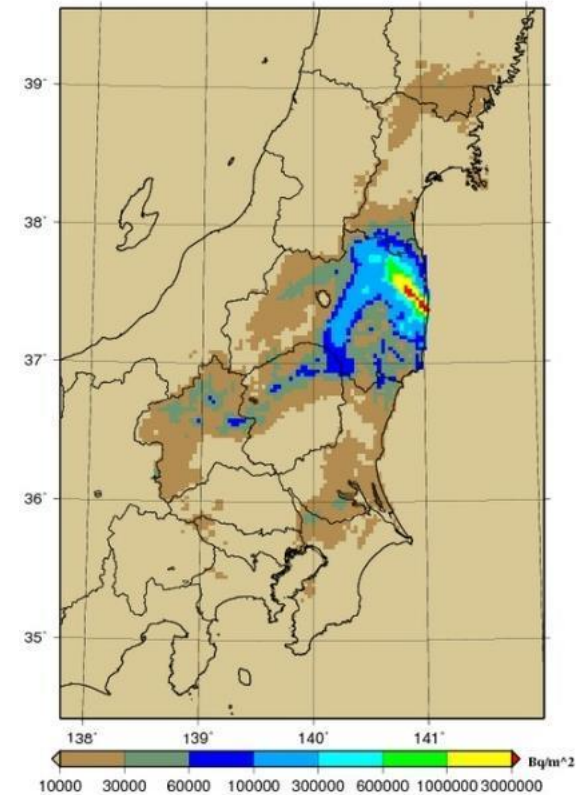
I-131



Cs-137



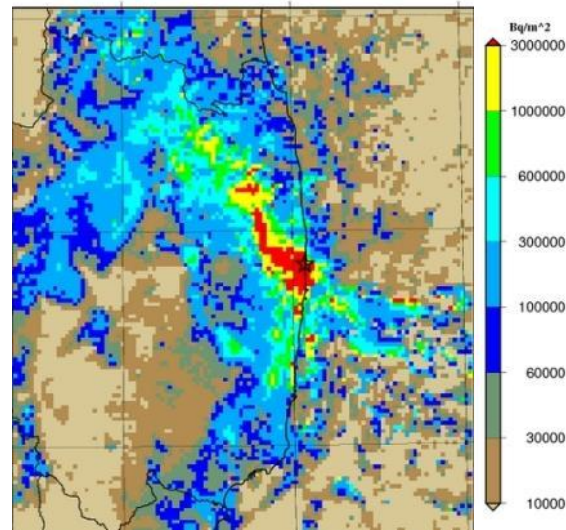
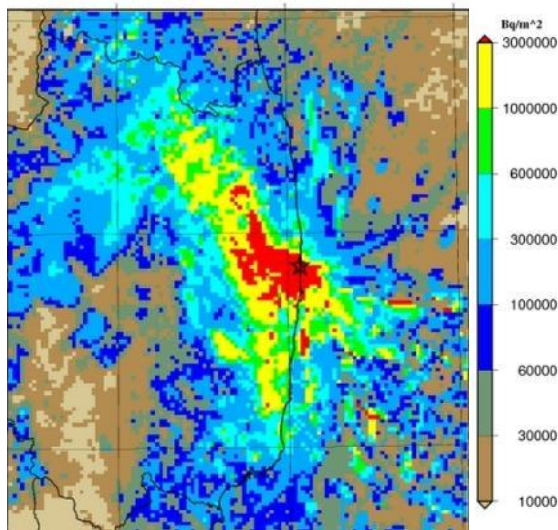
MEXT airborne
monitoring for Cs-137
(31 May. 2012)



WSPEEDI-II
calculations
(1 Apr. 2011)

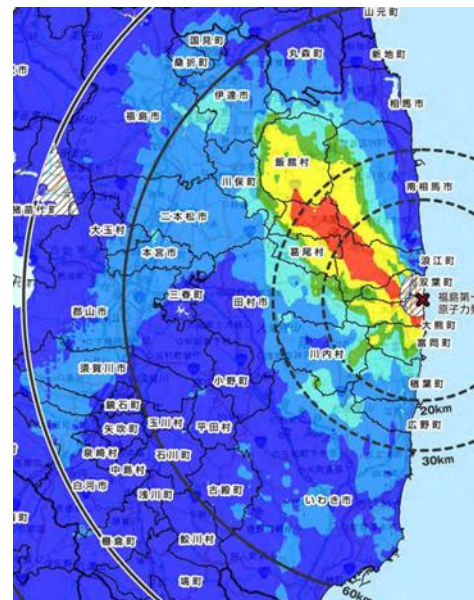
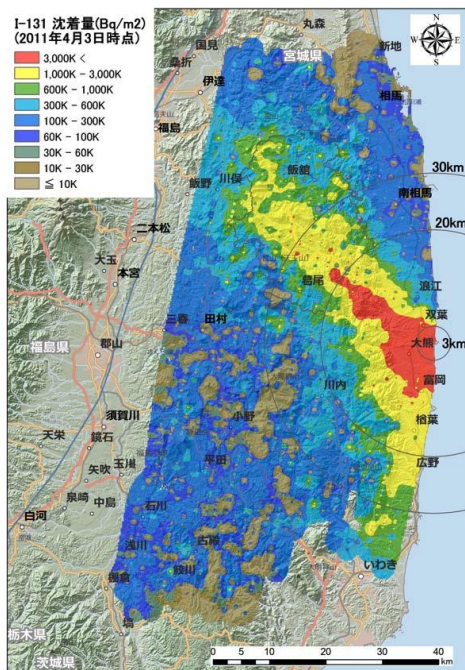
I-131

Cs-137



Airborne
monitoring

1 Apr. 2011



31 May. 2012

Torii et al. (2013)

MEXT

Major differences from our previous work (Terada et al., 2012) are :

(1) Afternoon of March 12

- The release amount of **wet venting of Unit 1 from 14:30 to 15:00 JST** is estimated from the monitoring station data. The order of release was **almost the same level as hydrogen explosion of Unit 1 at 15:36 JST**.

(2) Morning of March 13

- The release amounts of **wet venting of Unit 3 in the morning** is estimated by coupling marine concentration data and ocean model.

(3) Night of March 14 to early morning of March 15

- The major releases from Unit 2 could be separated three times (**21:00, 23:00, 01:00 JST**), although the previous results showed continuous releases.

(4) Morning of March 15 to morning of March 16

- The major releases were estimated during the periods from **07:00 to 11:00** and **16:00 Mar. 15 to 01:00 JST Mar. 16**. The second release starts with a delay of 4 hours and continues long, comparing with Terada et al. (2012). This emission was estimated by new monitoring post data near the plant.
- **The plume of second release was iodine-rich one.** This was supported by I-131 and Cs-137 airborne survey and dust sampling data at JAEA Tokai.