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Session No: 1.2

Marine Contamination Status Caused by the Accident

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Radiation Monitoring Division,
The Secretariat of the Nuclear Regulation Authority
(welcome our web site: <http://www.nsr.go.jp/english/index.html>)

(November 2016)

Comprehensive Radiation Monitoring Plan

(Enacted on April 1st, 2016)

http://radioactivity.nsr.go.jp/en/contents/12000/11110/24/274%20_20160401.pdf.pdf

Following the monitoring plan named “Comprehensive radiation monitoring plan”, a series of environmental radiation levels has been monitored and published continuously.

1. Aims

2. Role and Tasks (Which organization initialize monitoring, and for which field)

3. Monitoring subjects / areas (Monitoring tools and targets)

Dose rate & accumulative dose

Dust in air

Fallout and tap water

Land sediment, Index-Plants

Underground water and well water

Sea area

Schools

Ports, airports, parks and sewerage

Natural parks

Wastes

Cultivated soils, forest, pasture and irrigation reservoirs

Food stuff

Implementation Guides on Sea Area Monitoring

(Attachment of Comprehensive monitoring plan)

http://radioactivity.nsr.go.jp/en/contents/12000/11108/24/274_s_20160401.pdf.pdf

Objectives

Seawater:

To measure concentrations of radionuclides mainly Cs-134/137

Sediment:

To figure out distribution and time-dependent migration of radionuclides

Biota (Fisheries):

To measure concentrations and figure out their pathways

Targeted sea areas

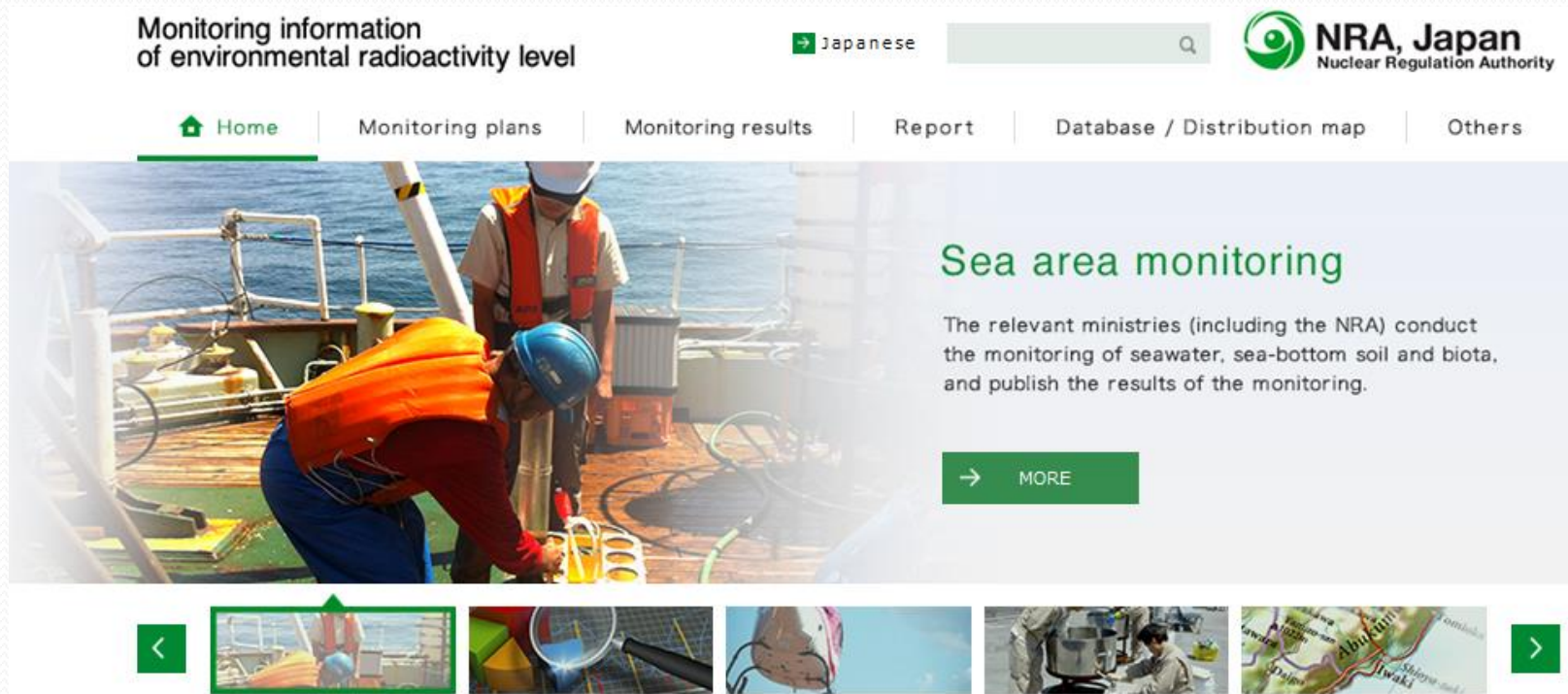
Sea area close to TEPCO's Fukushima Daiichi NPS(FDNPS)~

Outer sea area(Open sea area)(about 1,000km off the coast of FDNPS)

Monitoring information of environmental radioactivity level

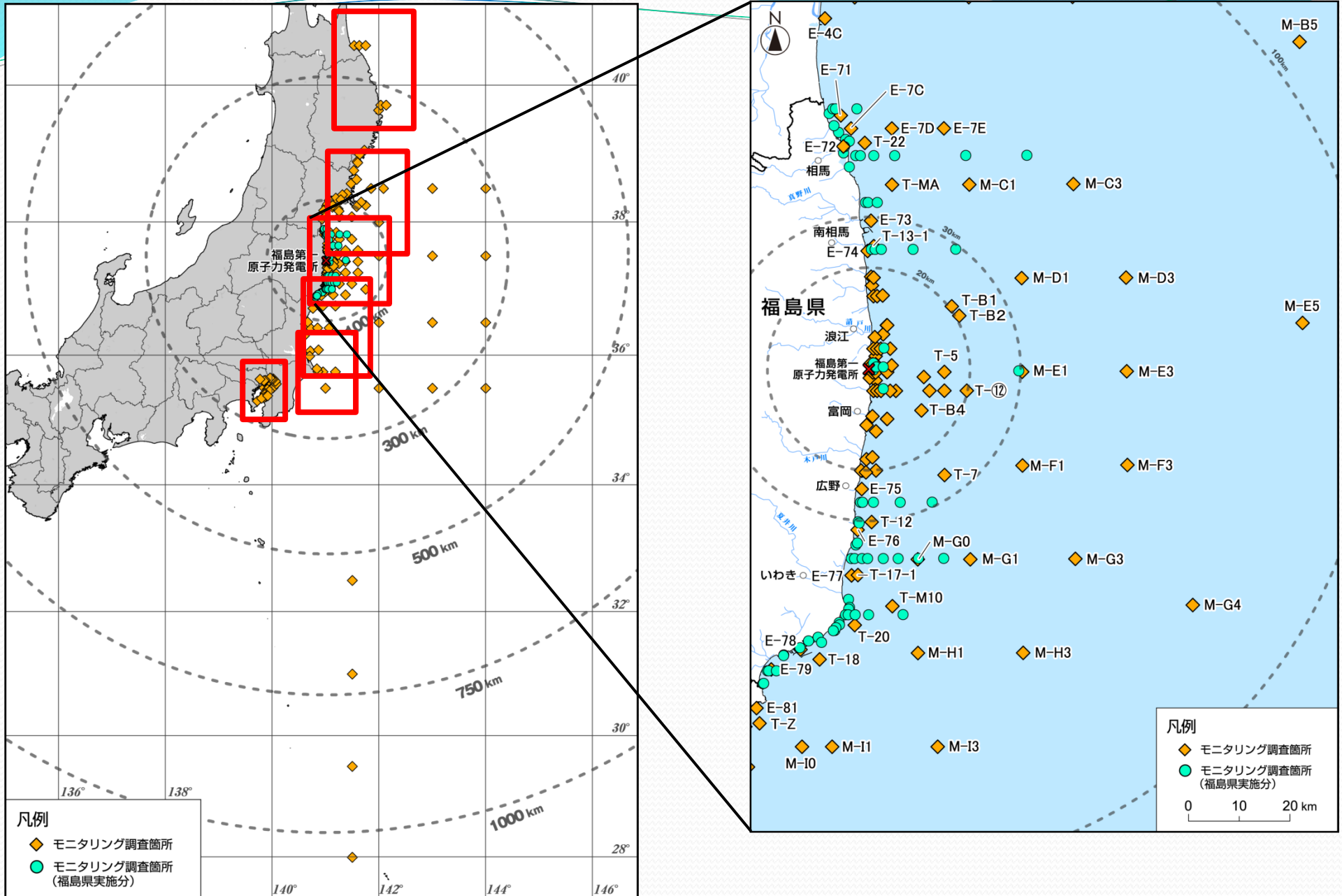
Monitoring data after Fukushima Daiichi NPS accident are
available in this URL:

<http://radioactivity.nsr.go.jp/en/>



The screenshot displays the website's header with the title "Monitoring information of environmental radioactivity level" and the NRA, Japan logo. A navigation menu includes "Home", "Monitoring plans", "Monitoring results", "Report", "Database / Distribution map", and "Others". A large banner image shows workers on a ship deck. To the right of the image, the text "Sea area monitoring" is followed by a description: "The relevant ministries (including the NRA) conduct the monitoring of seawater, sea-bottom soil and biota, and publish the results of the monitoring." Below this text is a green button labeled "MORE". At the bottom, a horizontal carousel of six small images is shown, with a left arrow on the far left and a right arrow on the far right.

Seawater/Sediment Sampling Points for Sea area Monitoring



Typical radioactivity analysis of seawater and sediment samples for monitoring purposes (main target)

H-3 (tritium) : by liquid scintillation counter (LSC) (after an electrolytic enrichment) (DL: approx. 0.04 Bq/L)

Sr-90 : by low background beta counter (LBC) (after radiochemical separation (^{90}Sr - ^{90}Y)) (DL: approx. 0.5 mBq/L)

Cs-134, Cs-137 : by high purity Ge detector (after radiochemical separation (AMP adsorption) (seawater) / after drying (sediment) (DL: approx. 0.5 mBq/L for seawater)

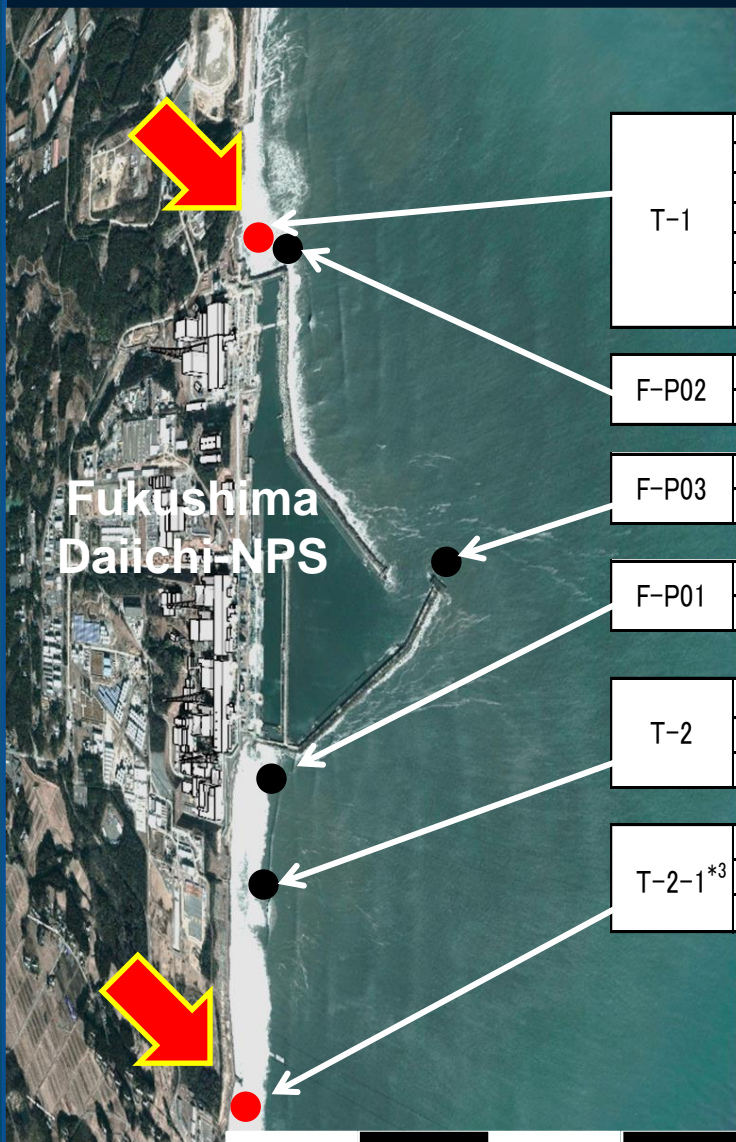
Pu isotopes : by alpha ray spectrometry (after radiochemical separation)

Seawater

- ✓ < 2km area
- ✓ 2-20km area
- ✓ 20-100km area
- ✓ > 100km area

from the Fukushima Daiichi NPS

The most recent radioactivity data of the waters within 2km from the NPS



Sampling point	Sampling Date	Cs-134	Cs-137	Gross β	H-3	Sr-90	Gross α	Pu-238	Pu-239+Pu-240
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Sea water radioactivity (Bq/L):

ND: Not detected; Numbers in parentheses: detection limits

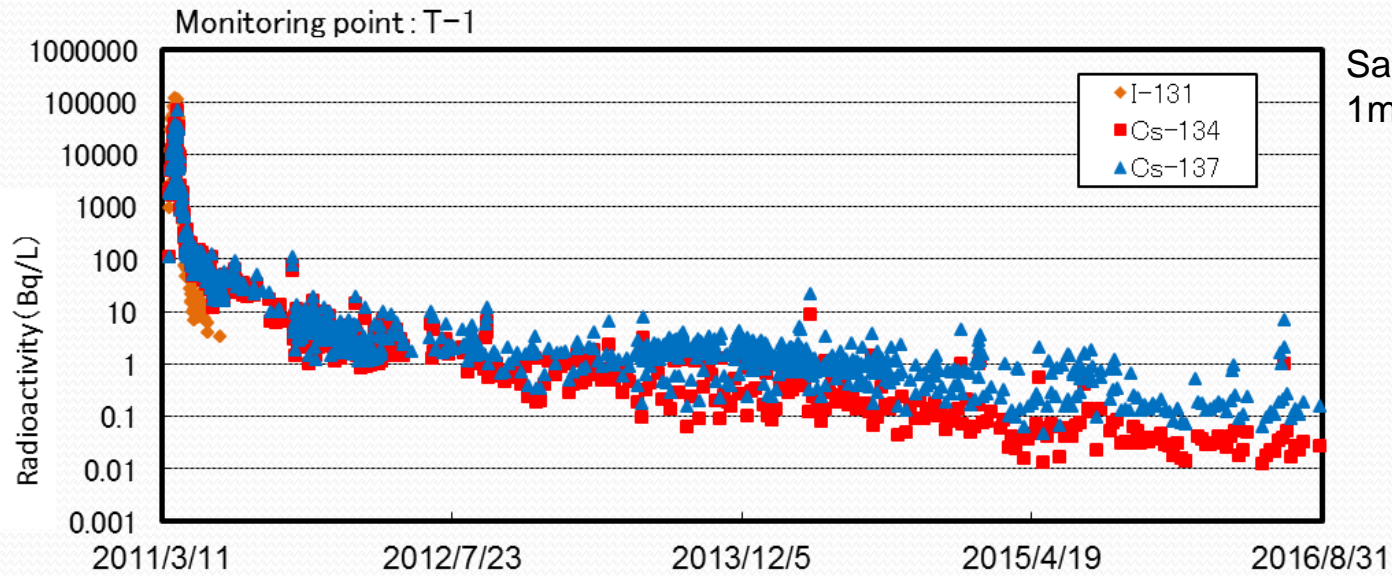
*1: Gross β including K-40 *2: Gross β excluding K-40

T-1	2016/9/26	ND(0.75)	ND(0.68)	10 ^{*1}	In progress				
	2016/9/19	ND(0.62)	ND(0.67)	14 ^{*1}	ND(1.4)				
	2016/9/12	ND(0.63)	ND(0.58)	11 ^{*1}	1.6				
	2016/9/5	ND(0.81)	ND(0.76)	8.6 ^{*1}	ND(1.5)				
	2016/8/29	ND(0.56)	ND(0.72)	9.7 ^{*1}	ND(1.5)				
	2016/6/6	ND(0.67)	ND(0.69)	14 ^{*1}	ND(1.8)	0.0097	ND(1.6)		
	2016/4/11	ND(0.70)	ND(0.62)	11 ^{*1}	ND(1.7)			ND(4.7 × 10 ⁻⁶)	(6.1 ± 1.7) × 10 ⁻⁶
F-P02	2016/8/3	ND(0.053)	ND(0.054)	0.03 ^{*2}	ND(0.50)	In progress		In progress	In progress
	2016/7/11	ND(0.061)	ND(0.051)	0.02 ^{*2}	ND(0.50)	0.001		ND(5.0 × 10 ⁻⁶)	ND(5.0 × 10 ⁻⁶)
F-P03	2016/8/3	ND(0.066)	ND(0.062)	0.02 ^{*2}	ND(0.50)	In progress		In progress	In progress
	2016/7/11	ND(0.057)	ND(0.047)	ND(0.02) ^{*2}	ND(0.50)	ND(0.0005)		ND(9.0 × 10 ⁻⁶)	ND(6.0 × 10 ⁻⁶)
F-P01	2016/8/3	ND(0.050)	ND(0.046)	0.02 ^{*2}	ND(0.50)	In progress		In progress	In progress
	2016/7/11	ND(0.050)	ND(0.048)	0.02 ^{*2}	ND(0.50)	0.001		ND(6.0 × 10 ⁻⁶)	ND(6.0 × 10 ⁻⁶)
T-2	2016/9/26	ND(0.49)	ND(0.71)	8.9 ^{*1}	In progress				
	2016/9/21	ND(0.59)	ND(0.53)	14 ^{*1}	ND(1.8)				
	2016/9/14	ND(0.91)	ND(1.3)	ND(17) ^{*1}	ND(1.6)				
T-2-1 ^{*3}	2016/8/29	ND(0.66)	1.3	10 ^{*1}	ND(1.5)				
	2016/6/6	ND(0.51)	ND(0.60)	11 ^{*1}	ND(1.8)	ND(0.0065)	ND(1.5)		
	2016/4/11	ND(0.79)	ND(0.76)	11 ^{*1}	ND(1.7)			ND(4.9 × 10 ⁻⁶)	(5.1 ± 1.5) × 10 ⁻⁶

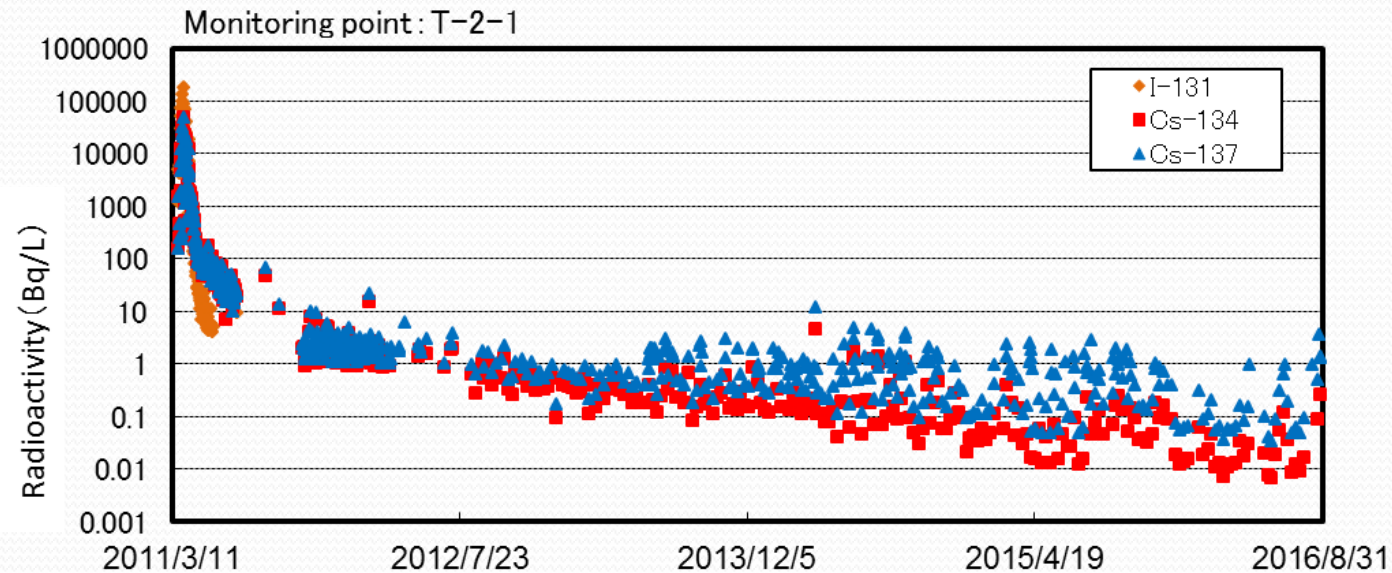
*3: Sampling at T-2-1 was replaced by sampling at T-2 on and after Sep.2016, because the road access to T-2-1 had been damaged by typhoon.

0 0.5 1km

The time course of the I-131, Cs-134 and Cs-137 concentration found in the surface waters within 2km from the NPS



Sampling depth:
1m below the sea level



The most recent radioactivity data of the surface waters within

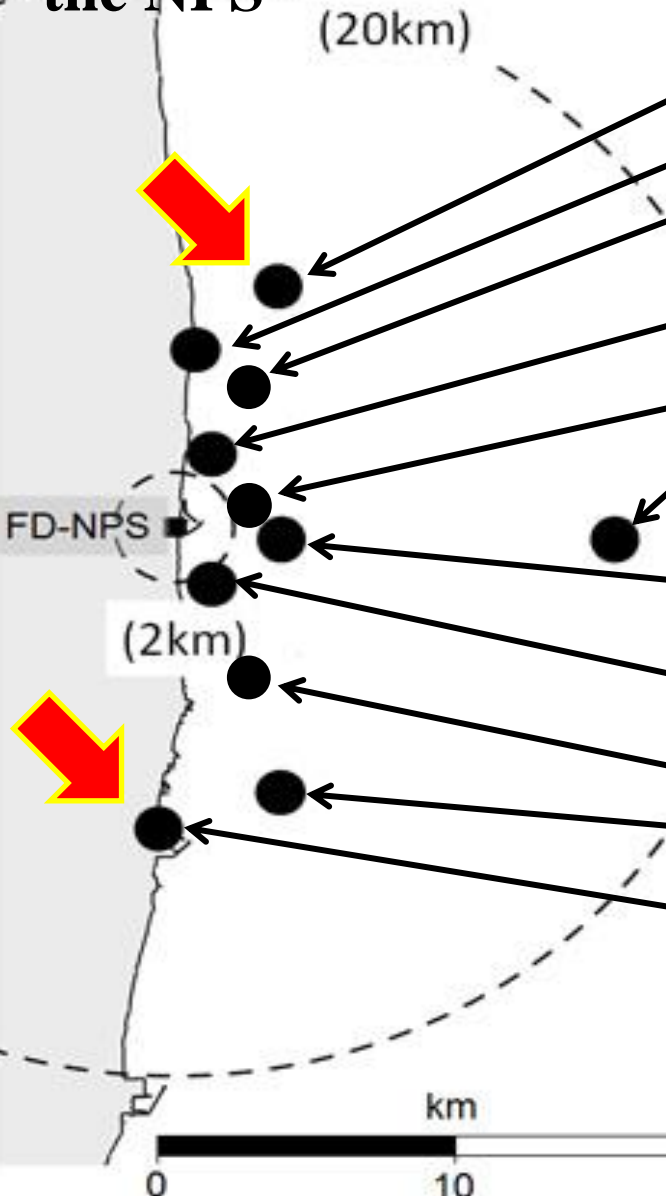
2-20km from
the NPS

Sampling point	Sampling Date	Cs-134	Cs-137	Gross β	H-3	Sr-90	Gross α	Pu-238	Pu-239+240	S	S:2m below sea level
										Depth(m) from sea level	

Sea water radioactivity (Bq/L):

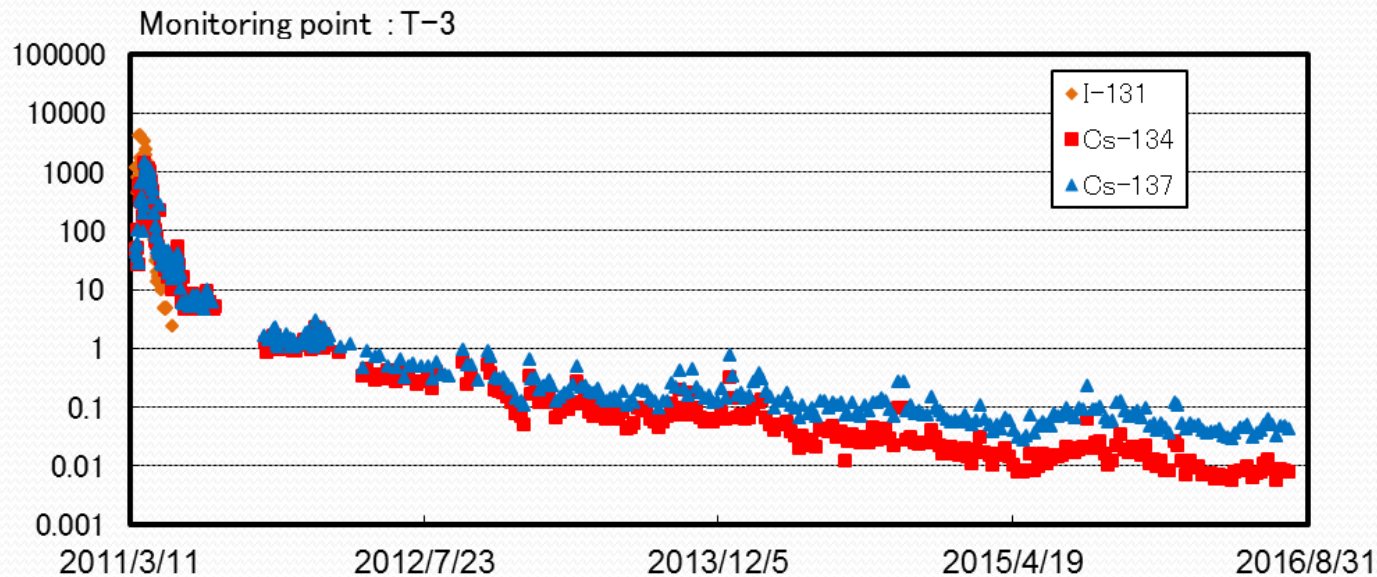
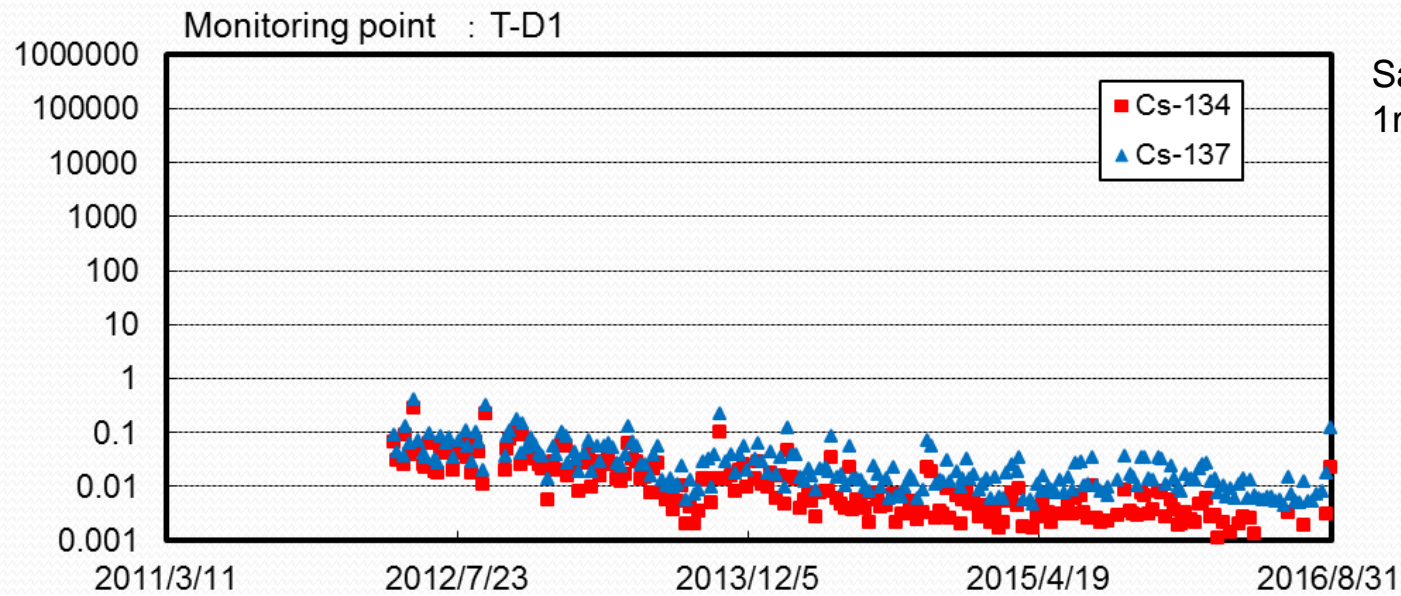
ND: Not detected; Numbers in parentheses: detection limits

*1: Gross β including K-40 *2: Gross β excluding K-40



T-D1	2016/8/19	ND(0.0014)	0.0082	ND(17) ^{*1}	ND(0.35)						S
	2016/8/1	ND(0.0012)	0.0054	ND(17) ^{*1}	ND(0.35)	ND(0.0077)	ND(1.5)				S
	2016/4/5	0.0027	0.014	ND(18) ^{*1}	ND(0.35)	ND(0.0078)	ND(1.9)	ND(5.5 × 10 ⁻⁶)	(7.2 ± 2.0) × 10 ⁻⁶		S
T-6	2016/8/16	0.011	0.064	ND(16) ^{*1}	ND(0.35)						S
	2016/8/2	0.0079	0.044	ND(18) ^{*1}	ND(0.31)						S
F-P06	2016/8/3	ND(0.061)	ND(0.050)	0.03 ^{*2}	ND(0.49)	In progress		In progress	In progress		S
	2016/7/11	ND(0.068)	ND(0.049)	0.02 ^{*2}	ND(0.50)	0.001		ND(8.0 × 10 ⁻⁶)	ND(9.0 × 10 ⁻⁶)		S
M-103	2016/8/4	0.00085	0.0074		0.11	In progress					0.5m
	2016/7/13	0.0017	0.0077		0.12	In progress					0.5m
	2016/6/15	0.0032	0.017		0.090	In progress					0.5m
	2016/5/18	0.0013	0.0082		0.065	In progress					0.5m
	2016/4/27	0.0012	0.0071		0.11	0.0011					0.5m
F-P04	2016/8/3	ND(0.055)	ND(0.052)	0.02 ^{*2}	ND(0.50)	In progress		In progress	In progress		S
	2016/7/11	ND(0.054)	ND(0.051)	0.02 ^{*2}	ND(0.50)	0.001		ND(9.0 × 10 ⁻⁶)	ND(9.0 × 10 ⁻⁶)		S
T-5	2016/8/18	0.0019	0.012	ND(17) ^{*1}	ND(0.35)						S
	2016/8/2	ND(0.0011)	0.0029	ND(16) ^{*1}	ND(0.35)	ND(0.0074)	ND(1.5)				S
	2016/4/5	ND(0.0011)	0.0055	ND(18) ^{*1}	ND(0.35)	ND(0.0064)	ND(1.6)	ND(5.2 × 10 ⁻⁶)	ND(5.2 × 10 ⁻⁶)		S
T-D5	2016/8/19	0.0049	0.030	ND(17) ^{*1}	ND(0.35)						S
	2016/8/1	ND(0.0014)	0.0062	ND(17) ^{*1}	ND(0.36)	ND(0.0072)	ND(1.5)				S
	2016/4/5	0.0018	0.012	ND(18) ^{*1}	ND(0.35)	ND(0.0075)	ND(1.9)	ND(5.4 × 10 ⁻⁶)	ND(5.7 × 10 ⁻⁶)		S
	2016/8/3	0.0010	0.0063		0.12	In progress					0.5m
	2016/7/14	0.0014	0.0096		0.11	In progress					0.5m
M-104	2016/6/16	0.0021	0.011		0.069	In progress					0.5m
	2016/5/19	0.0012	0.0066		0.074	In progress					0.5m
	2016/4/27	0.00098	0.0067		0.079	0.0014					0.5m
	2016/8/3	ND(0.055)	ND(0.050)	0.02 ^{*2}	ND(0.49)	In progress		In progress	In progress		S
F-P05	2016/7/11	ND(0.064)	ND(0.063)	0.03 ^{*2}	ND(0.50)	ND(0.0004)		ND(8.0 × 10 ⁻⁶)	ND(9.0 × 10 ⁻⁶)		S
	2016/8/18	0.0042	0.022	ND(17) ^{*1}	ND(0.35)						S
T-D9	2016/8/1	ND(0.00093)	0.0035	ND(17) ^{*1}	ND(0.35)	ND(0.0071)	ND(1.5)				S
	2016/4/5	0.0015	0.010	ND(18) ^{*1}	ND(0.35)	ND(0.0076)	ND(1.6)	ND(4.9 × 10 ⁻⁶)	ND(4.9 × 10 ⁻⁶)		S
T-3	2016/8/16	0.010	0.066	ND(16) ^{*1}	ND(0.30)						S
	2016/8/2	0.0078	0.039	ND(16) ^{*1}	ND(0.30)						S

The time course of the I-131, Cs-134 and Cs-137 concentration found in the surface waters within 2-20km from the NPS



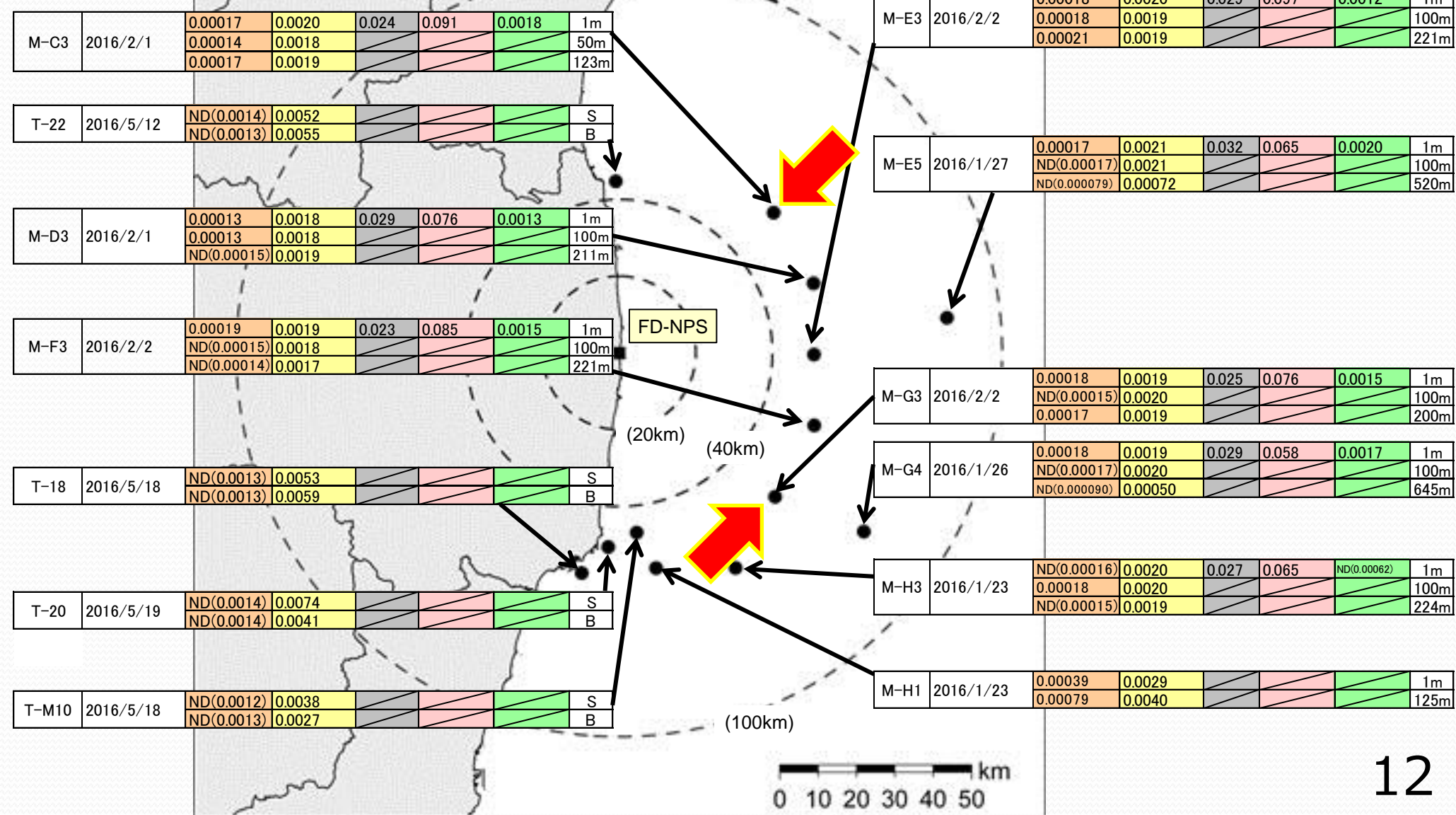
The most recent radioactivity data of the surface waters within 20-100km from the NPS

Sampling point	Sampling Date	Cs-134	Cs-137	Total β*	H-3	Sr-90	S/B
							S:2m below sea level B:2-3m above sea bottom
							Depth(m) from sea level

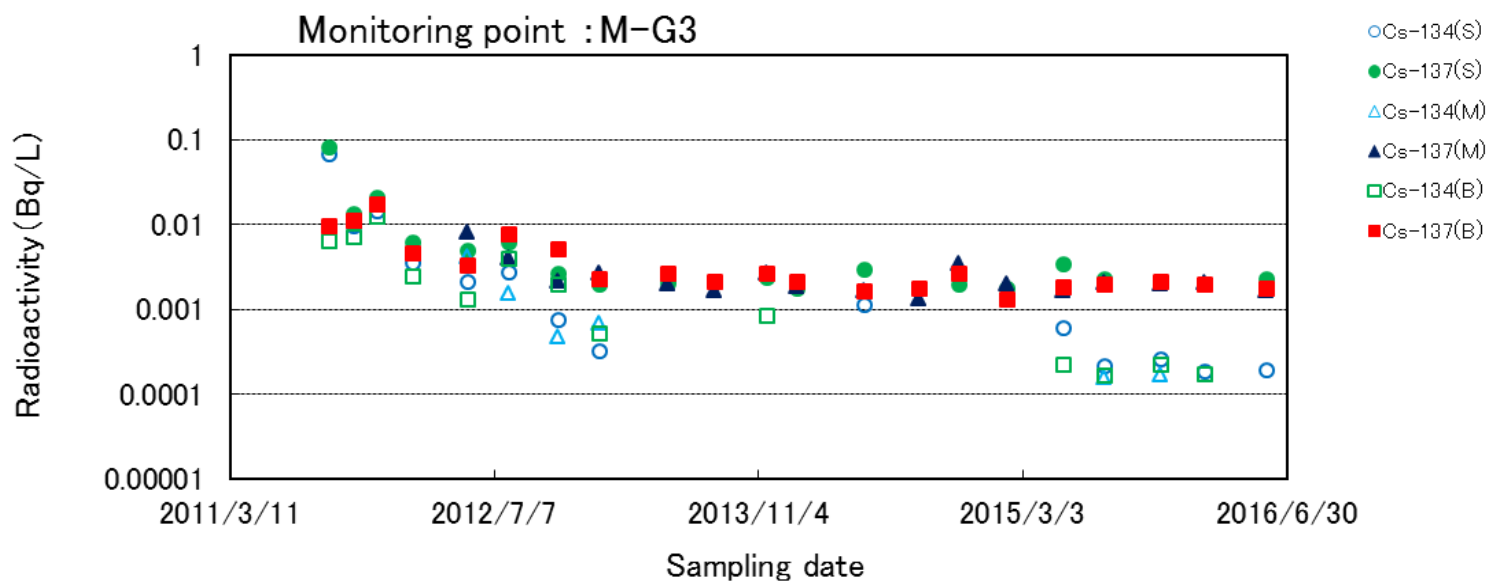
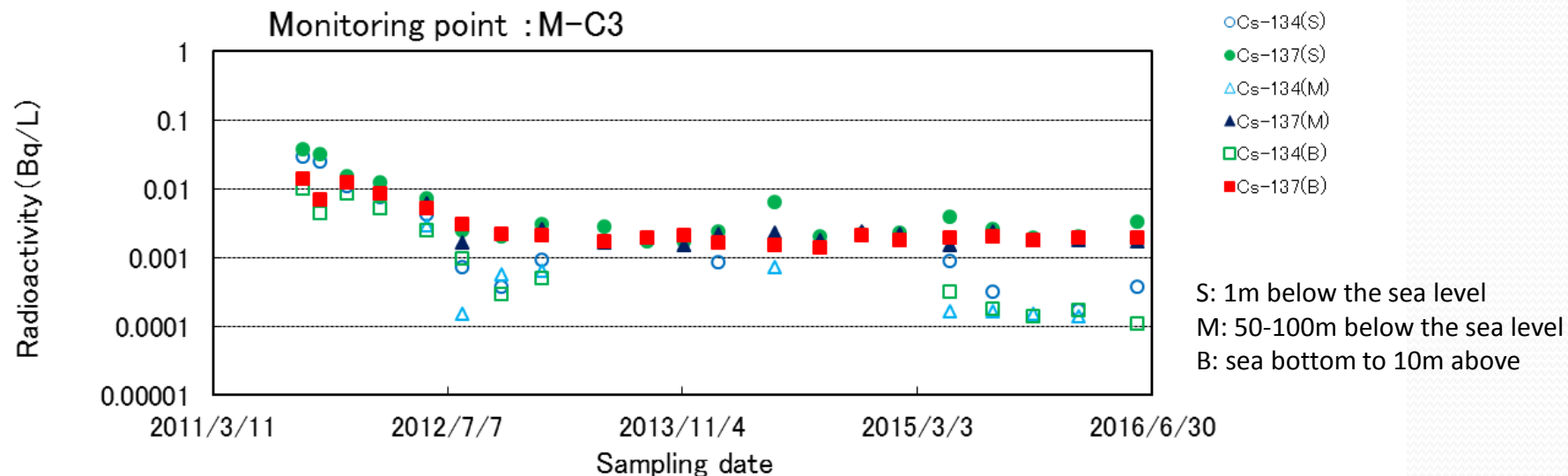
Sea water radioactivity (Bq/L):

ND: Not detected; Numbers in parentheses: detection limits

*Gross β excluding K-40



The time course of the Cs-134 and Cs-137 concentration found in the waters within 20-100km from the NPS



The most recent radioactivity data of the waters off the coast of Eastern Japan

Sampling point	Sampling Date	Cs-134	Cs-137	Depth(m) from sea level
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Sea water radioactivity (Bq/L):
 ND: Not detected; Numbers in parentheses: detection limits

M-10	2016/6/9	ND(0.00064)	0.0022	1m
		ND(0.00069)	0.0026	100m
		ND(0.00063)	0.0020	200m
		ND(0.00062)	0.0018	300m
		ND(0.00064)	0.0011	500m

M-14	2016/6/7	ND(0.00058)	0.0022	1m
		ND(0.00060)	0.0028	100m
		ND(0.00056)	0.0024	200m
		ND(0.00060)	0.0020	300m
		ND(0.00062)	0.00084	500m

M-19	2016/6/4	ND(0.00068)	0.0026	1m
		ND(0.00068)	0.0028	100m
		ND(0.00067)	0.0025	200m
		ND(0.00070)	0.0019	300m
		ND(0.00072)	0.00084	500m

M-20	2016/6/7	ND(0.00065)	0.0023	1m
		ND(0.00064)	0.0026	100m
		ND(0.00068)	0.0021	199m
		ND(0.00060)	0.0019	301m
		ND(0.00063)	0.0010	500m

M-25	2015/6/5	ND(0.00060)	0.0016	1m
		ND(0.00056)	0.0023	100m
		ND(0.00069)	0.0034	200m
		ND(0.00063)	0.0034	300m
		ND(0.00062)	0.0021	500m

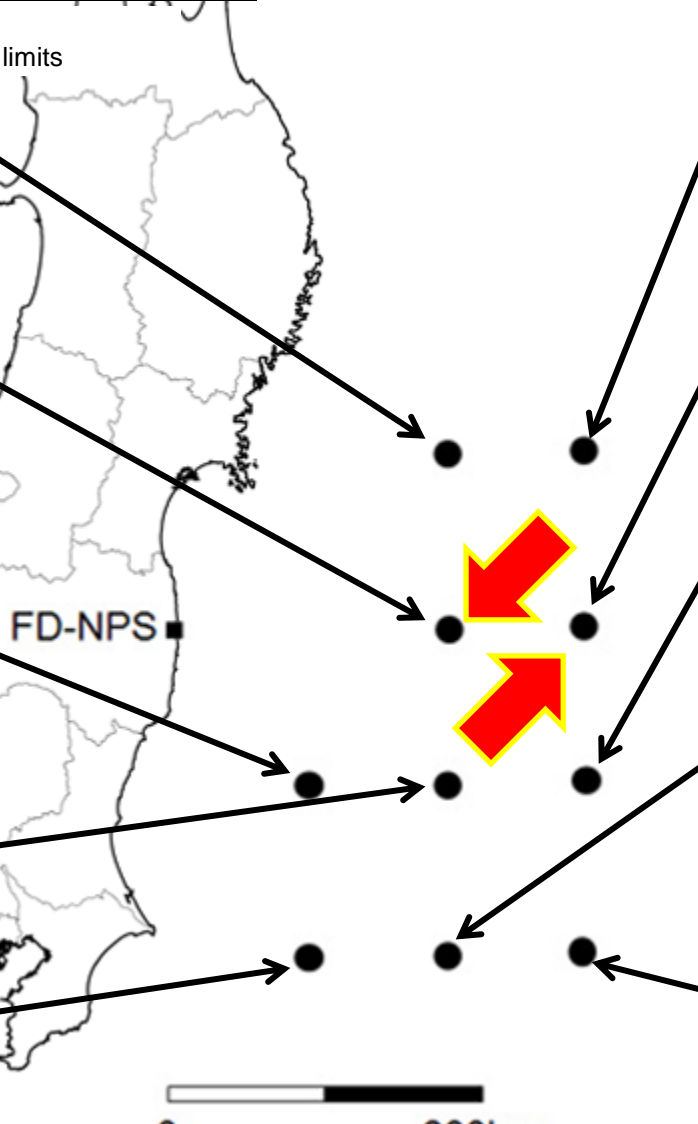
M-11	2016/6/8	ND(0.00064)	0.0026	1m
		ND(0.00072)	0.0027	100m
		ND(0.00065)	0.0020	200m
		ND(0.00064)	0.0014	300m
		ND(0.00072)	0.00092	500m

M-15	2016/6/8	ND(0.00058)	0.0020	1m
		ND(0.00062)	0.0027	100m
		ND(0.00070)	0.0035	200m
		ND(0.00063)	0.0031	300m
		ND(0.00059)	0.0012	500m

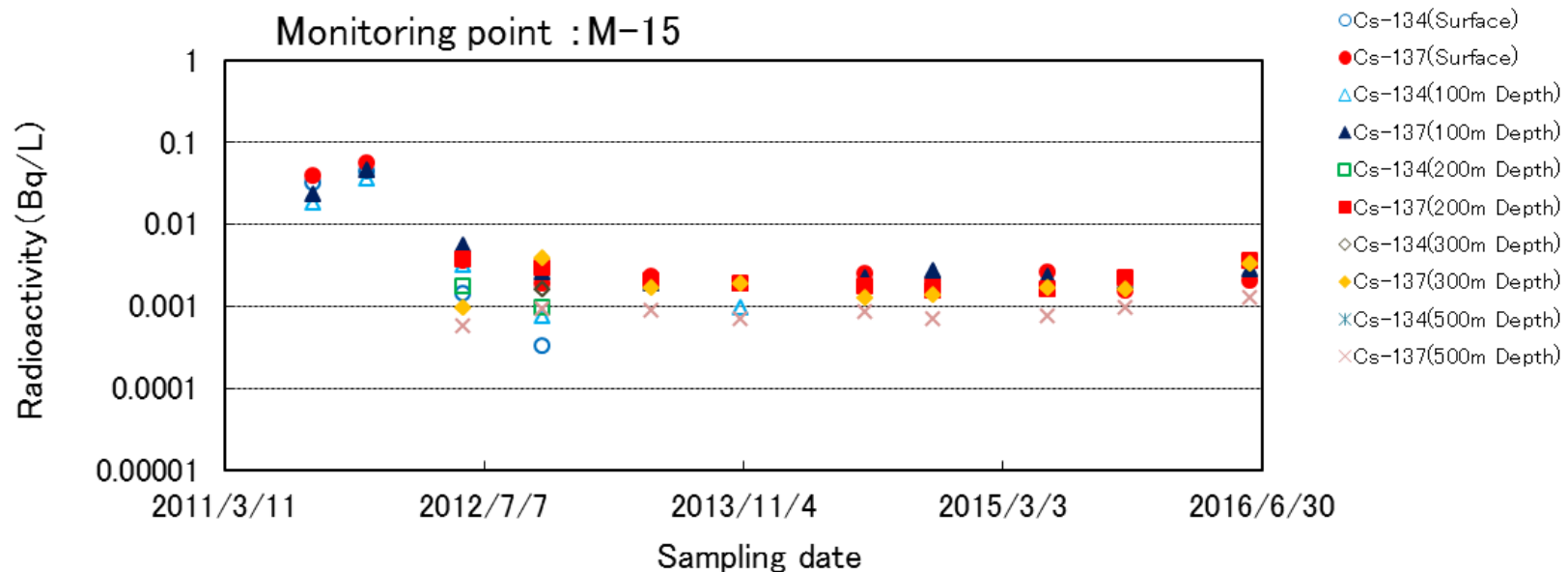
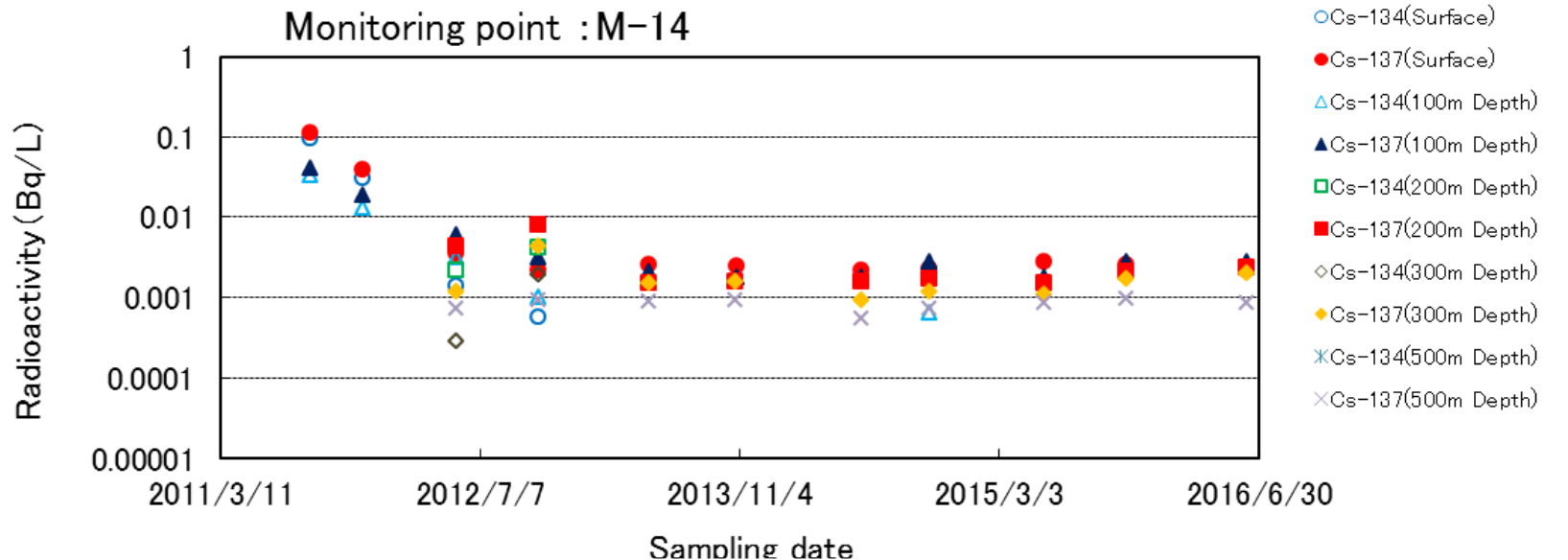
M-21	2016/6/6	ND(0.00059)	0.0022	1m
		ND(0.00060)	0.0025	100m
		ND(0.00062)	0.0023	200m
		ND(0.00064)	0.0015	300m
		ND(0.00063)	0.00090	501m

M-26	2016/6/5	ND(0.00060)	0.0017	1m
		ND(0.00058)	0.0025	99m
		ND(0.00066)	0.0028	200m
		ND(0.00056)	0.0037	301m
		ND(0.00064)	0.0021	500m

M-27	2016/6/6	ND(0.00056)	0.0026	1m
		ND(0.00056)	0.0032	100m
		ND(0.00055)	0.0022	200m
		ND(0.00055)	0.0022	300m
		ND(0.00057)	0.0011	500m



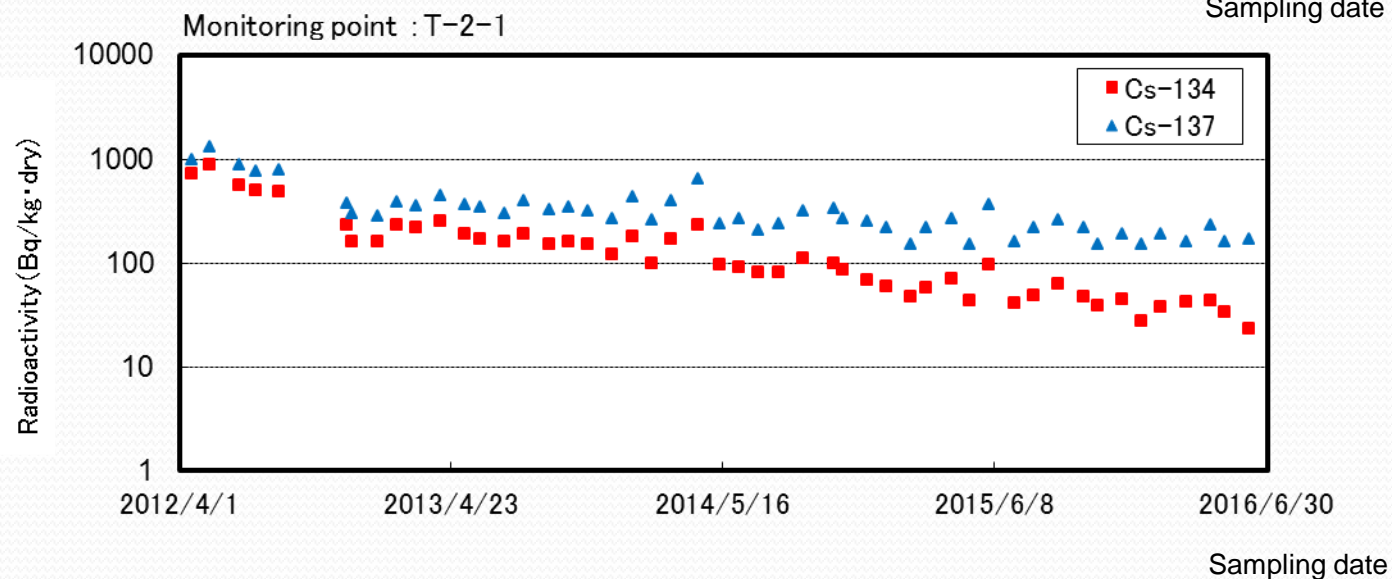
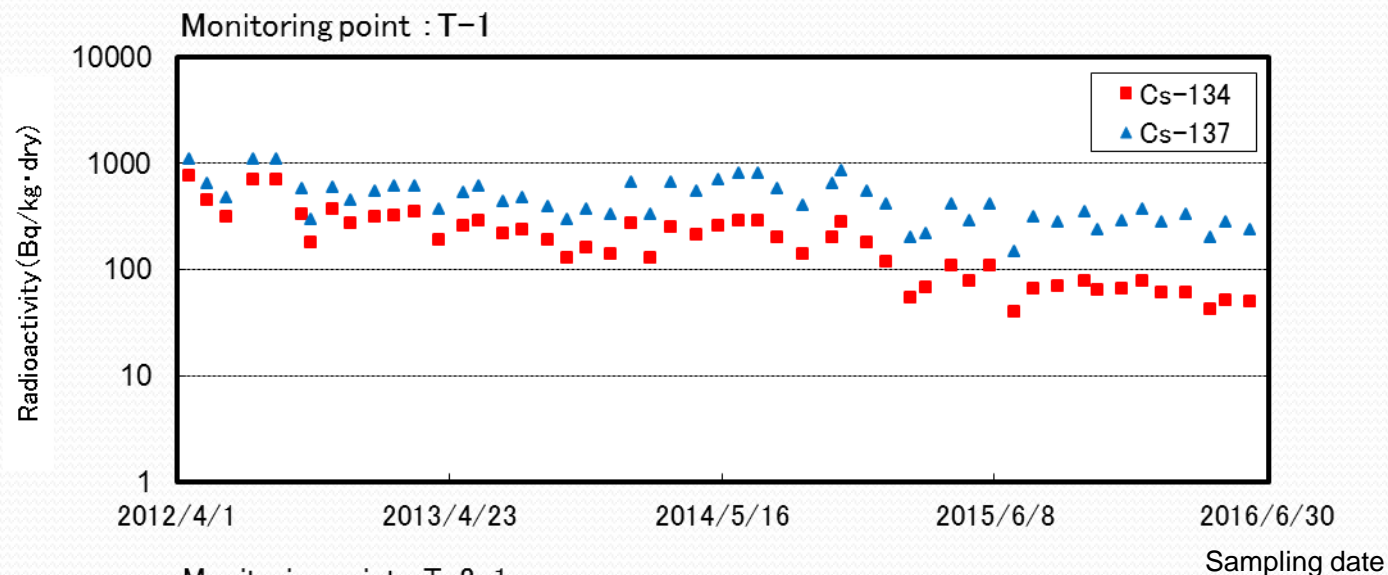
The time course of the Cs-134 and Cs-137 concentration found in the waters off the coast of Eastern Japan



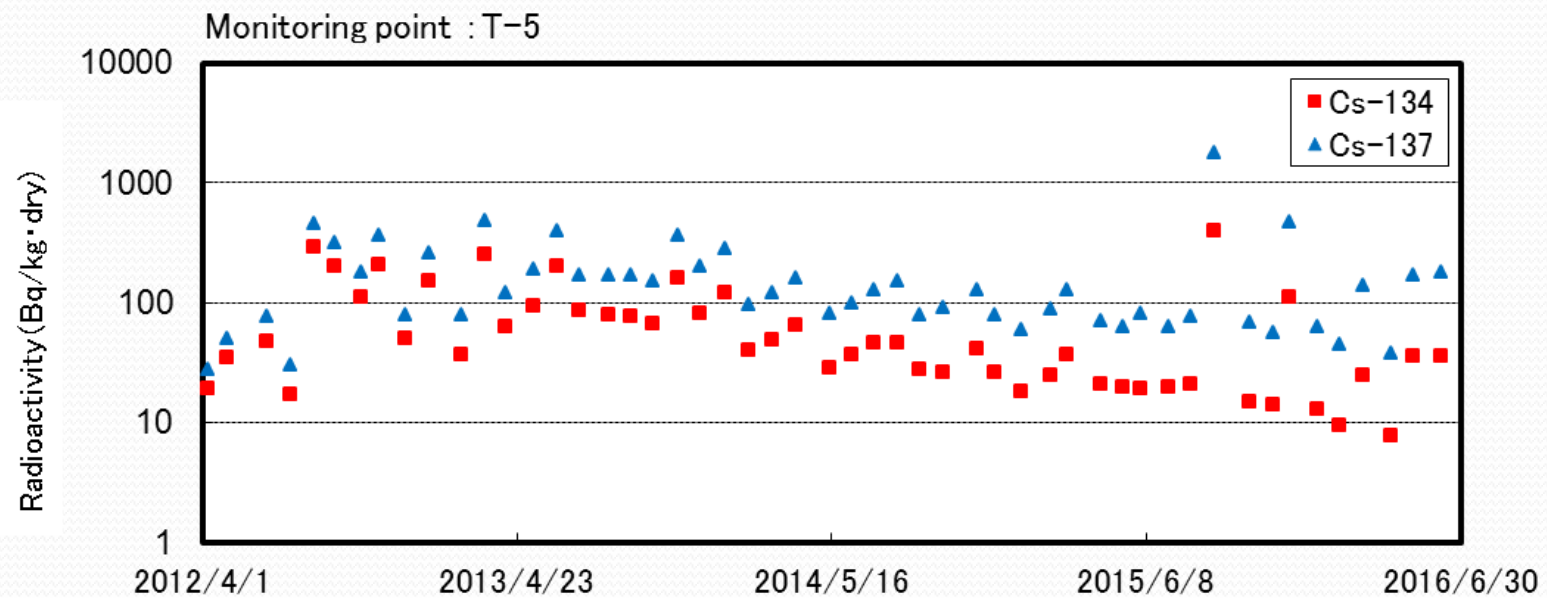
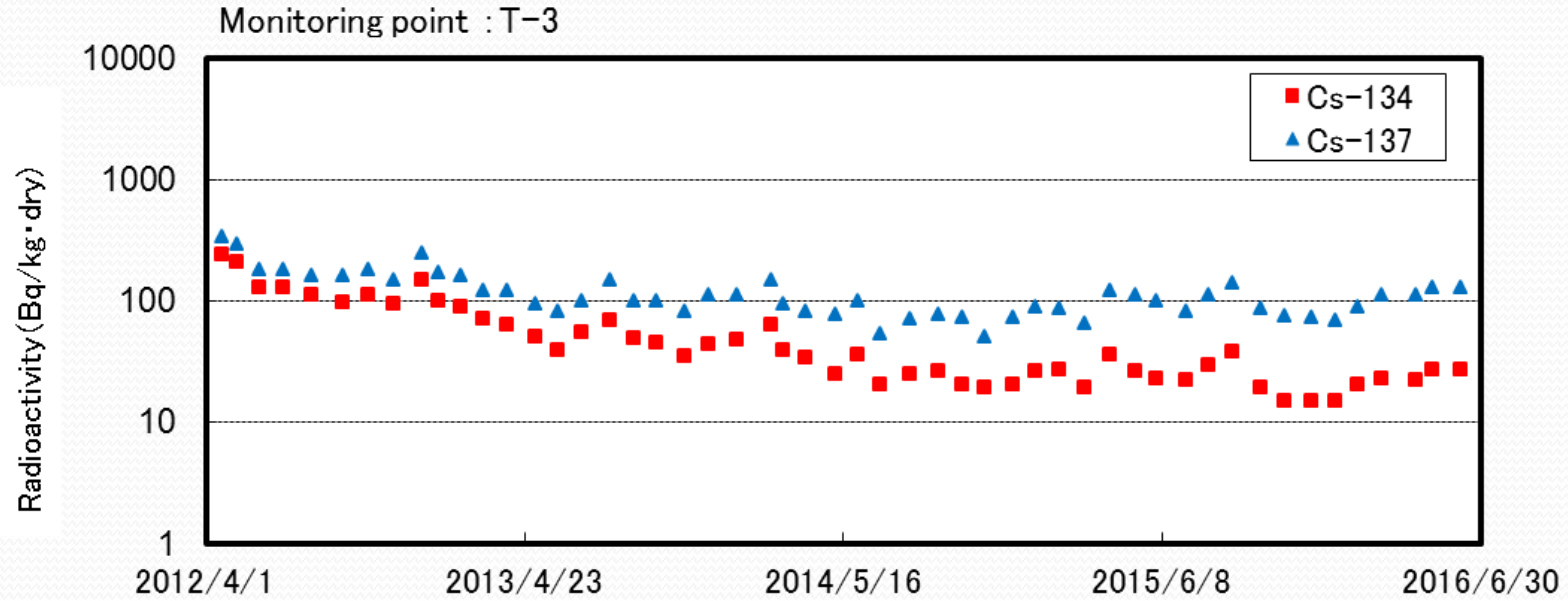


Sediment

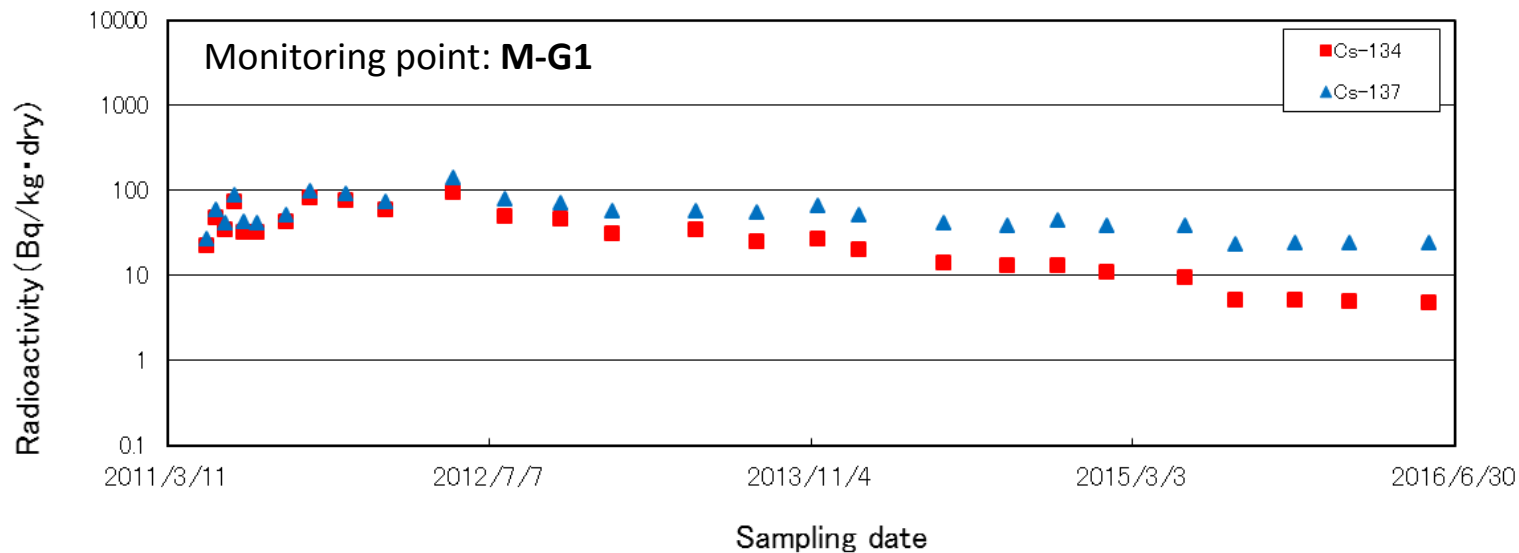
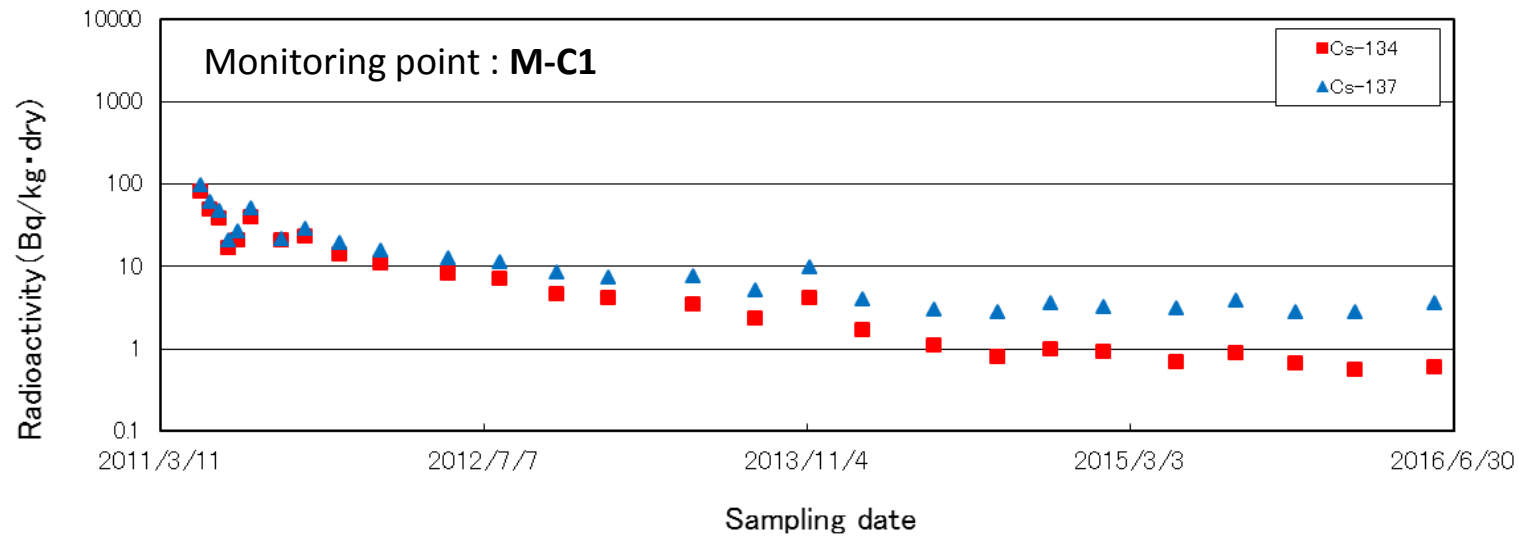
The time course of the Cs-134 and Cs-137 concentration found in the sediments within 2km from the NPS



The time course of the Cs-134 and Cs-137 concentration found in the sediments within 2-20km from the NPS



The time course of the Cs-134 and Cs-137 concentration found in the sediments within 20-100km from the NPS



Inter-laboratory Comparison between IAEA and Japan



Distribution of seawater samples to NRA and IAEA containers after homogenization. The samples will subsequently be analyzed in parallel in Japan and the IAEA.



Collecting surface seawater during the mission using a Niskin bottle.



F D N
P S

Collection of seawater samples at location M-102.

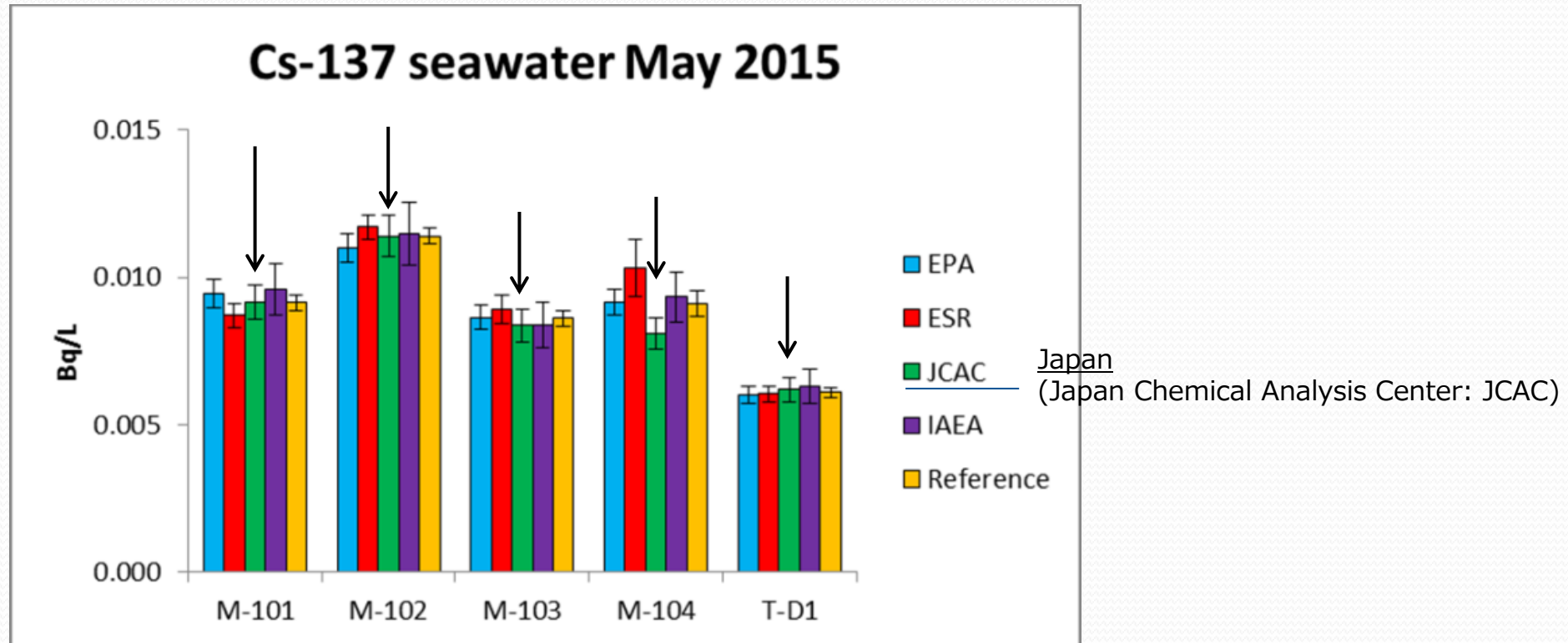


Preparations at the port for the transport of NRA and IAEA samples after completion of the mission.

(as of September 16, 2014)

<http://radioactivity.nsr.go.jp/ja/contents/11000/10134/24/140916.pdf>

Result of Seawater Inter-laboratory Comparison between IAEA and Japan



- Good agreement is shown between activity concentrations of Cesium-137 in five seawater samples
- IAEA found that Japanese labs reliable in analyzing seawater, sediment and fish samples near Fukushima

- END -