Monitoring activity on radioactive cesium in seawater and sediment in the North Pacific by Fisheries Research Agency after the Fukushima Dai-ichi Nuclear Power Plant Accident

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Fukushima Dai-ichi Nuclear Power Plant accident

- ✧ **The Fukushima Dai-ichi Nuclear Power Plant (FNPP) accident after the Great East Japan Earthquake and tsunami resulted in a considerable elevation of anthropogenic radioactivity in the western North Pacific**
- ✧ **Estimates of the total ^{134}Cs release ranged from 10 to 46 PBq**

Radioactive cesium monitoring in seawater and sediment

Motivation

- ❖ **The distributions of the Fukushima derived radioactive cesium in sea water and sediment are a fundamental information in addressing risks to both marine ecosystems and public health through consumption of fisheries products**

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Monitoring outline -seawater-

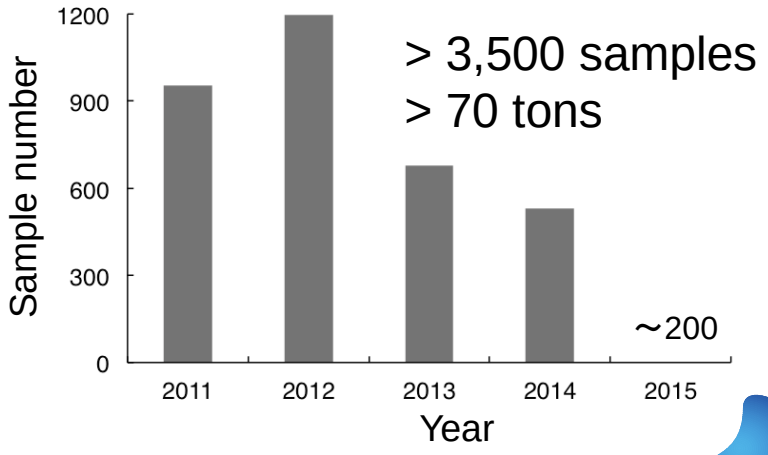
Research vessels of FRA

Sampling and measurement of radioactivity

A 20 L seawater at pH 1.4 w/nitric acid
AMP precipitation method was applied

Gamma ray measurement
by Ge-semiconductor detector

Counting time and detection limit
In 2011-mid 2012
7,200 sec (2h), ca 5 mBq/L
After mid 2012
> 80,0000 sec (24h), ca 1.5 mBq/L



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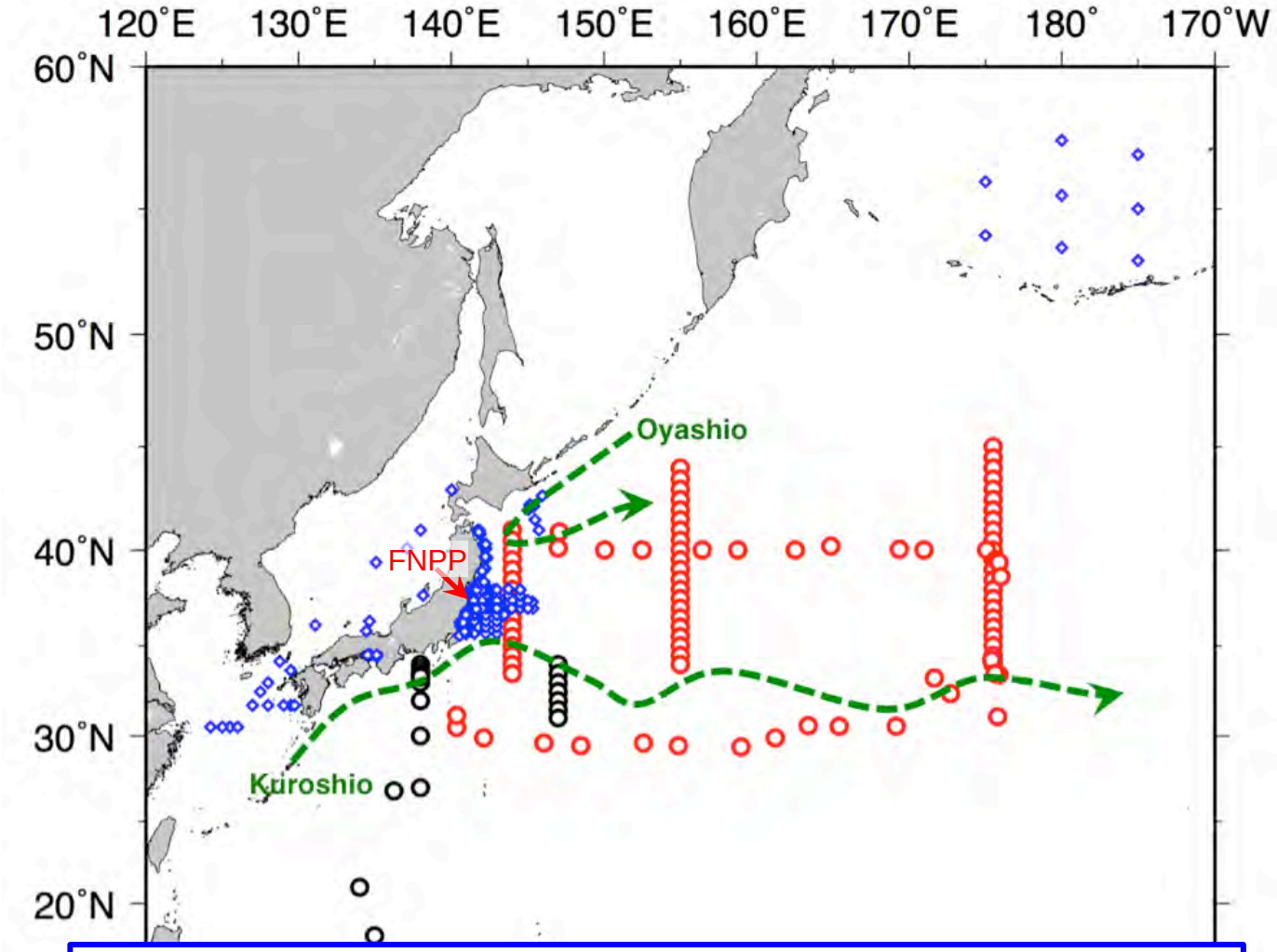
Sampling area -seawater-



In Japan Sea, East China Sea and Bering Sea,

- ^{134}Cs was not detected (< 1-5 mBq/L)
- only background level ^{137}Cs (1-2 mBq/L) were detected

Kaeriyama (2015)

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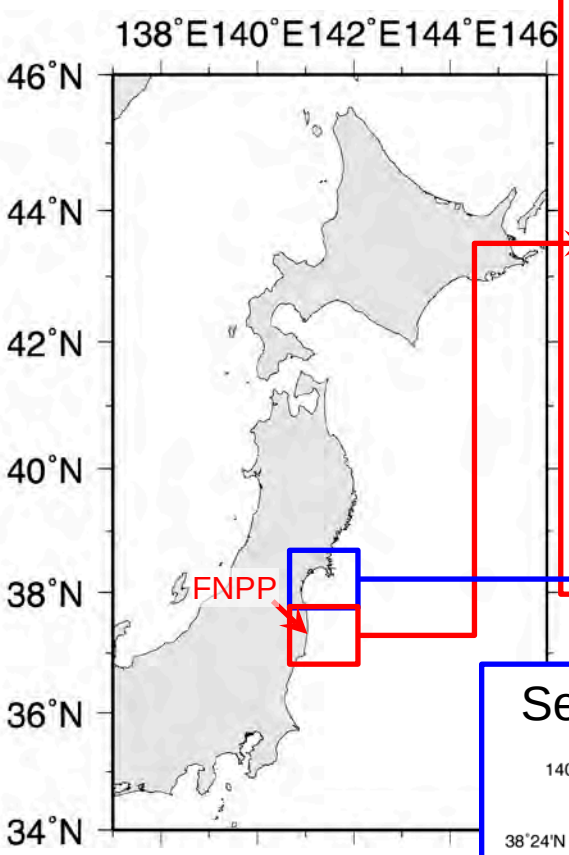
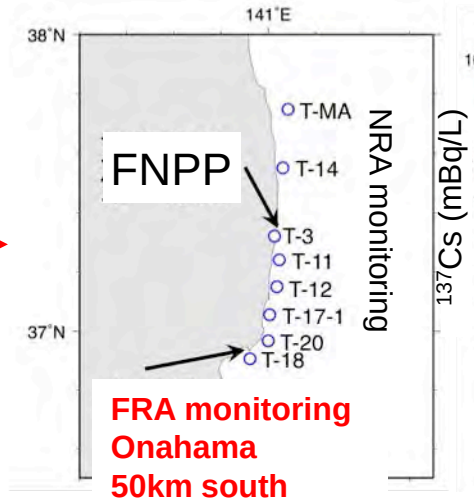
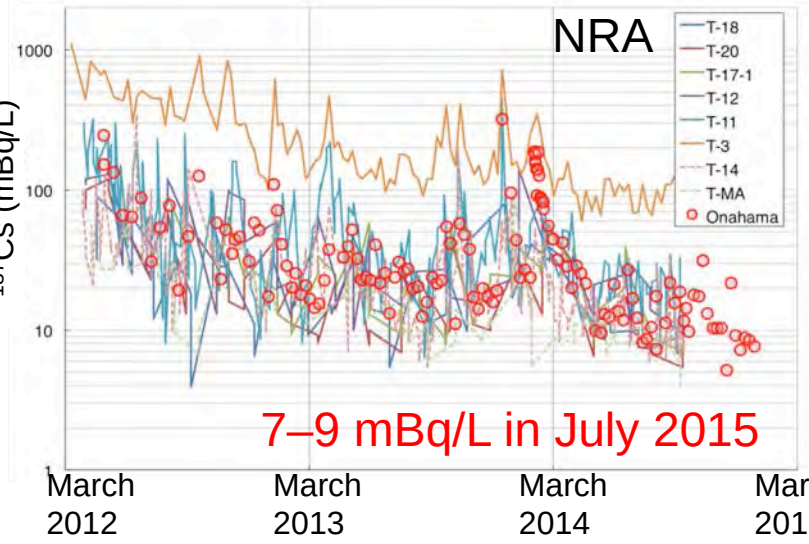
Coastal water near the FNPP





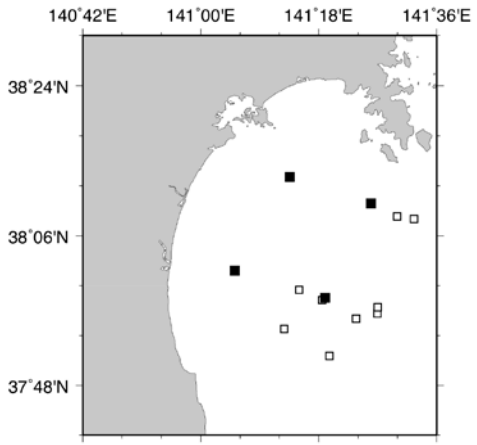
FRA monitoring
Onahama
50km south
from FNPP

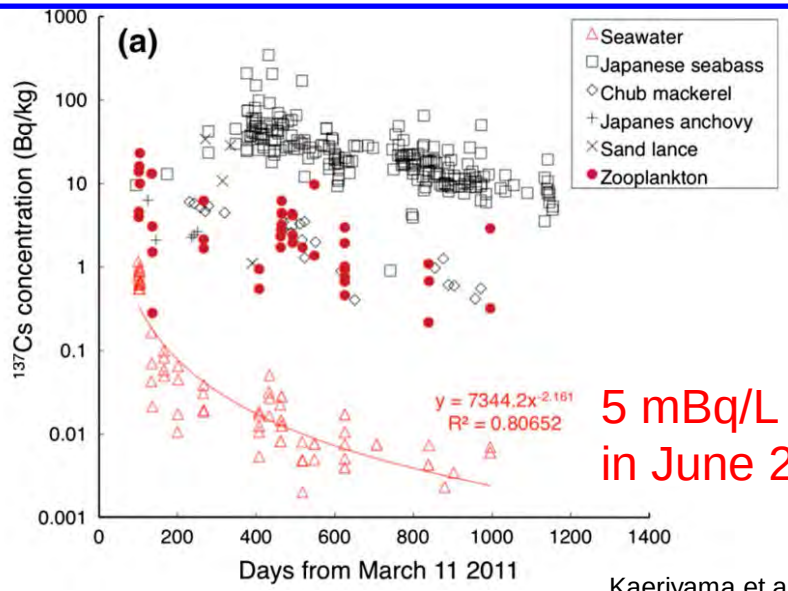


7–9 mBq/L in July 2015

based on Kaeriyama (2015), and Nuclear Regulation Authority

Sendai Bay





5 mBq/L
in June 2015

Kaeriyama et al (2015)

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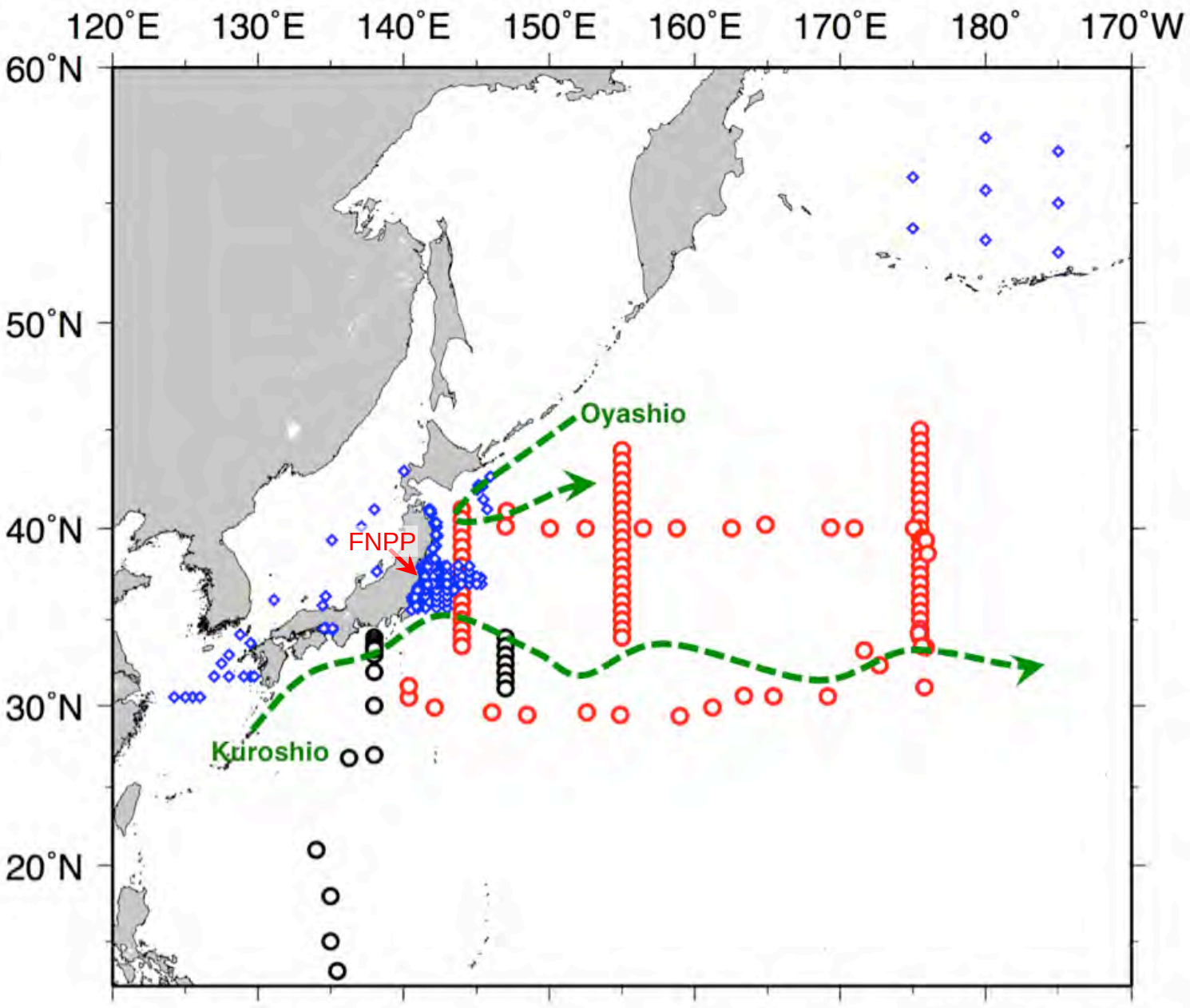
North Pacific (red and black circles)



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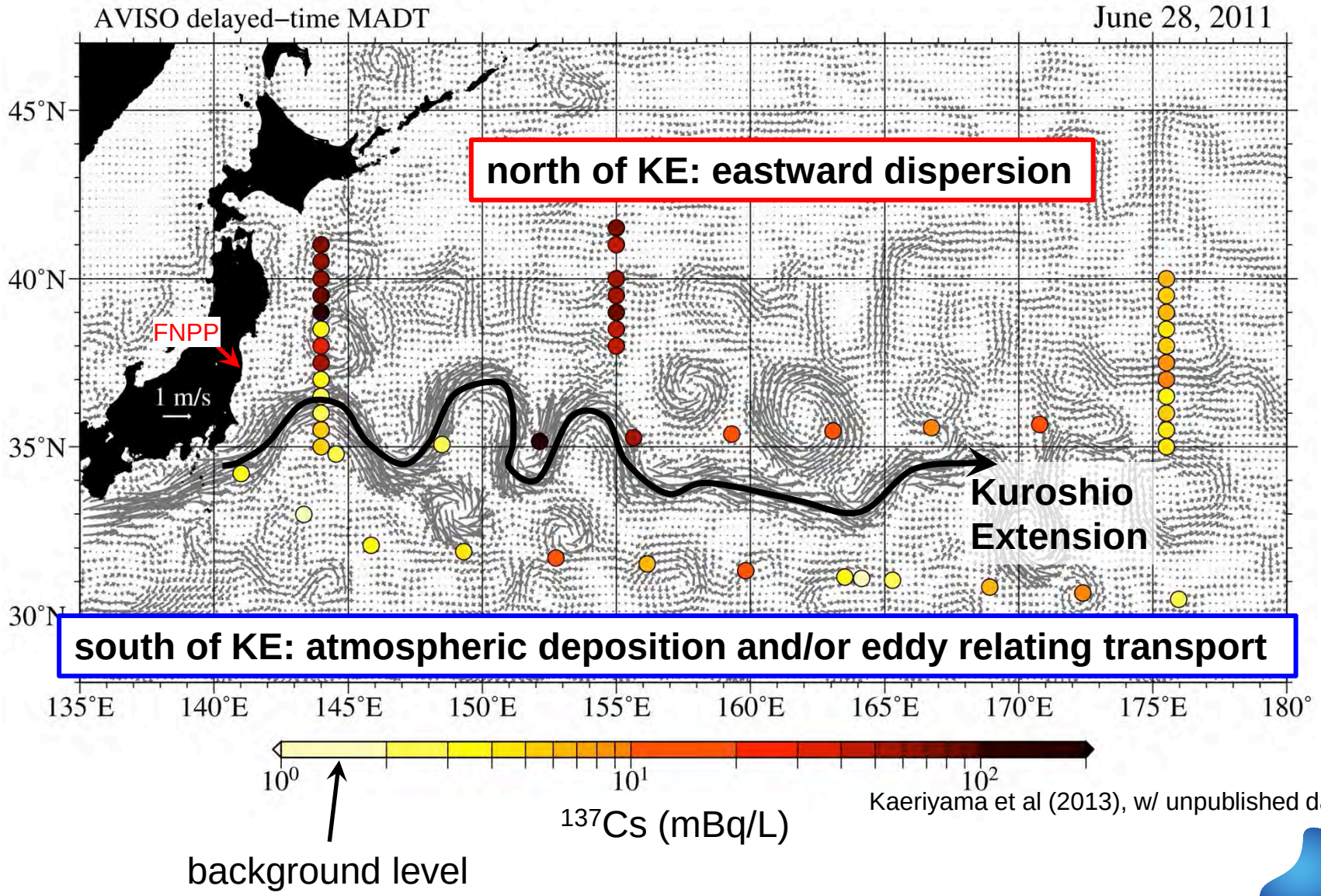
Surface dispersion of ^{137}Cs (June-July 2011)



Kaeriyama et al (2013), w/ unpublished data

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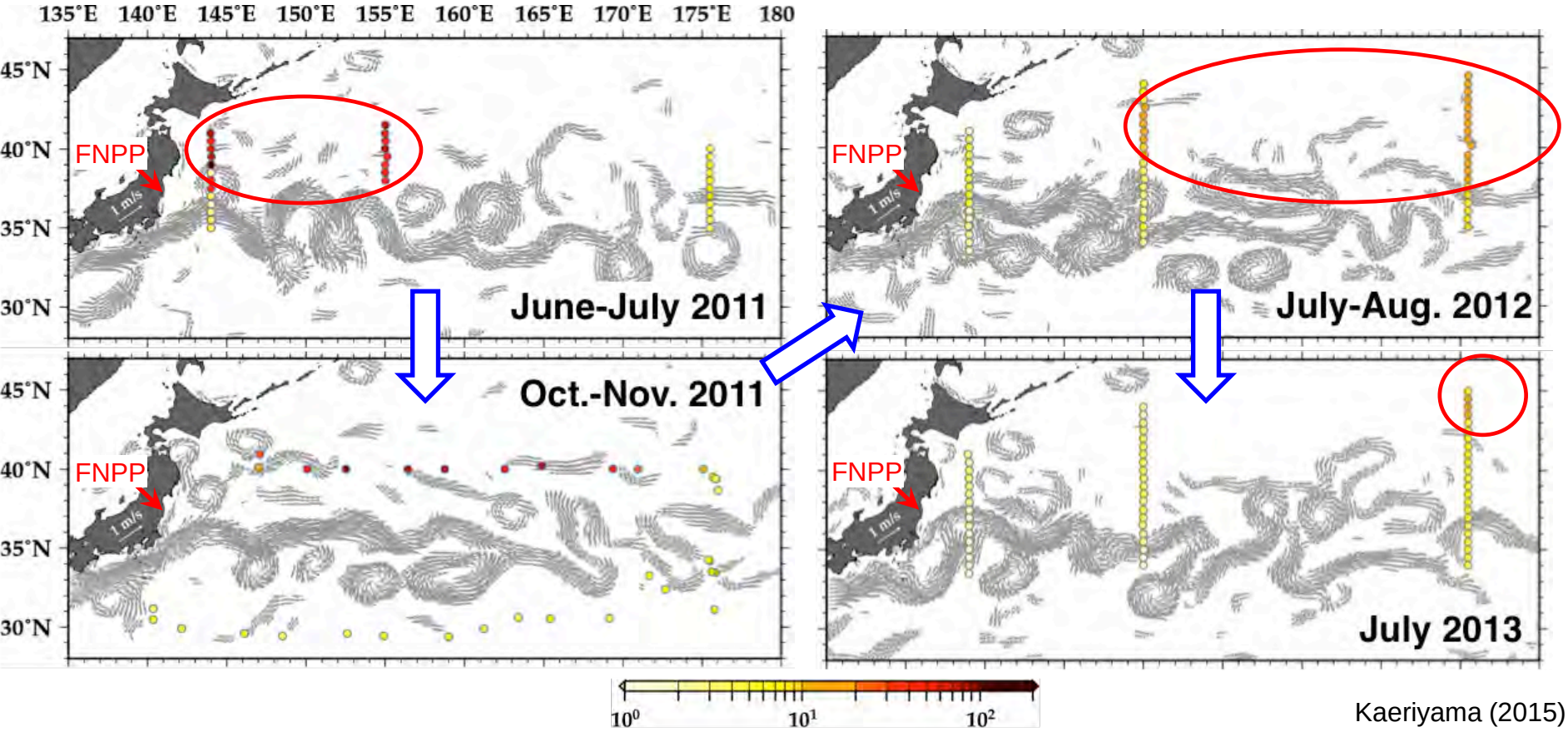
Eastward dispersion of ^{137}Cs (2011-2013)



Kaeriyama (2015)

^{137}Cs (mBq/L)

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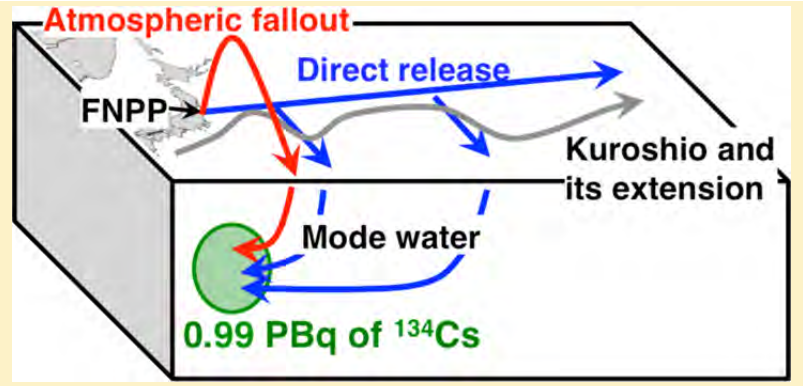
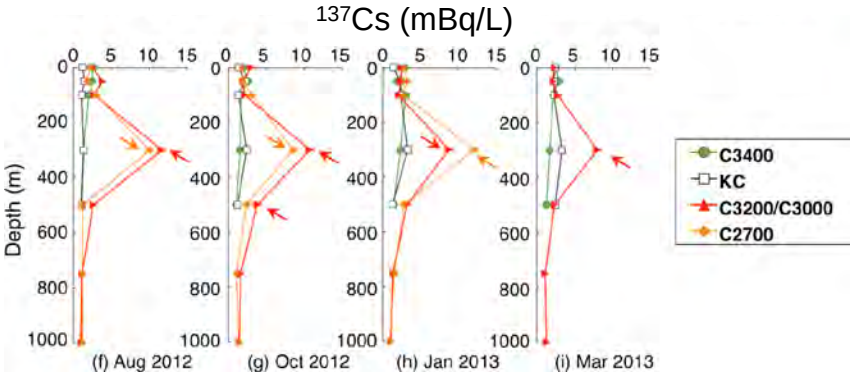
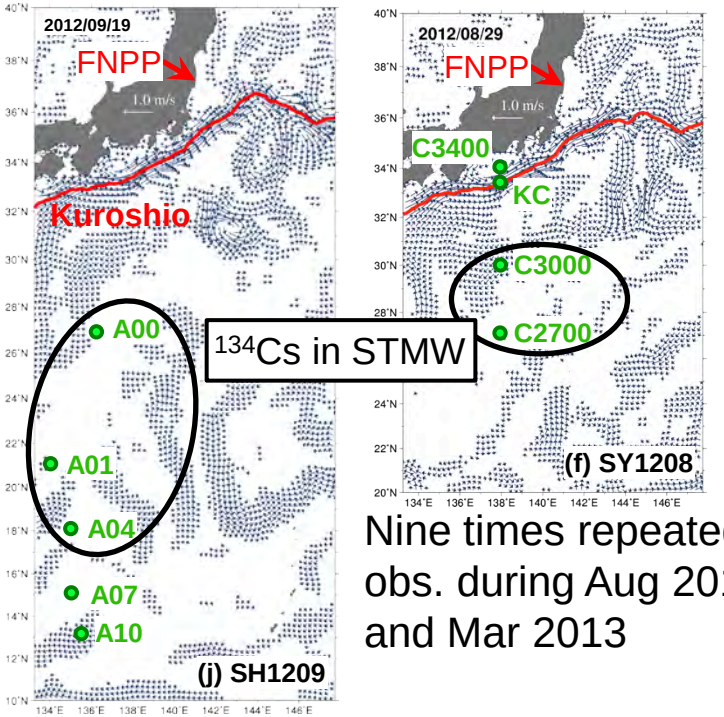
Southward intrusion with mode water : Kaeriyama et al (2014)







Sep 2012

Nine times repeated obs. during Aug 2011 and Mar 2013

137Cs (mBq/L)

134Cs was observed in Subtropical Mode Water (STMW)

Inventory of 137Cs increased during Feb and Aug 2012

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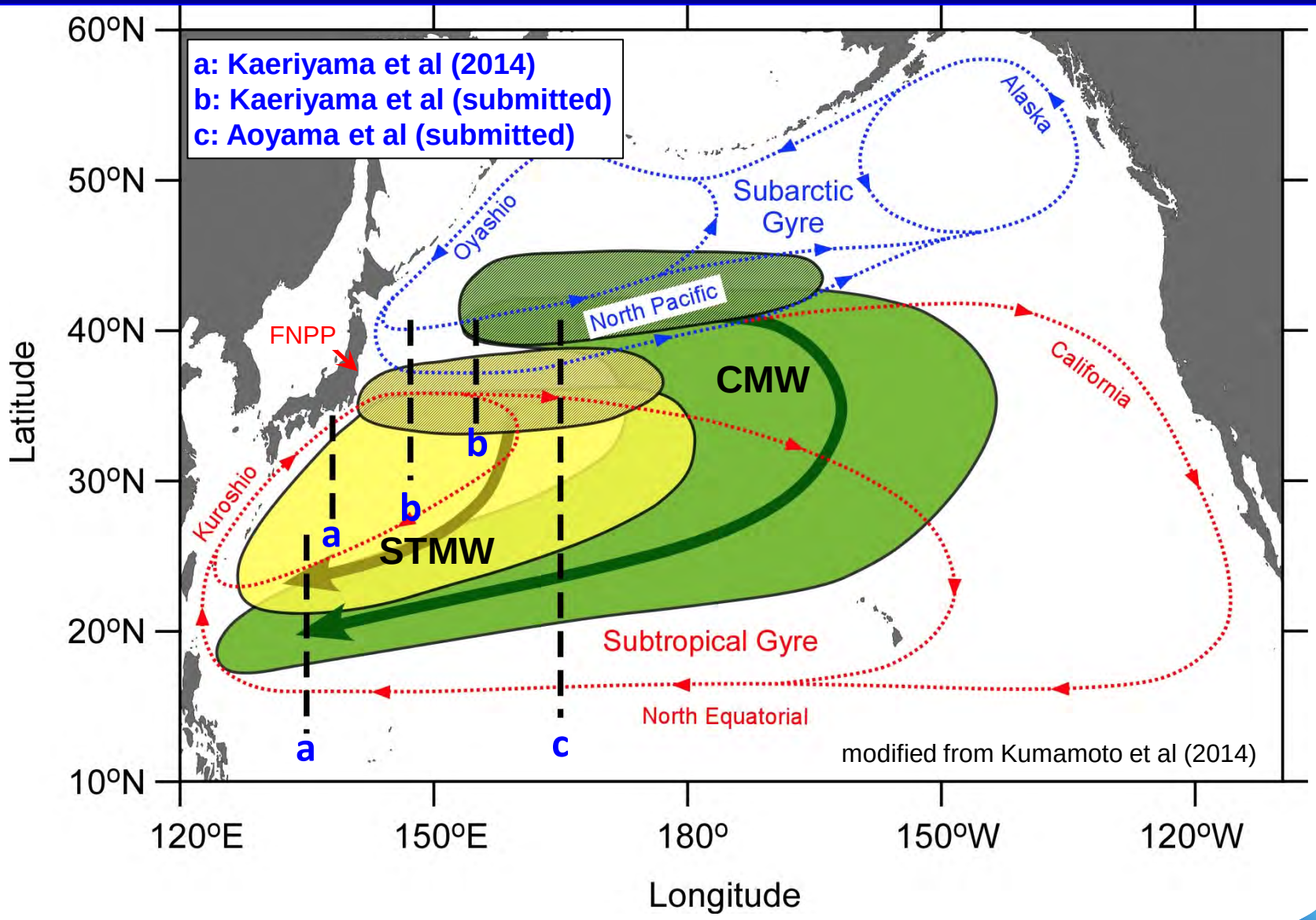
Schematic view of mode waters



Subtropical Mode Water (STMW) and Central Mode Water (CMW) transported the FNPP-derived radioactive cesium into the ocean interior

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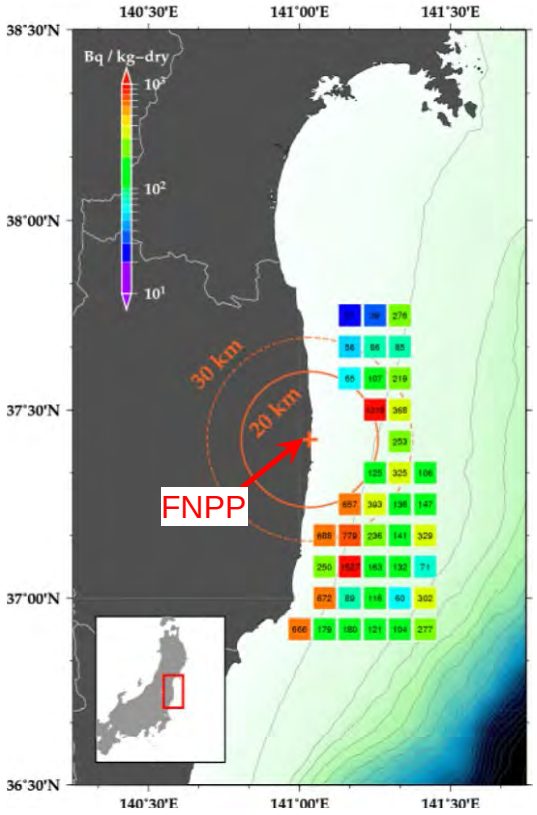
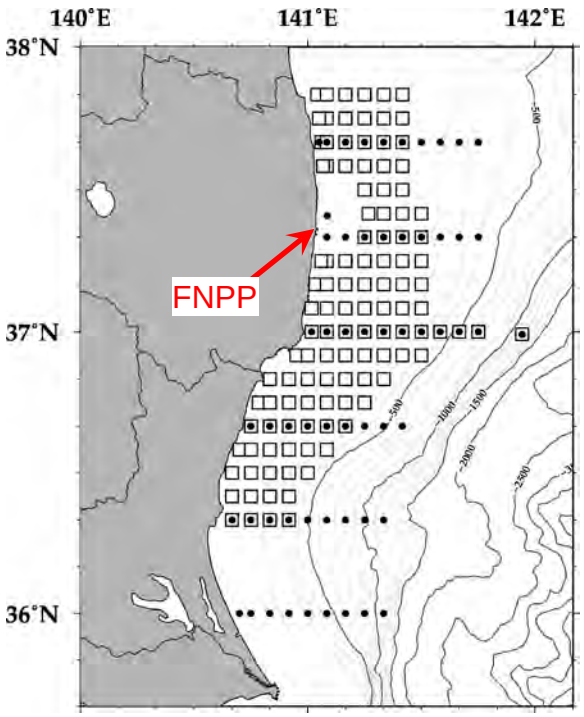
Monitoring of radioactive Cs in sediment

Five-minute resolution mapping of radioactive Cs campaign had been conducted

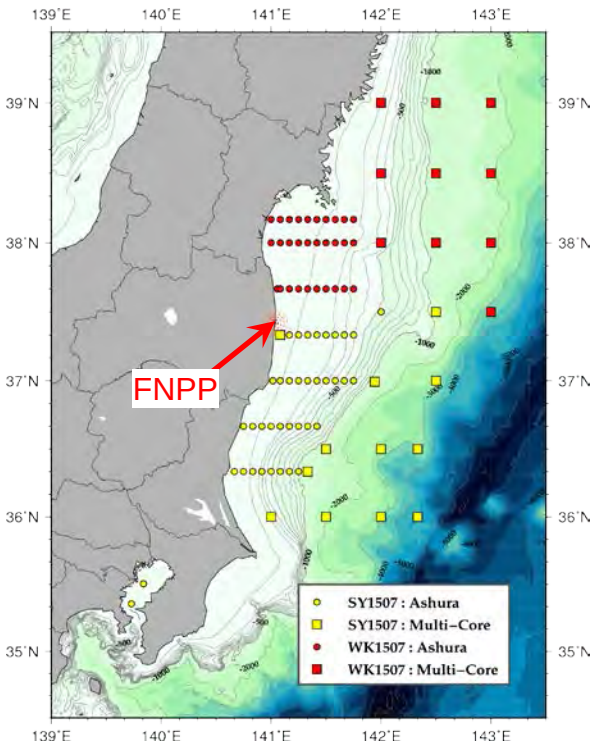
Feb. 2012



July 2012 (squares)
July 2013 (dots)



July 2015



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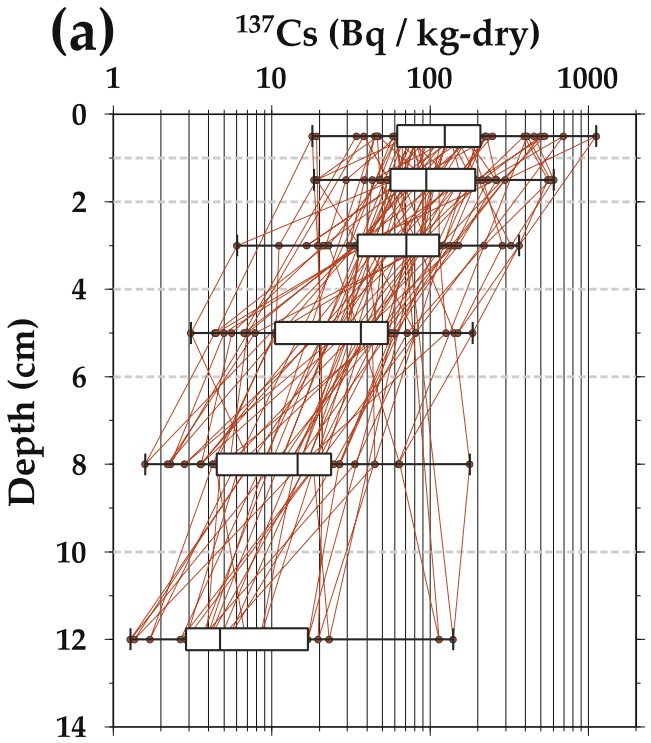
Spatio-temporal variations in ^{137}Cs in the sediment

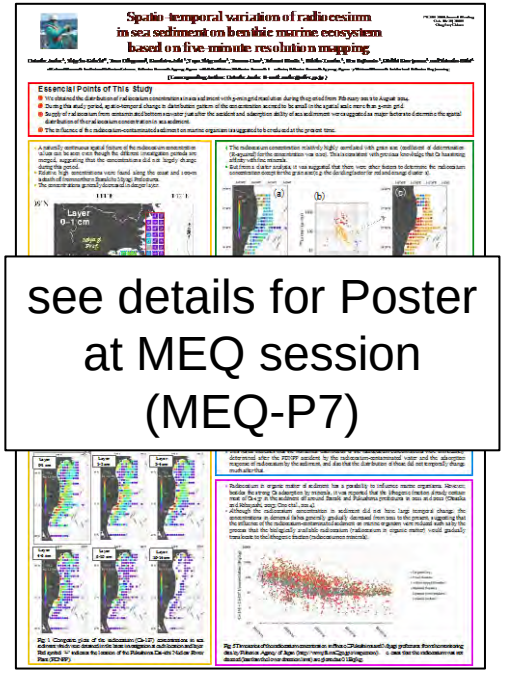
Horizontal distribution of ^{134}Cs in July 2012
Relatively high conc. of ^{134}Cs (> 200 Bq/kg-dry) were observed coastal area south of FNPP site

^{134}Cs (Bq/kg-dry)

Vertical profiles of ^{137}Cs in Feb 2012



Ambe et al (2014)



see details for Poster at MEQ session (MEQ-P7)

Concluding remarks

Our findings

- off the coast of Fukushima, FNPP-derived radioactive Cs decreased rapidly within two years
- eastward dispersion and dilution of radioactive Cs in surface seawater in the area north of KE
- southward intrusion with STMW (and CMW, submitted)
- on the continental shelf off Fukushima, relatively high radioactive Cs were observed in sediment, and showed slow decreasing trend

Future perspective on monitoring of fishing grounds

- Seawater monitoring off the coast of Fukushima and subtropical region (mode waters) should be continued
- Sediment monitoring also should be continued to clarify the decreasing trends, vertical change of radioactive Cs in sediment

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Thank you for your attention

References

- Ambe et al (2014) J Environ Radioact, 138: 265-275
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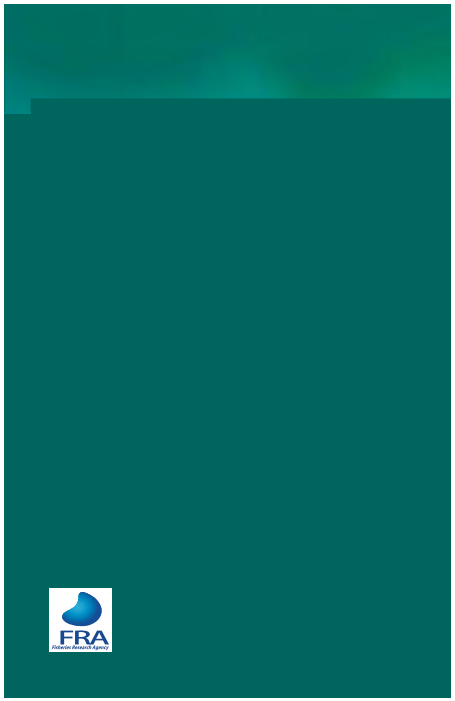

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