Marine Radioactivity Monitoring and Assessment in Coastal Waters

Jinqiu Du, Chuanlin Huo and Ziwei Yao

National Marine Environmental Monitoring Center，

State Oceanic Administration， China

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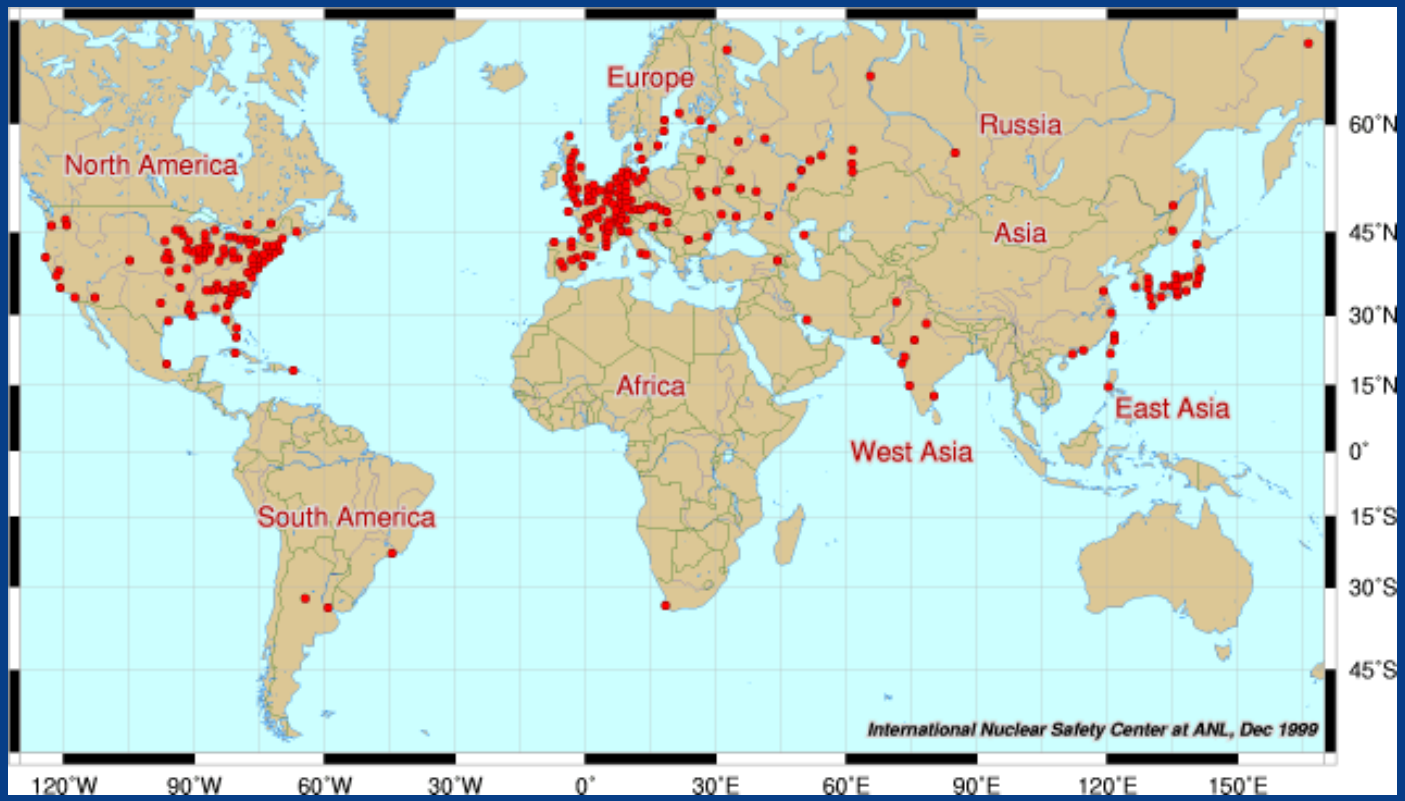
1. Background on Marine Radioactivity Monitoring and Assessment

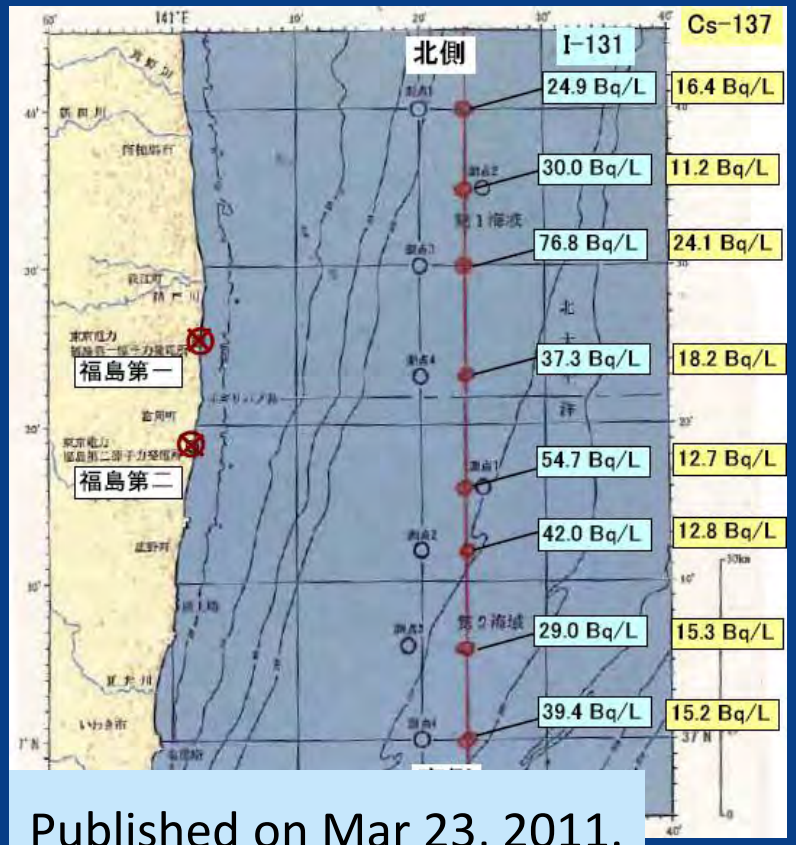


* Worldwide Distribution of Nuclear Power Plants （NPP）

Accident at Fukushima NPP

* March 11th , 2011, accident caused massive amount of radionuclides leaking into the sea;
* Total quantity of leaked radioactivity matter published by Japanese Authority is 630 thousand trillion Bq.

Effect on Marine Environment



Published on Mar 23, 2011.

Fukushima: Radiation level spiked in Hokkaido, "Still it's on-going"

According to the report of Ministry of Education, Culture, Sports, Science and Technology, radiation level spiked up in Hokkaido, the most northern island in Japan.

It started picking up at 15:40 of 10/14/2012 (JST), and still it's on-going.

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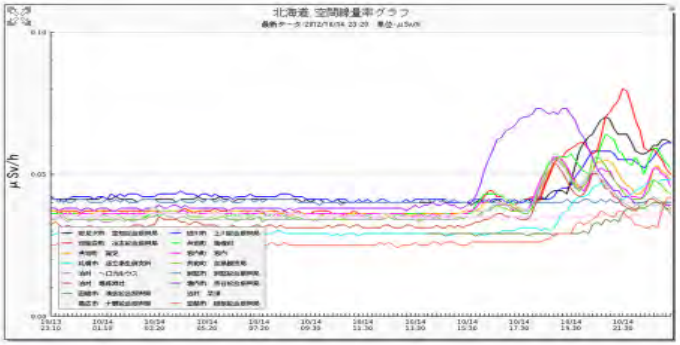
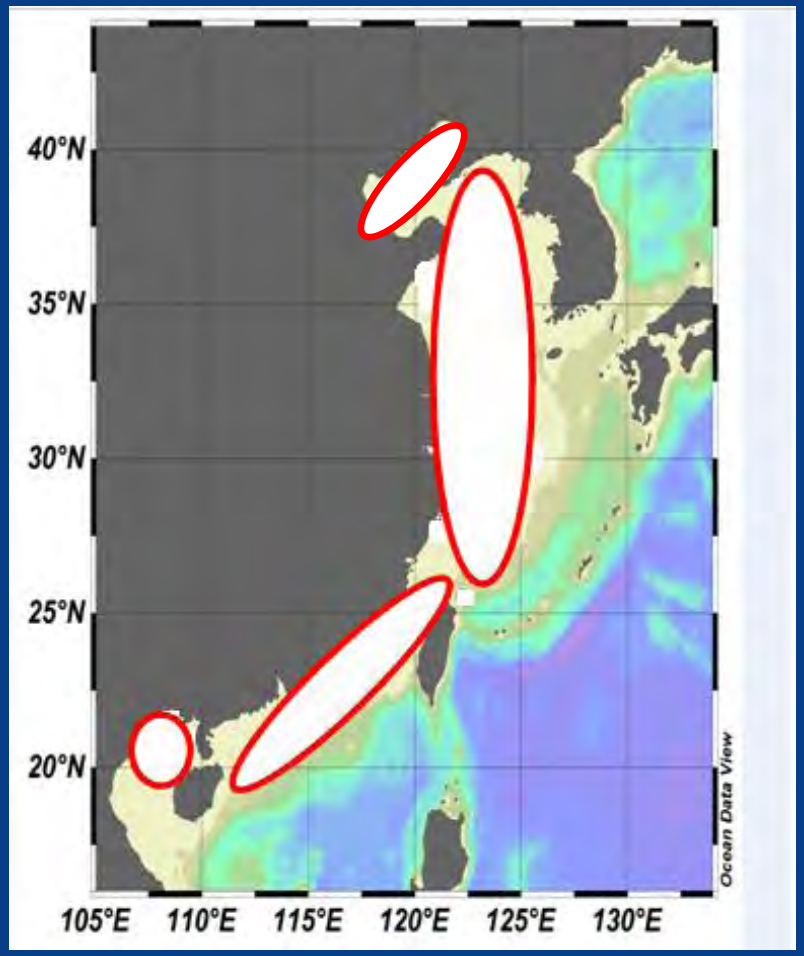


Source

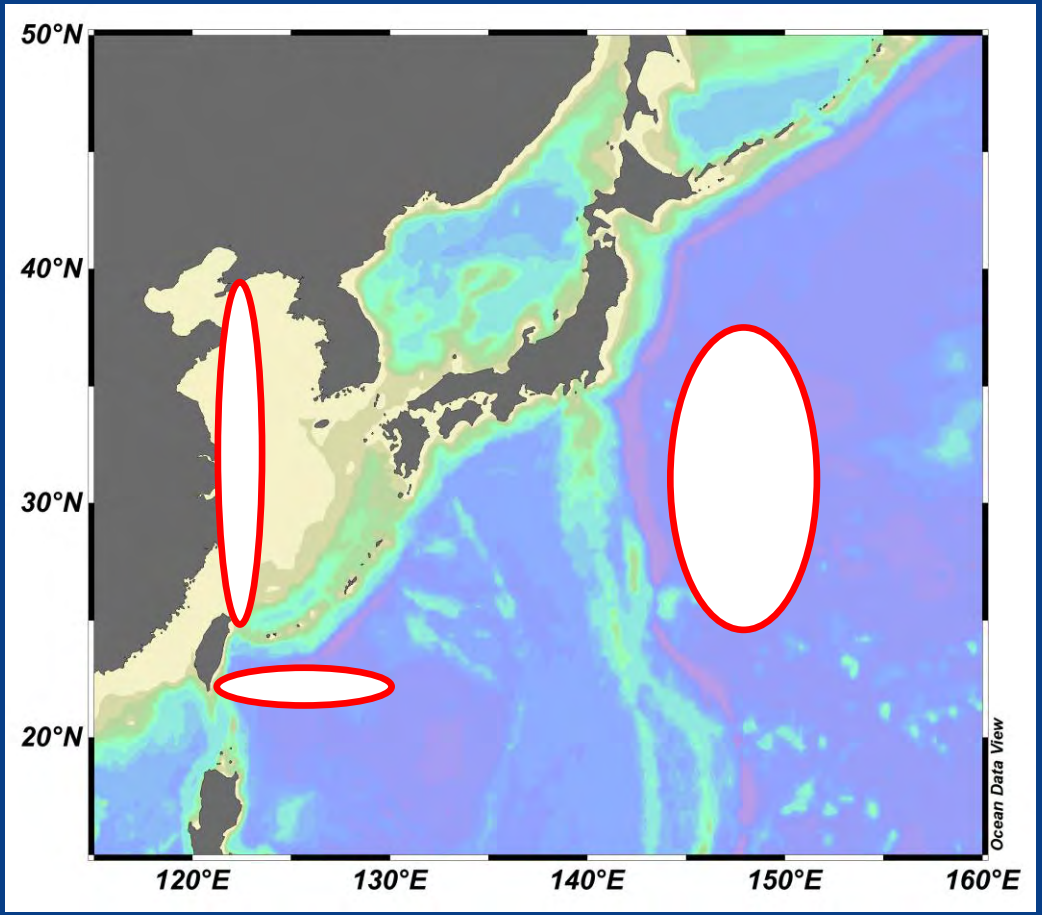
Published on Oct 14, 2012.

2. Status of Investigation and Research in China's SOA



* Time: from 1960s
* Areas: coastal waters and adjacent areas of NPP
* Medium: Sea water, marine organism, sediment and atmosphere.

Relevant work after Fukushima accident



* Coastal waters:

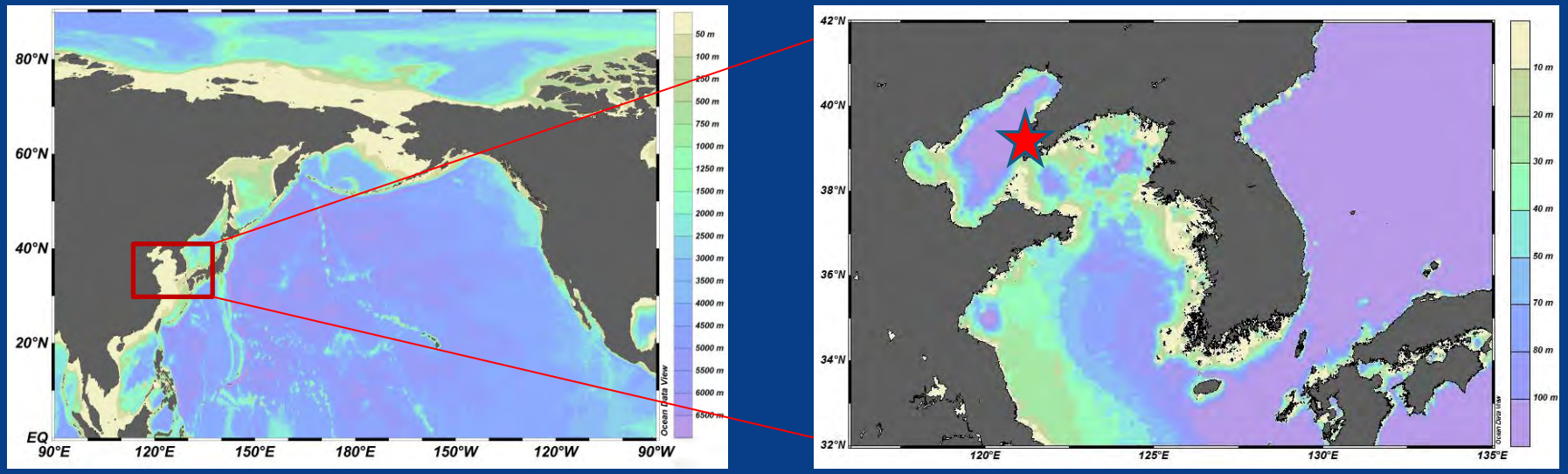
Continuous monitoring

* Open seas:

2 times investigations

in north Pacific per year

3. Radioactivity Monitoring in Coastal Waters by NMEMC



* Investigation area is concentrated in Bo Sea and Yellow Sea

Sampling/Pre-treatment method

Sea water

Most direct

Marine organism

Connect to human

Sediment

Final sink

Common Measurement Methods

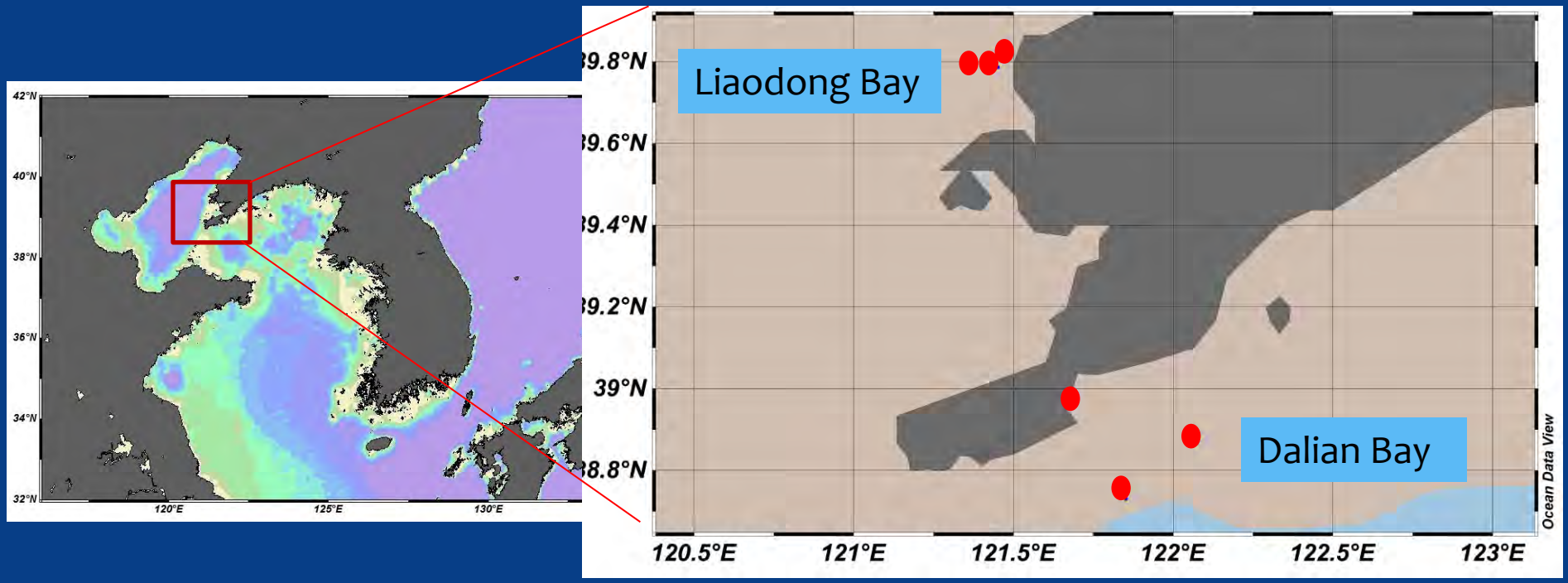
Low background alpha beta counter

Ultra low background liquid scintillation spectrometer

HPGe Gamma spectrometer

Alpha spectrometer

Sediment from coastal waters



* 3 samples were taken from each bay respectively

Measurement

- ORTEC GEM-MX7080P4, detecting efficiency 〉 66%
- Energy Calibration : Standard Point Source 10keV～10MeV
- Efficiency Calibration : Standard Volume Source

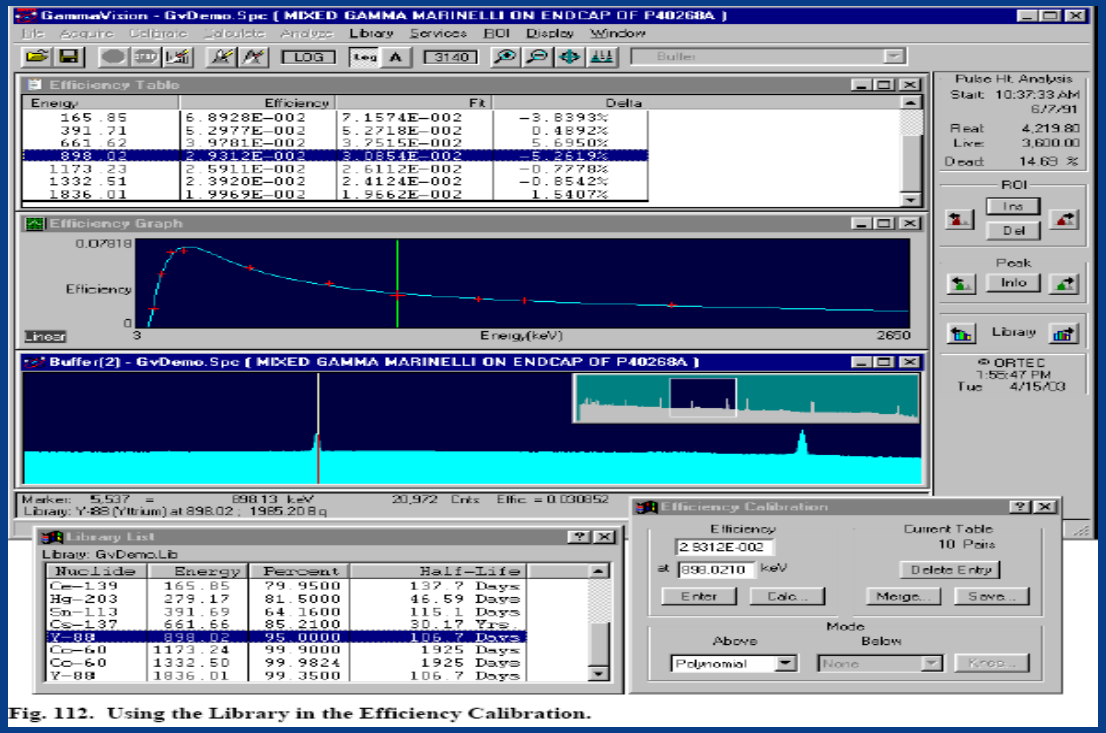


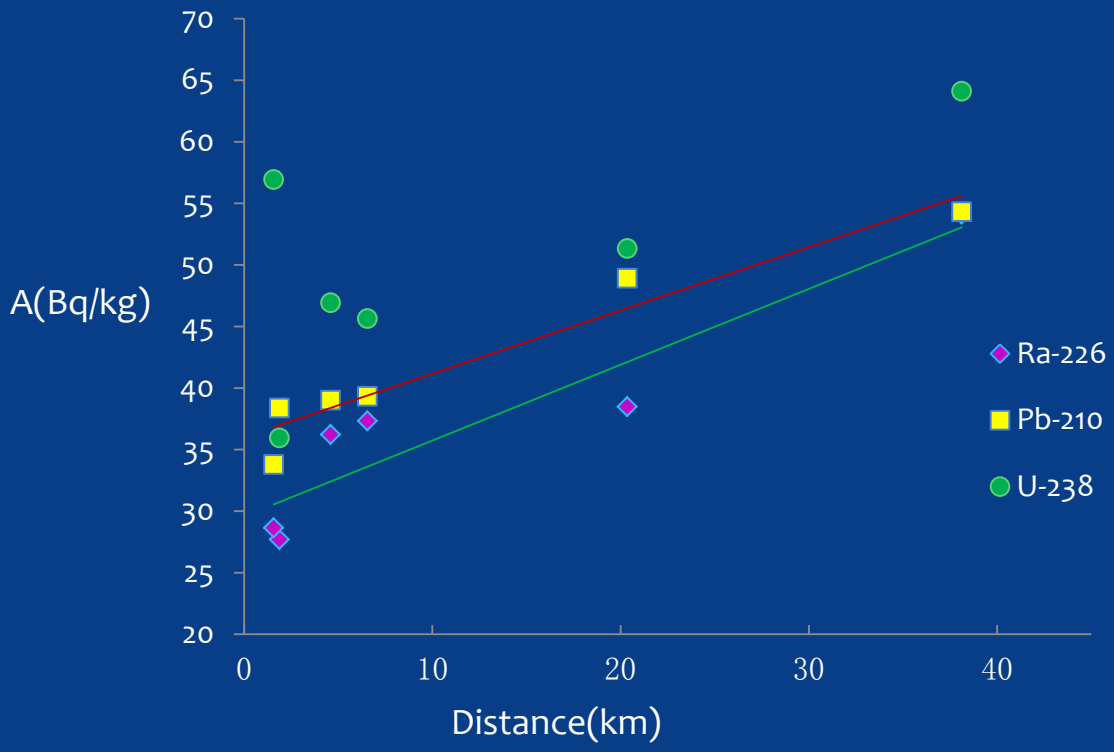
Fig. 112. Using the Library in the Efficiency Calibration.

Results

Station	Distance offshore (km)	Cs-137 Bq/kg (dry weight)	Ra-226 Bq/kg (dry weight)	U-238 Bq/kg (dry weight)	Pb-210 Bq/kg (dry weight)
LDW-M10	1.88	1.80±0.41	27.69±1.19	35.94±9.10	38.38±7.40
LDW-M2	4.59	1.73±0.44	36.21±0.97	46.92±10.91	39.01±7.80
LDW-M12	8.55	1.53±0.37	37.33±1.56	45.64±10.81	39.32±7.46
DLW-012	1.57	0.76±0.32	28.64±1.34	56.93±7.95	33.78±7.90
DLW-034	20.35	1.59±0.29	38.48±0.83	51.34±8.89	48.92±9.20
DLW-029	38.12	2.70±0.44	54.13±1.45	64.11±9.37	54.32±15.11

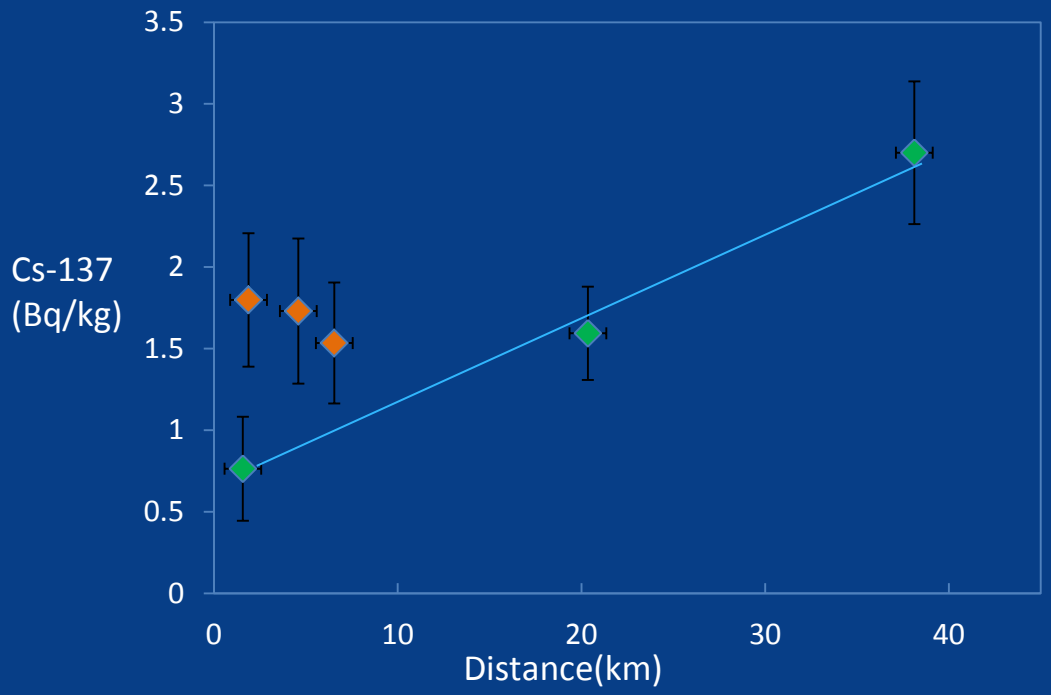
Results

* Uranium Series balance relationship: ^{226}Ra is deficient comparing to ^{238}U, and ^{210}Pb is in excess comparing to ^{226}Ra.
* Levels of ^{226}Ra and ^{210}Pb are increased with distance offshore in each bay.



Results

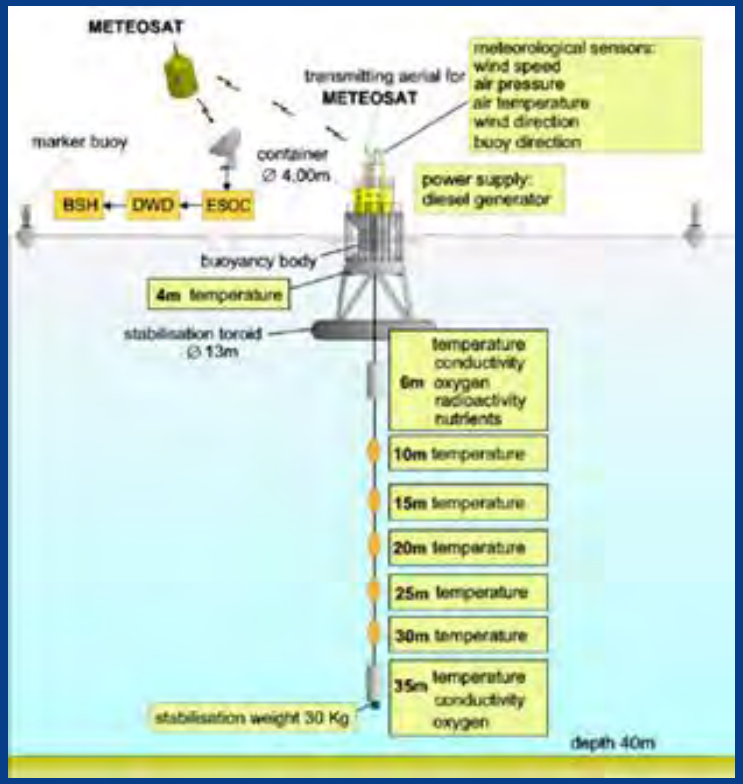
Area	Range （Bq/kg）
Liaodong Bay	1.53~1.80
Dalian Bay	0.76~2.70
Background	1.2~15.7

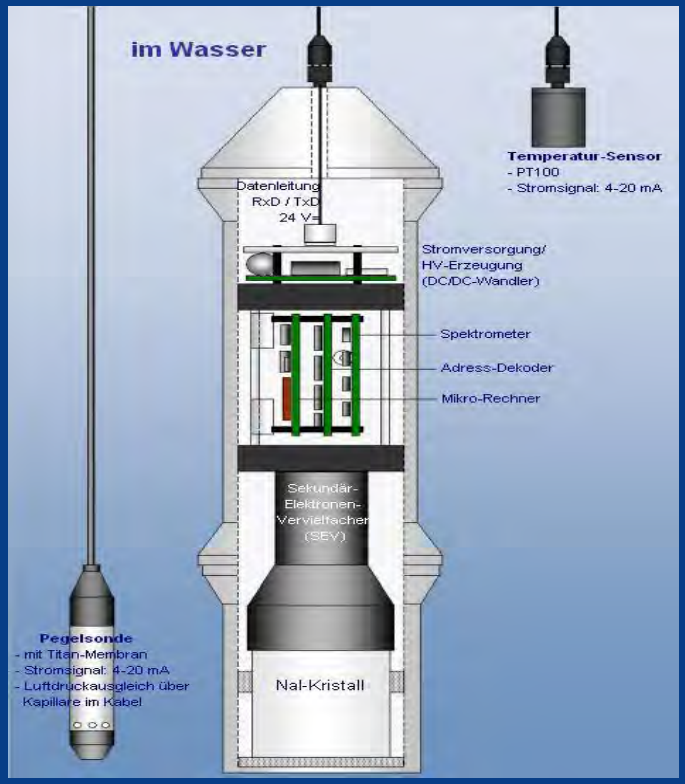


Conclusions

- ^{137}Cs, ^{226}Ra, ^{238}U, and ^{210}Pb were detected in samples ;
- Levels of radionuclides are all within background ranges, but the level in Dalian Bay is higher than Liaodong Bay;
- Values of ^{226}Ra and ^{210}Pb are increased with distance offshore in each bay, but for ^{137}Cs, there is a trend of higher level with increasing offshore distance only in Dalian Bay;
- Uranium series are unbalanced in each bay, the ratio value of ^{210}Pb / $^{226}Ra>1$, ^{226}Ra / $^{238}U<1$ at all stations, this suggests the terrigenous inputs is not the only sources of radionuclides.

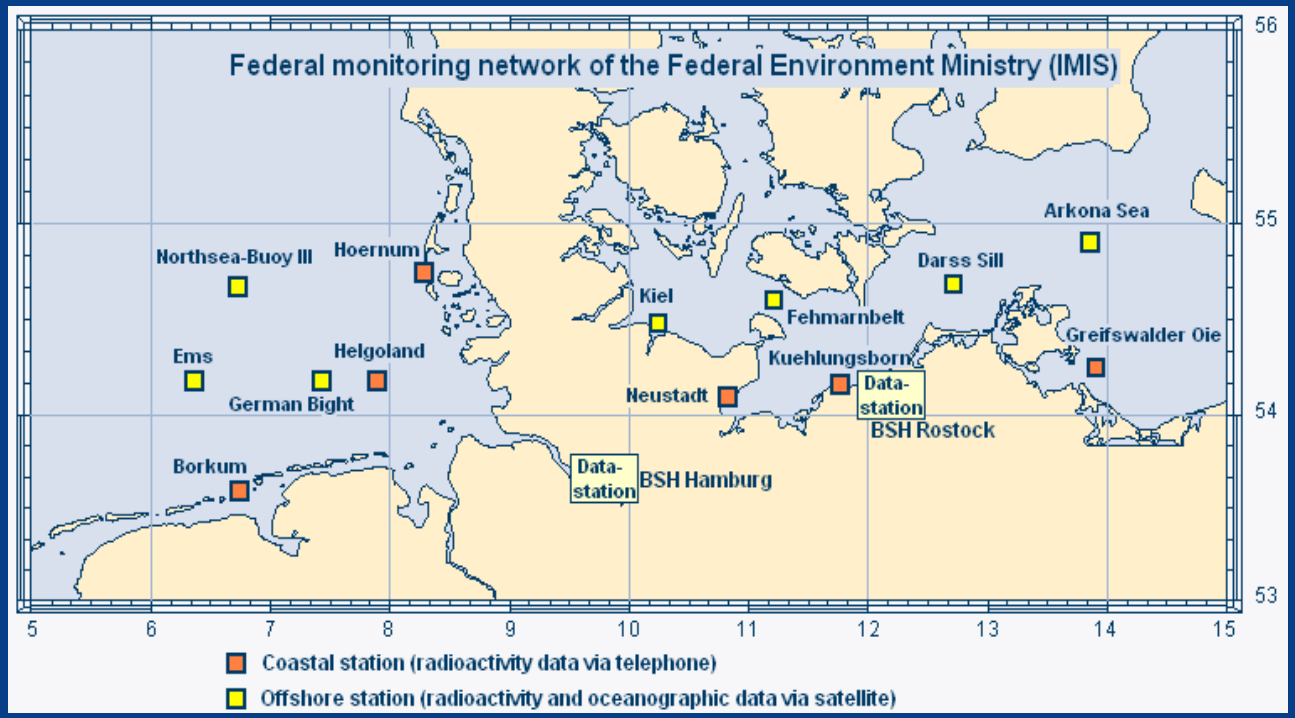
4. Obstacles and suggestions





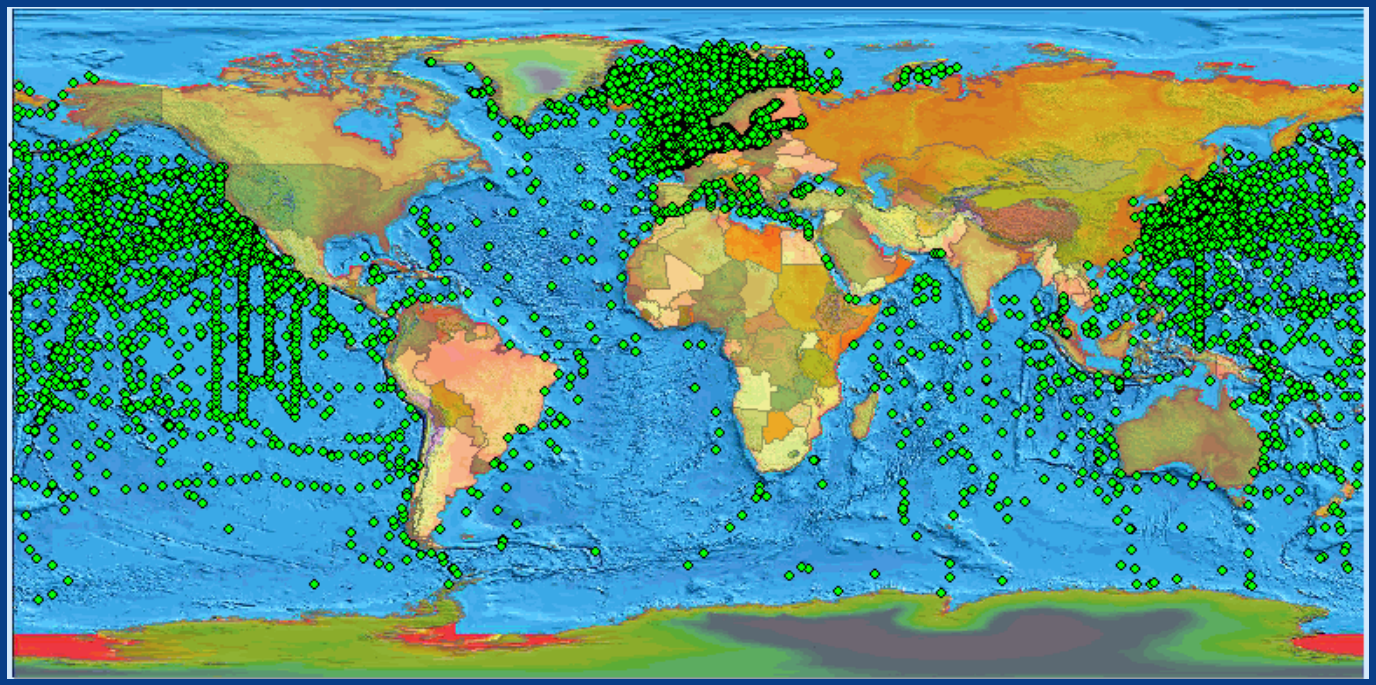
Real-Time Online Monitoring Equipment

Construction of Marine Radioactivity Monitoring Network



Germany's Monitoring Network

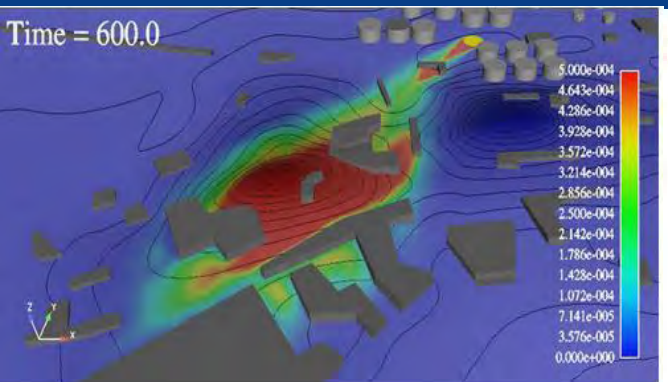
Better Data-Sharing among Organizations



IAEA Marine Radioactivity Monitoring Stations

Suggestions

* Promotion of Spreading Models of Different Scales;
* Unified International Standards and Guides;
* Improve Pre-treatment Devices and Methods.



Automated Sample Enrichment Device

Thank You!

杜金秋

Jinqiu Du
National Marine Environmental Monitoring Center
42 Linghe Street, Shahekou District
Dalian 116023, P.R. China
Tel: 86-411-84782901
Fax: 86-411-84782586
jqdu@nmemc.gov.cn/jinqiu609@gmail.com
http://www.nmemc.gov.cn