

Application systems of the FIO ocean forecasting system using Lagrangian methods

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Outline

- 1 Motivation
- 2 FIO ocean forecasting system
- 3 Using in ocean pollution
- 4 Search, rescue and backtracking system
- 5 Using in biological
- 6 Future plan

Motivation

- ❑ Chemical ocean pollution – nuclear, oil spill
- ❑ Ocean ecological pollution
- ❑ Ocean farming (artificial stock enhancement)
- ❑ Accident



Fukushima nuclear accident



Sanchi



Phuket boat capsizing accident³, 5th July

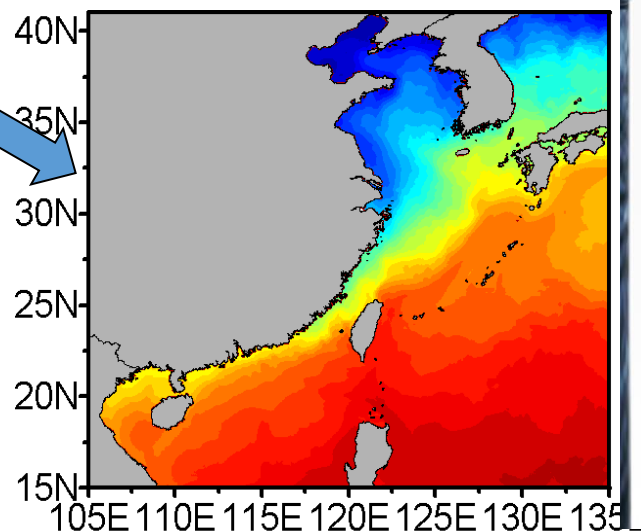
FIO ocean forecasting system-two generations

Framework

Global:
0°E~0°W
78°S~65°N
(1/2)°×(1/2)°

West Pacific:
99°E~150°E
0°N~50°N
(1/8)°×(1/8)°

Key area
105°E~135°E,
15°N~41°N
(1/24)°×(1/24)°



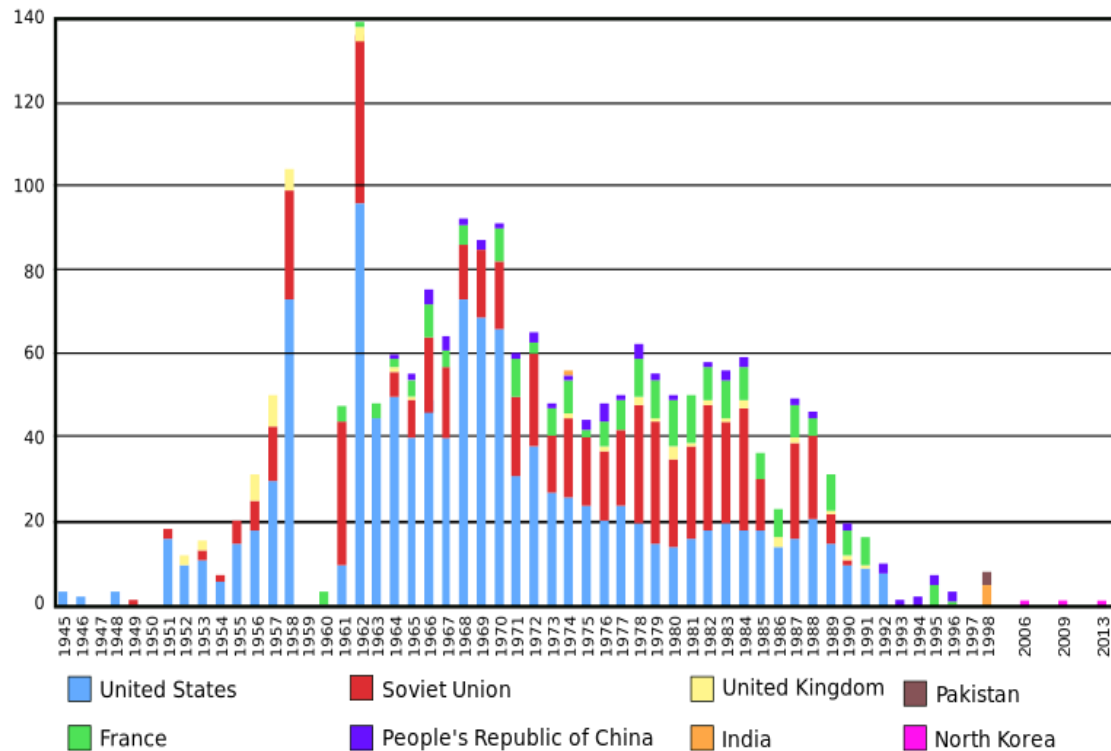
2006-2016



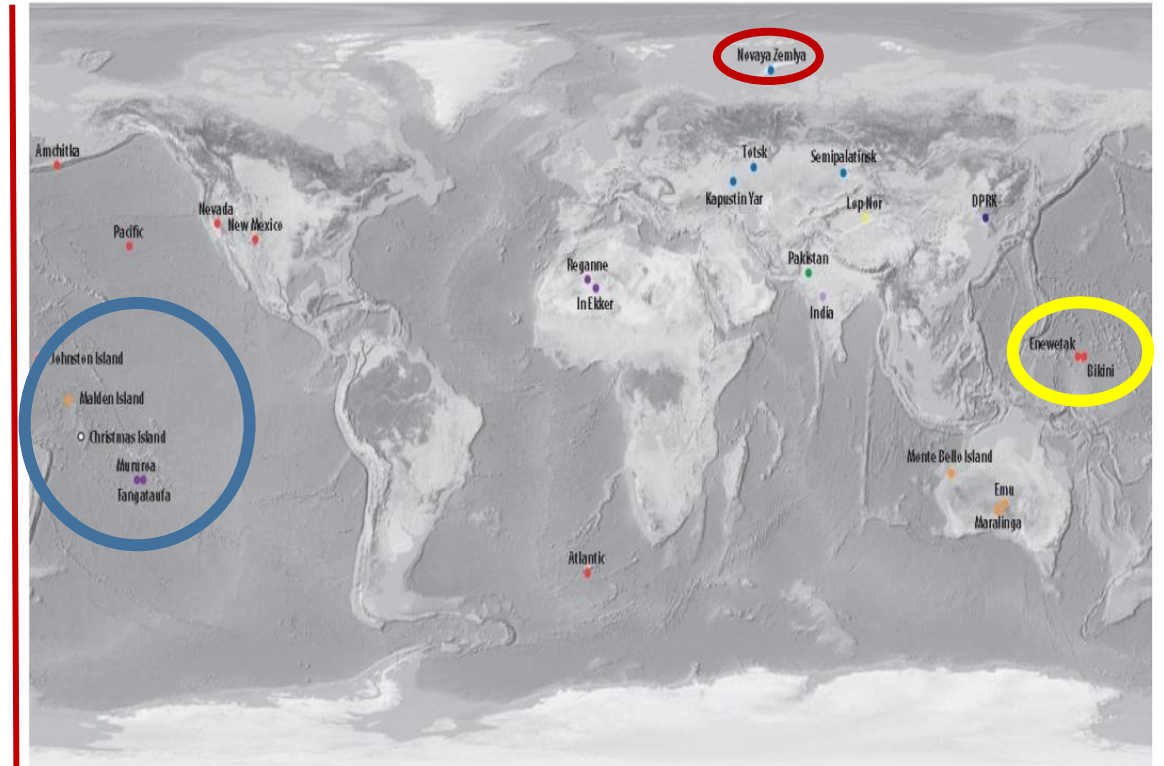
2016-present

Ocean pollution—nuclear test

Worldwide nuclear testing, 1945 - 2013

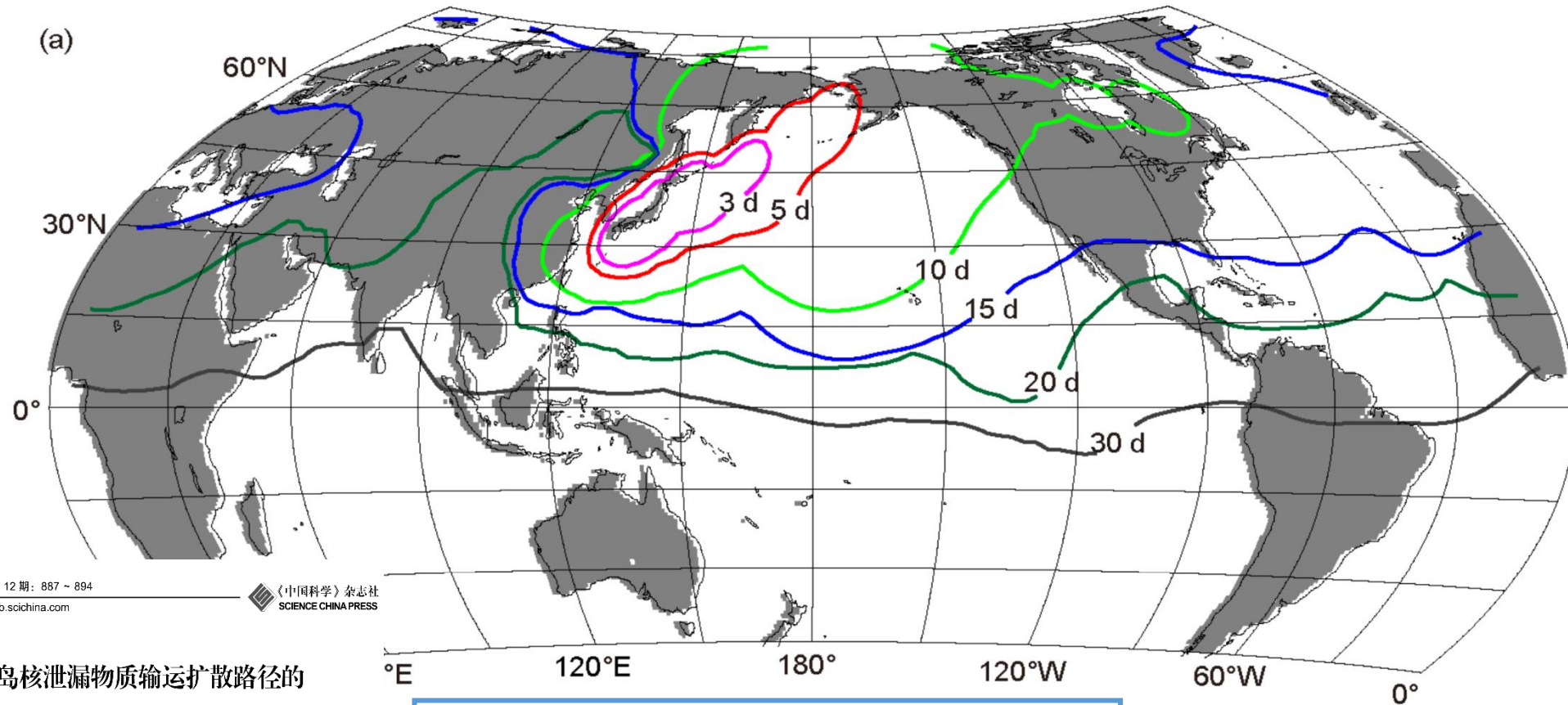


About 2000 nuclear test since 1945



Test site

global ocean radionuclides model



科学通报 2011年 第56卷 第12期: 887 ~ 894
www.scichina.com csb.scichina.com

《中国科学》杂志社
SCIENCE CHINA PRESS

2011年3月日本福岛核泄漏物质输运扩散路径的
情景模拟和预测

乔方利, 王关锁, 赵伟, 赵杰臣, 戴德君, 宋亚娟, 宋振亚

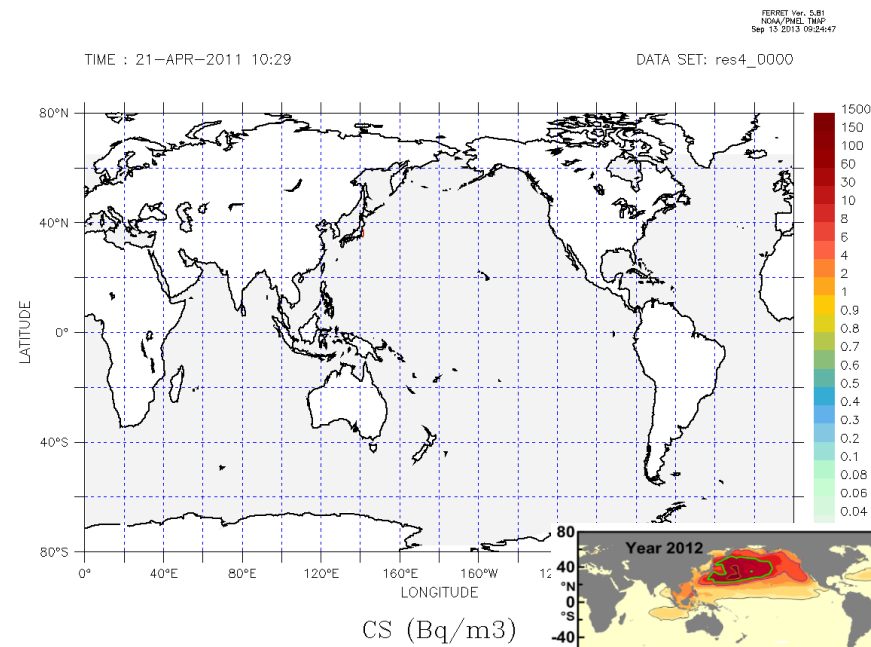
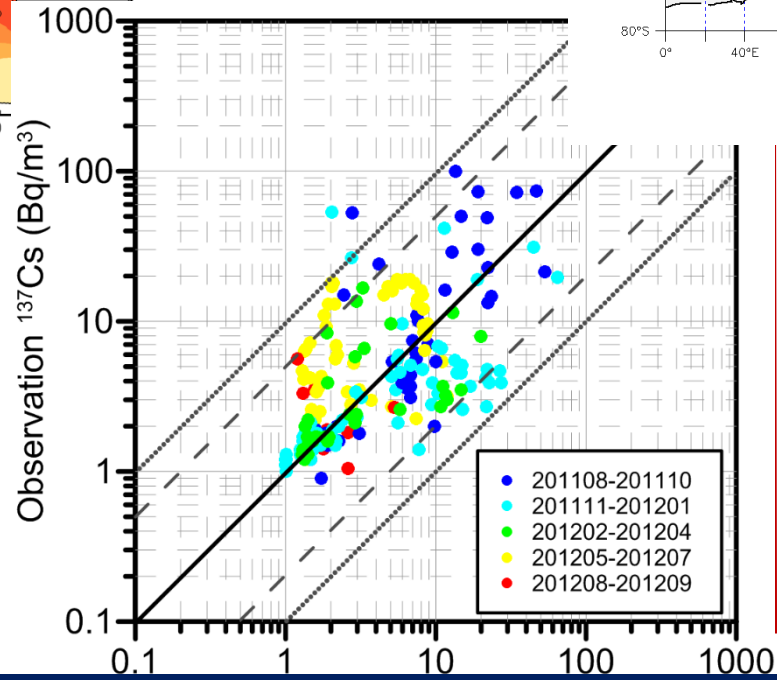
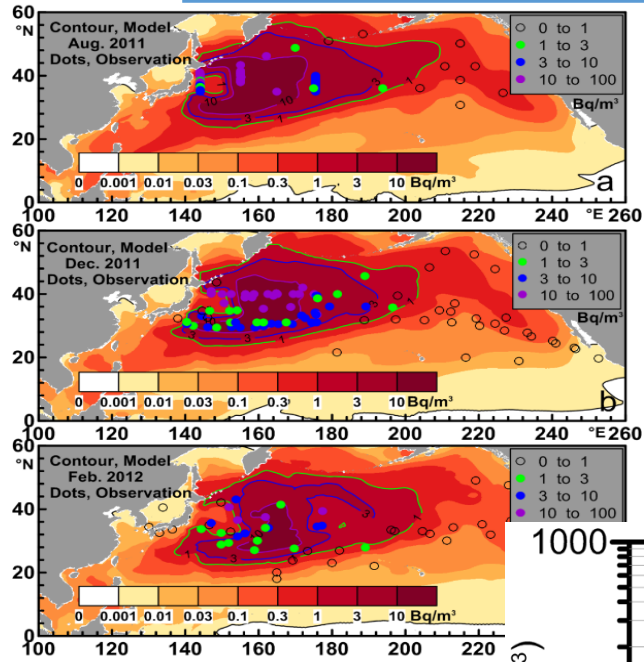
国家海洋局第一海洋研究所, 青岛 266061
E-mail: qiaofl@fio.org.cn

2011-03-23 收稿, 2011-04-09 接受

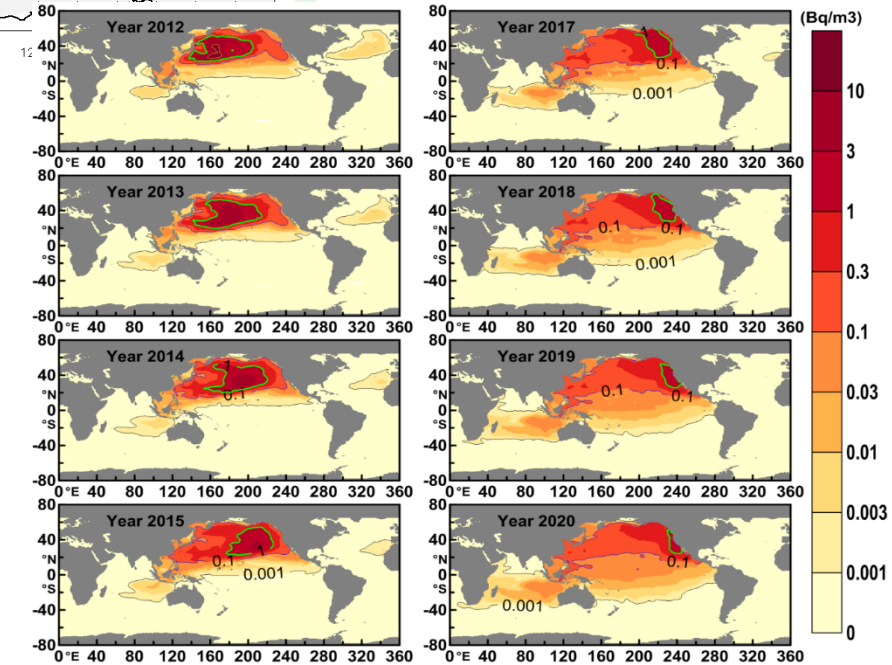
Will affect the Northeast
of China in 15 days

[Qiao et al., 2011]

Nuclear leakage from Fukushima-Prediction and Observation

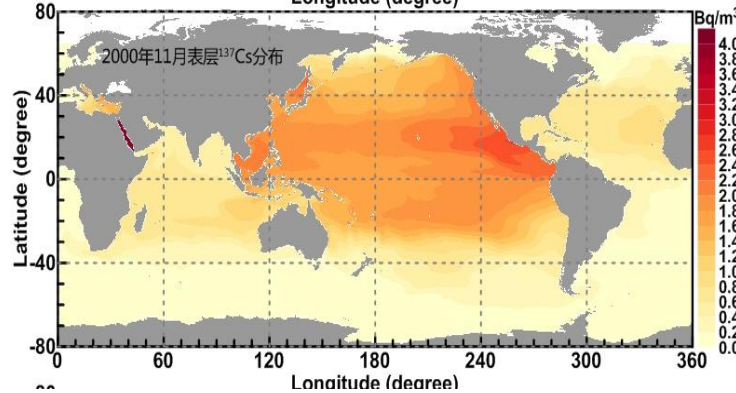
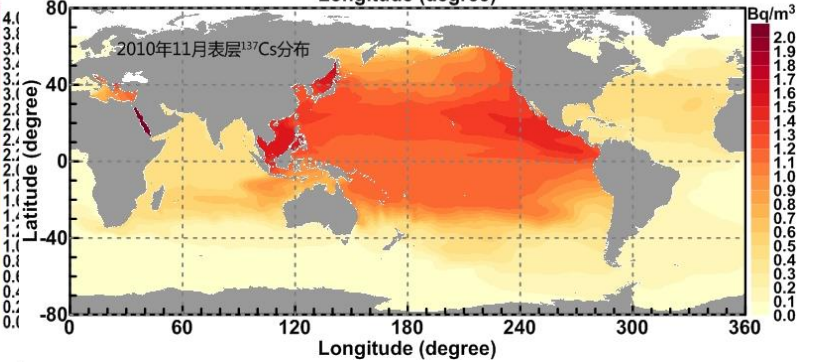
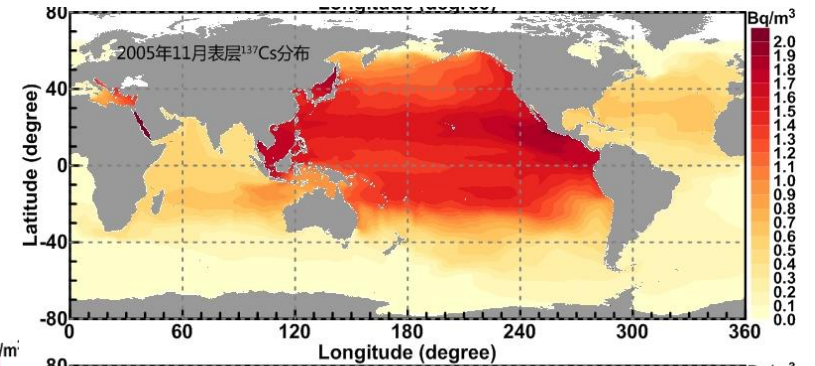
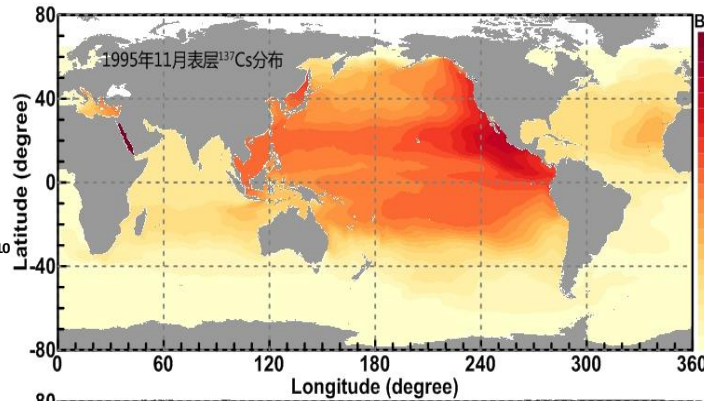
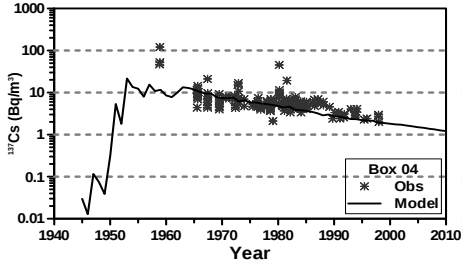
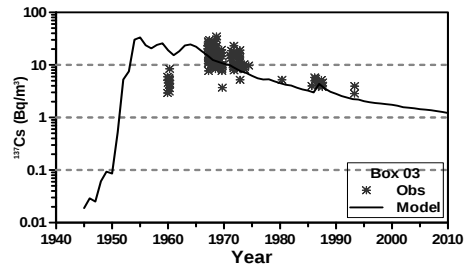
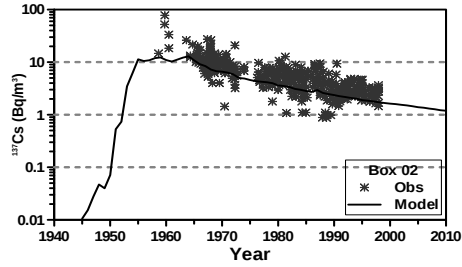
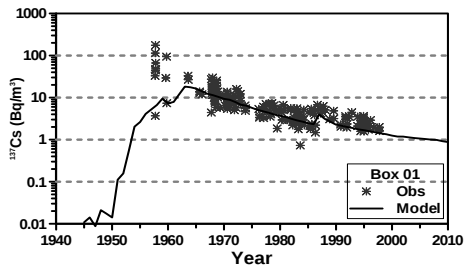


30 years prediction

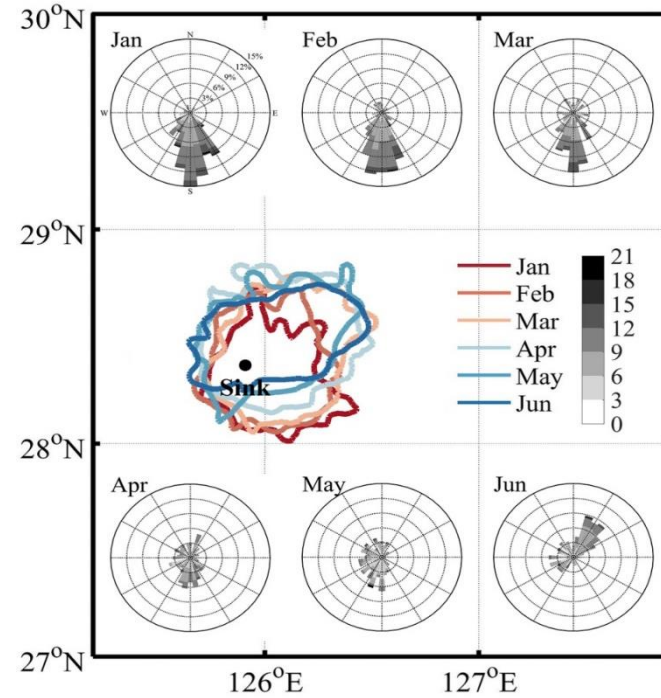
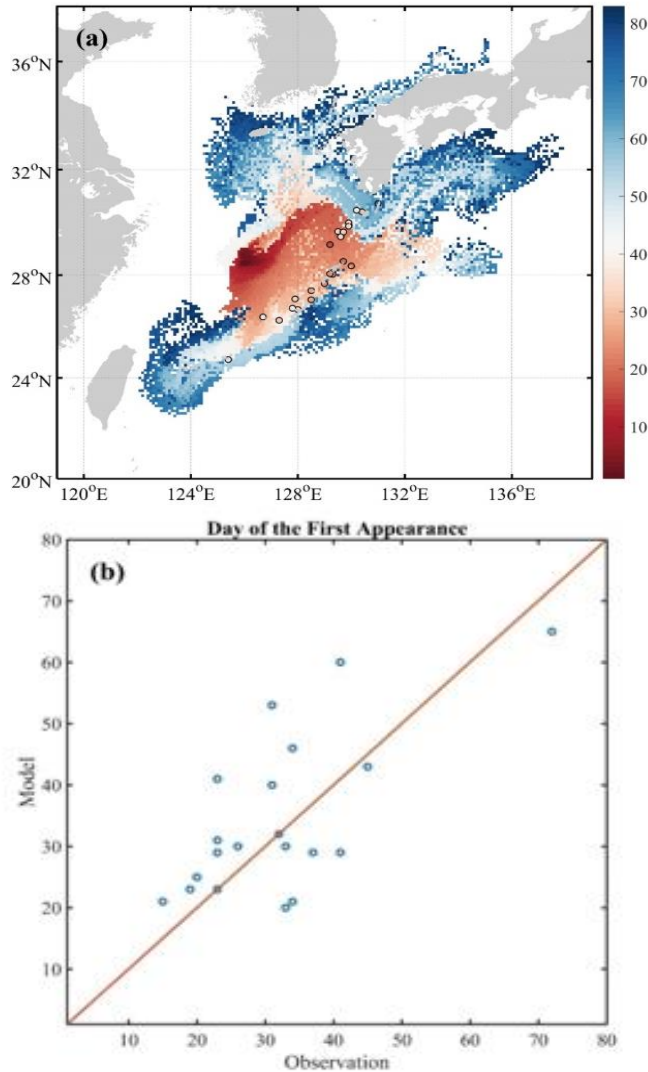


[Zhao et al., 2015]

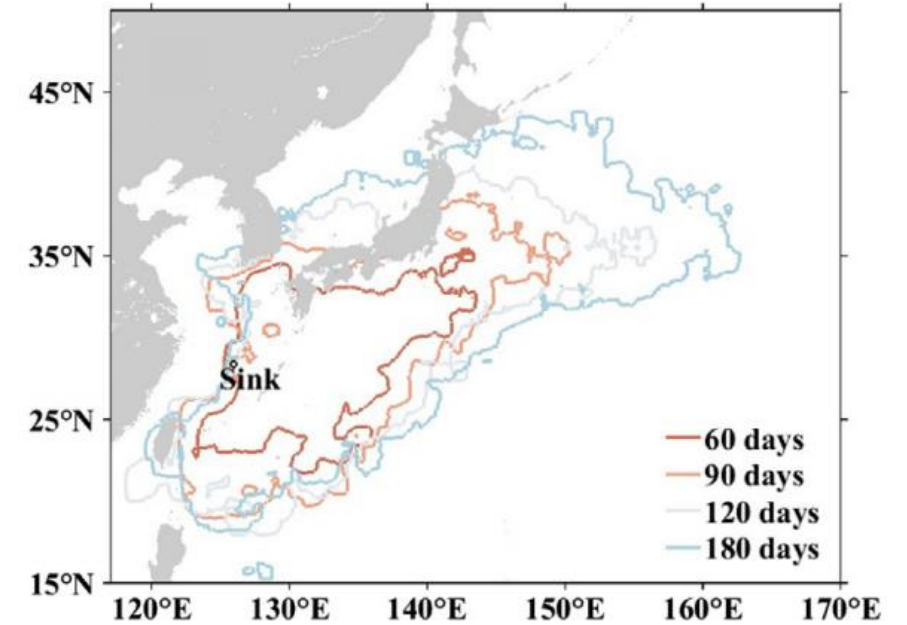
Application in the assessment of the nuclear test



Ocean pollution-oil spill



Condensate

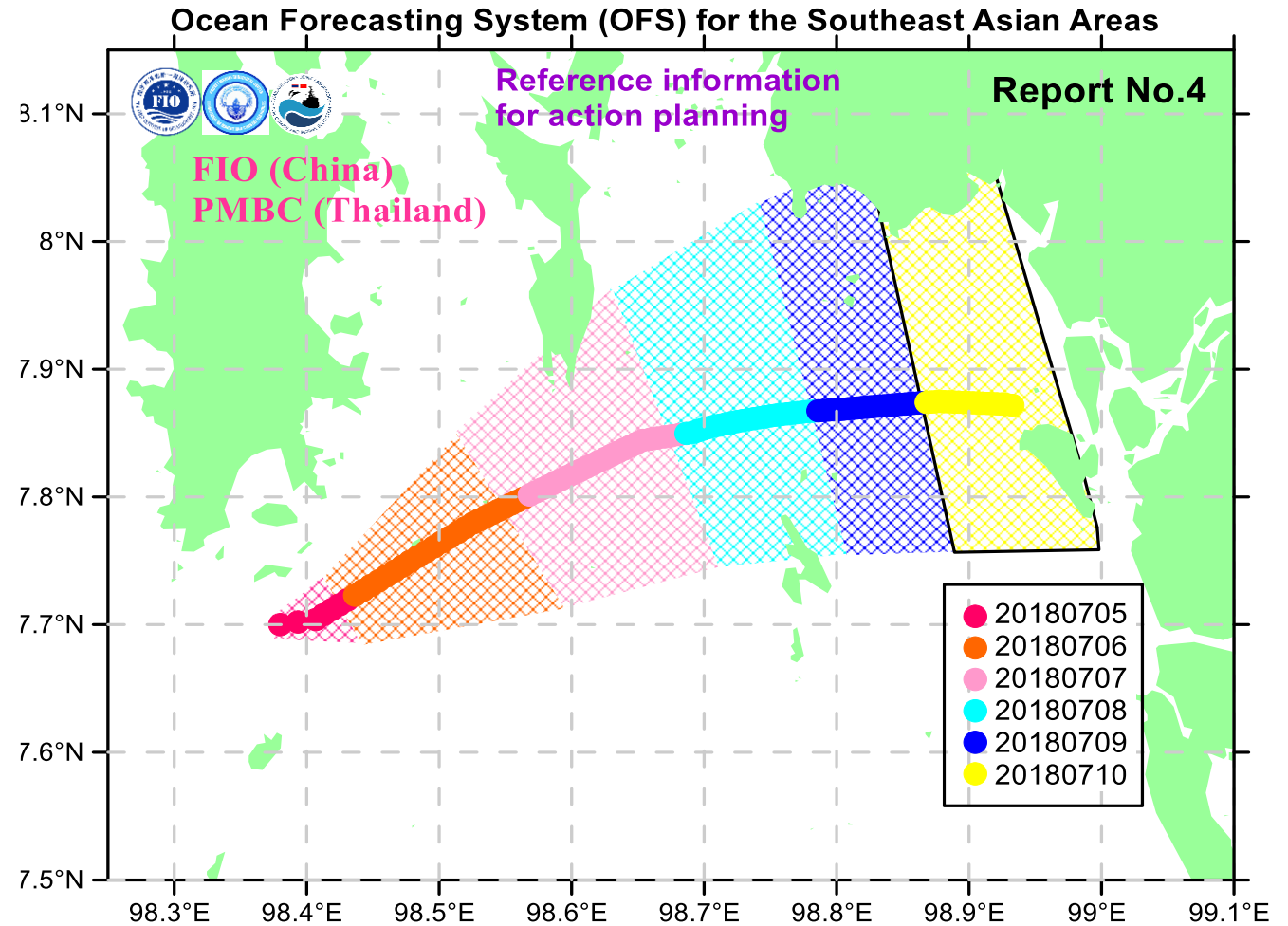


Fuel Oil

[Qiao et al., 2019]

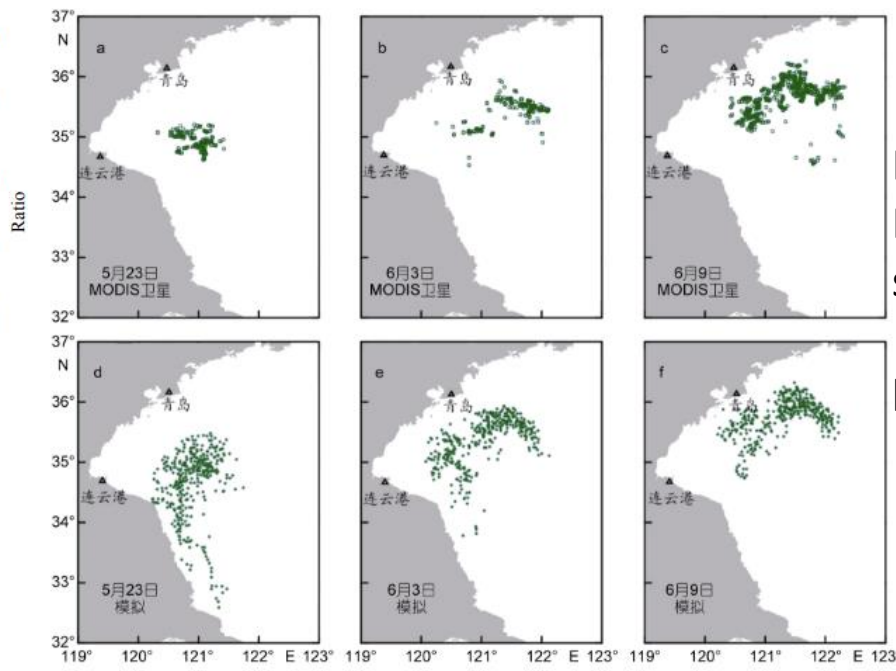
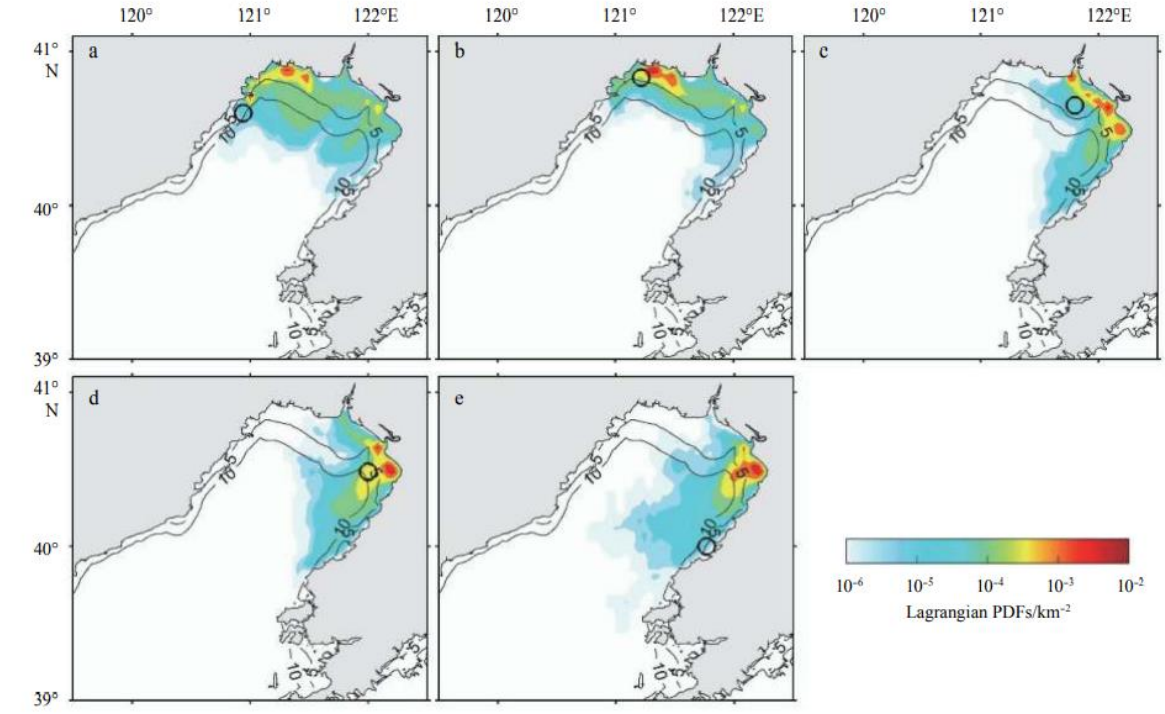
Simulation and prediction for the 'Sanchi' oil spill

Search, rescue and backtracking system

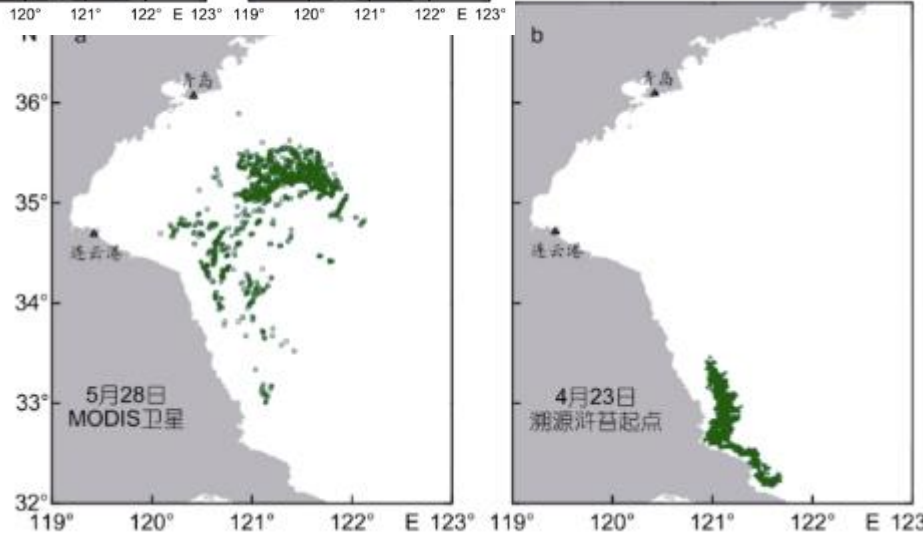


Using in biological

Release site	C1	C2	C3	C4	C5	Jul. 20, 2008	C1	C2	C3	C4	C5	Jul. 20, 2009	C1	C2	C3	C4	C5	Jul. 20, 2010
HLD	0.29	0.56	0.00	0.00	0.00	0.00	0.07	0.45	0.46	0.00	0.00	0.00	0.02	0.96	0.00	0.00	0.00	0.00
JZ	0.00	0.97	0.00	0.00	0.00	0.00	0.00	0.66	0.34	0.00	0.00	0.00	0.00	0.91	0.09	0.00	0.00	0.00
PJ	0.00	0.01	0.90	0.06	0.00	0.00	0.00	0.00	0.68	0.31	0.00	0.00	0.00	0.00	0.09	0.84	0.00	0.00
YK	0.00	0.00	0.31	0.36	0.00	0.00	0.00	0.00	0.16	0.84	0.00	0.00	0.00	0.00	0.04	0.91	0.00	0.00
WFD	0.00	0.00	0.04	0.39	0.02	0.00	0.00	0.00	0.03	0.90	0.00	0.00	0.00	0.00	0.00	0.02	0.25	0.00



Distribution of Ulva Prolifera in the Yellow sea in 2012 (upper MODIS, lower simulated)



Back tracking of the Ulva Prolifera, 2012

Future plan

- Improvement of the tracking algorithm
 - Computing speed
 - Drifting experiment for the calibration
- Combination with the ecological and biological model, making the biological more realistic