

Ocean currents off the eastern coast of Japan

Institute of Low Temperature Science

Humio Mitsudera

Purpose

To give an overview of ocean current field off the eastern coast of Japan, with a focus on Fukushima coast

Outline

- Ocean currents in the North Pacific, and currents around Japan.
- Ocean current simulation and analysis off Fukushima of Japan Coastal Ocean Prediction Experiment (JCOPE) by JAMSTEC
- Observation of radioactive matter concentration

Overview of North Pacific Ocean currents



Ocean current field around Japan



- Complicated flow field
Kuroshio (2)
Oyashio (7)
Tsugaru Warm Current (5)
eddies.
- Fukushima is located between
Kuroshio and Oyashio.

Simulation by a numerical ocean model

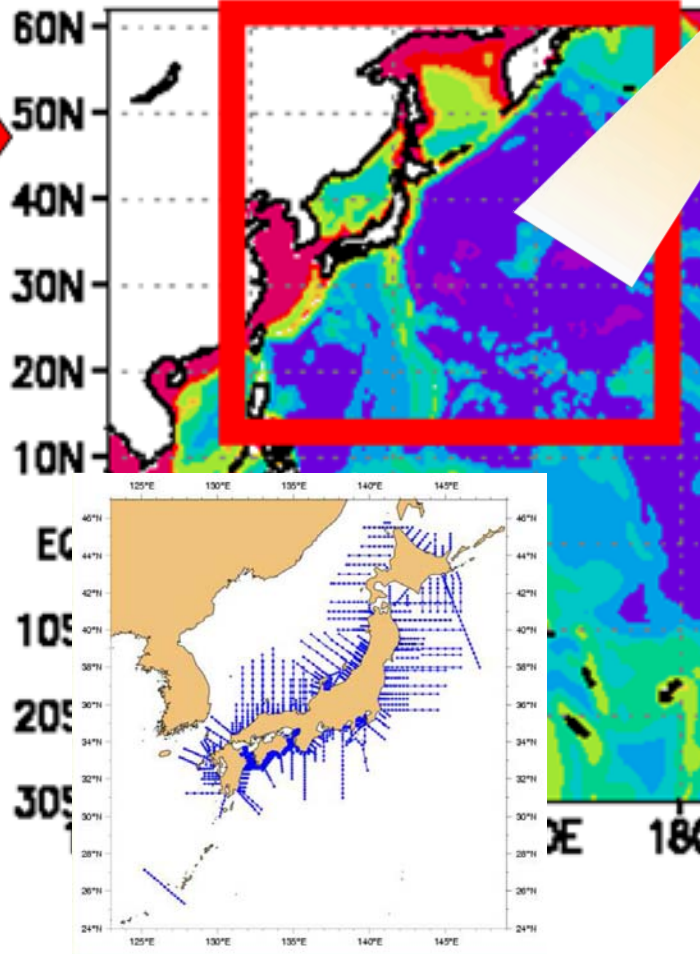
JCOPE (Japan Coastal Ocean Predictability Experiments)

By Miyazawa et al. (2009) of JAMSTEC

<http://www.jamstec.go.jp/frcgc/jcope>

High-resolution model

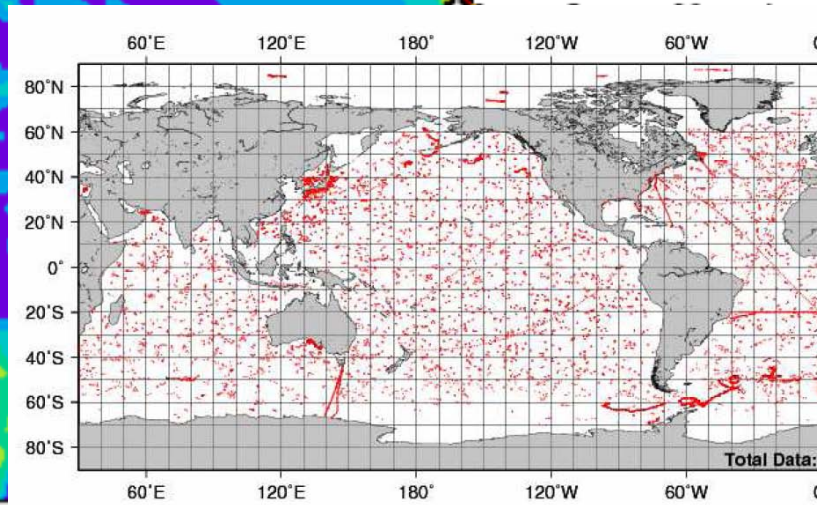
1/12 deg. (10km)



Depth (m)

Low-resolution model

1/4 deg. (30km)



Data from Meteorological Agency

Data from Fisheries Agency

Analysis of ocean currents: Flow characteristics

- Currents flow looking at warmer water on the right-hand side.

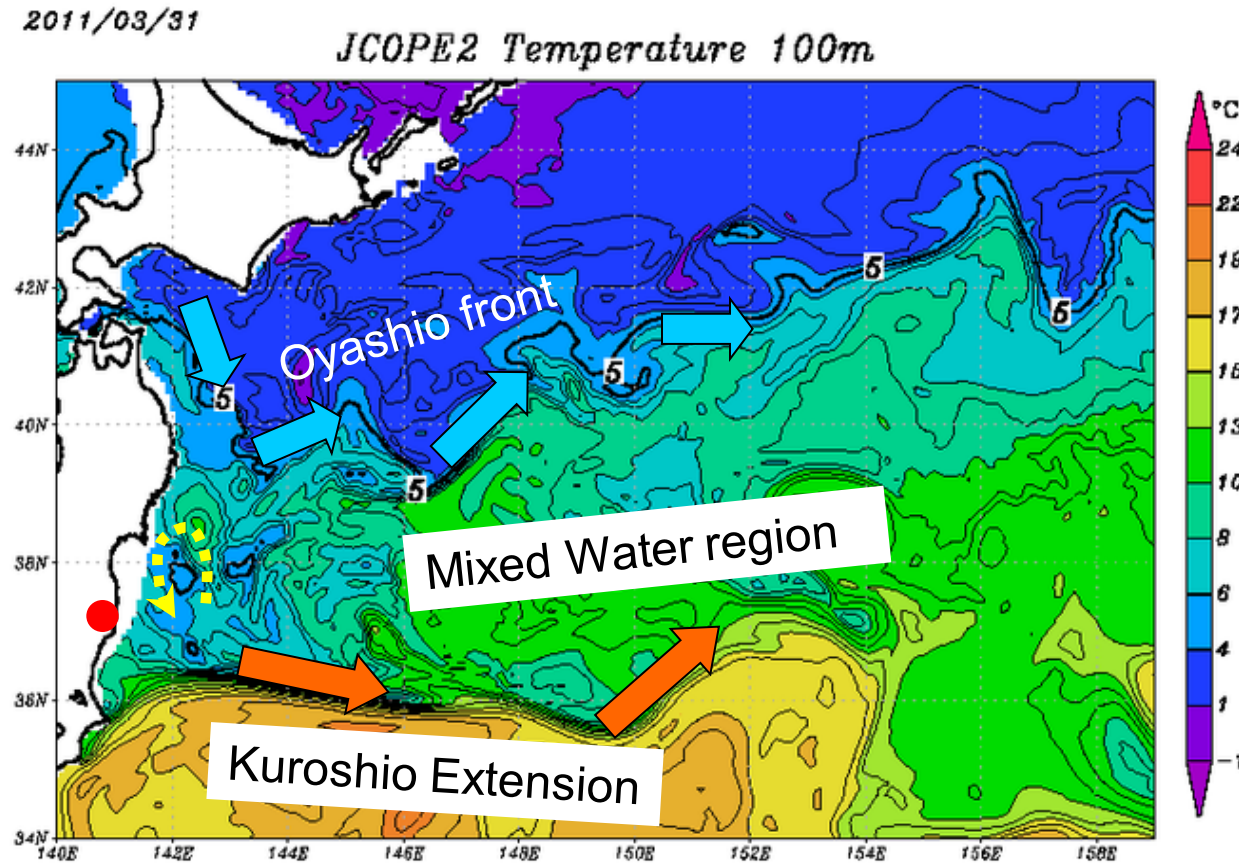
Kuroshio Extension

Oyashio Front

- Temperature difference across the fronts (e.g. Kuroshio Extension, Oyashio front) is large.

Waters are not mixed well across the fronts.

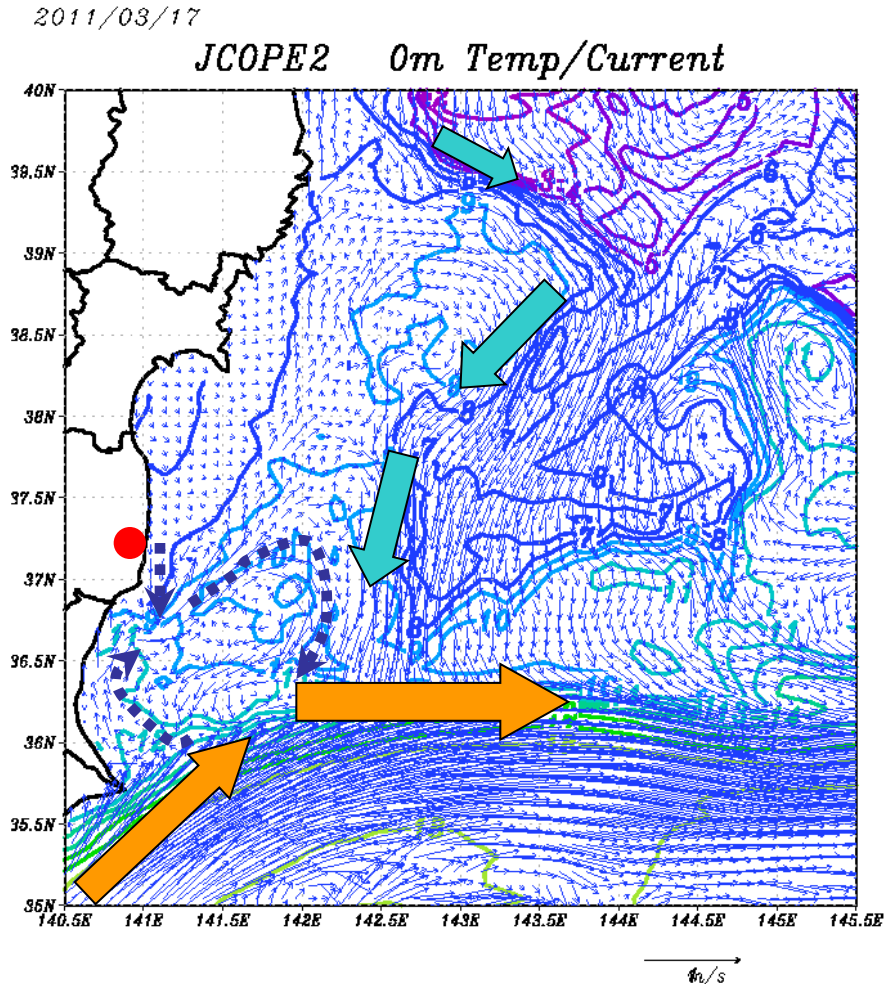
- Mixed water region is present between the Kuroshio Extension and the Oyashio front. Very complicated, turbulent flow.



from JCOPE HP

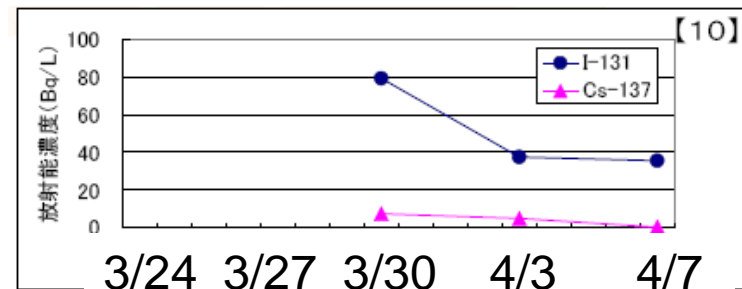
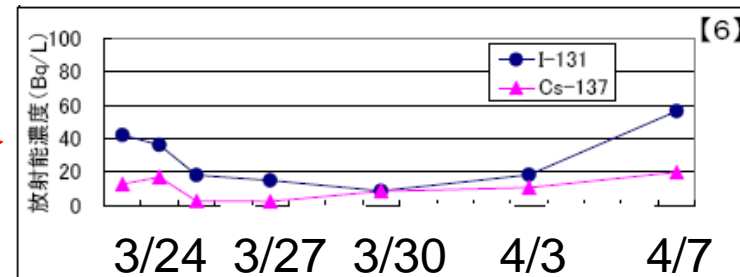
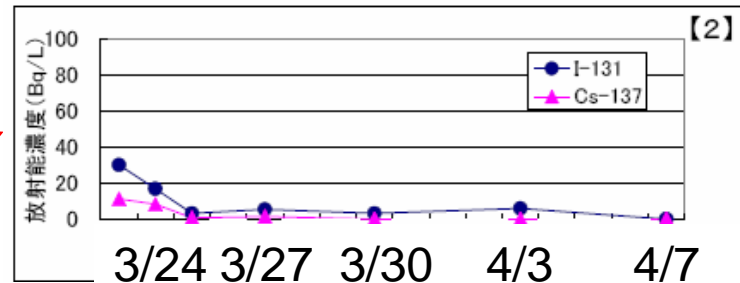
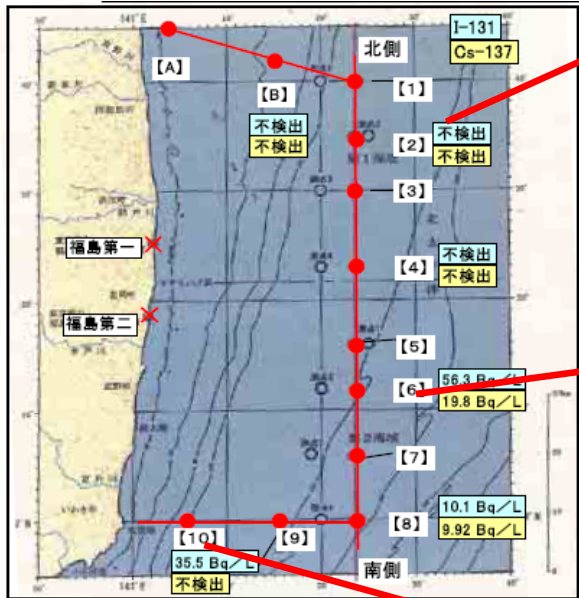
Current off Fukushima on 3/17

- Kuroshio and Oyashio are confluent, and then flow eastward off the eastern coast of Japan
- Current is complicated and relatively slow off Fukushima
- Southward flow
High concentration southward



from JCOPE HP

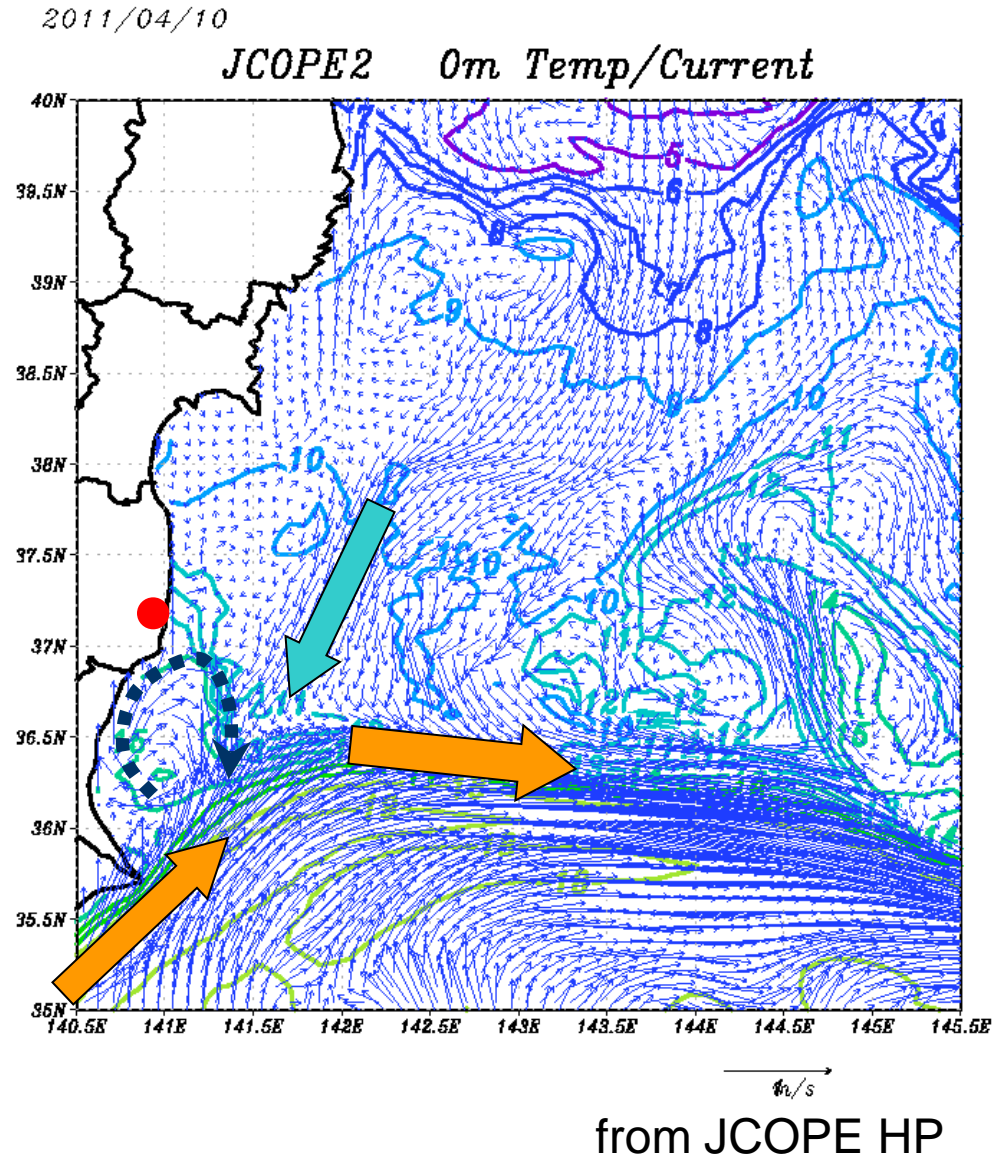
Time series of radioactivity concentration



from MEXT HP

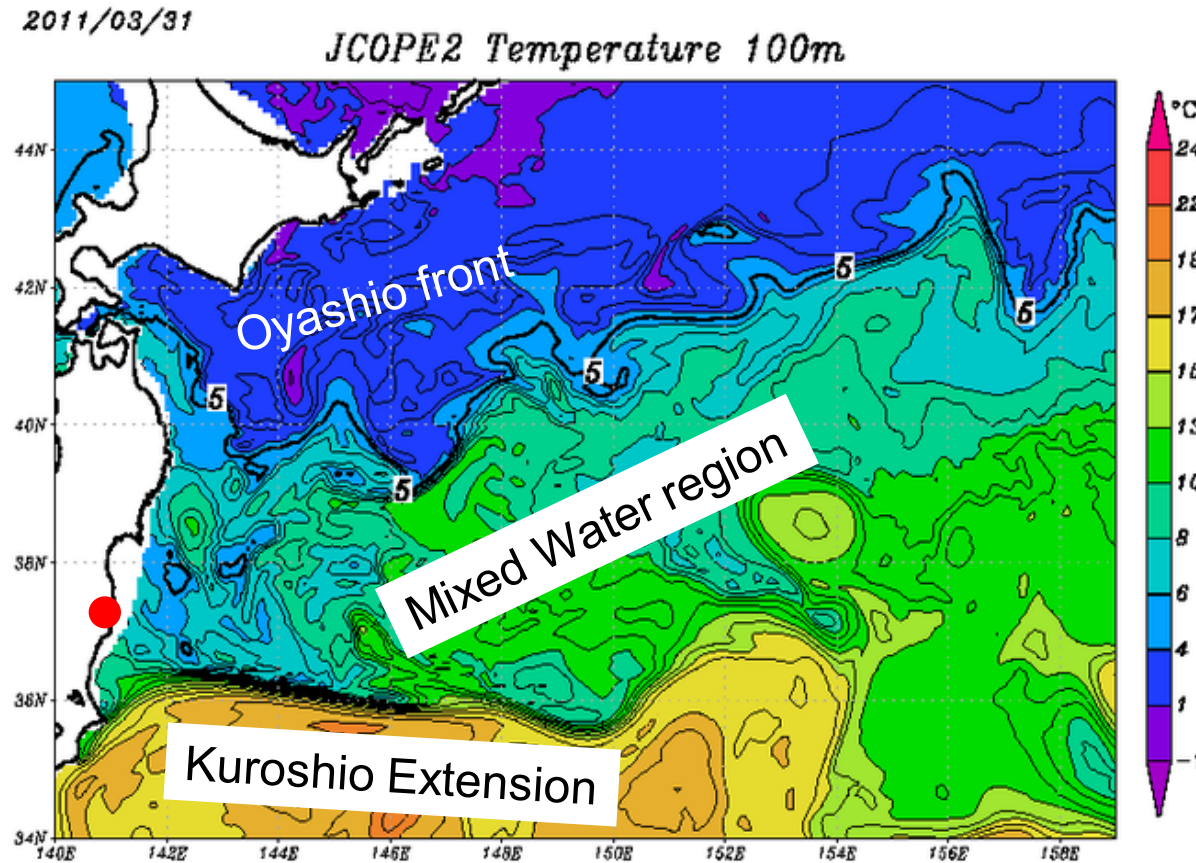
Current off Fukushima on 4/10

- Waters tend to flow offshore off the coast of Fukushima
- The flow is eventually confluent to the Kuroshio Extension and flow eastward.



Ocean currents off eastern coast of Japan

- As a whole, currents flow **eastward** off the eastern coast of Japan.
- Mixing across the fronts (e.g. Kuroshio Extension, Oyashio front) is weak. **Most of radioactive matters are likely to be transported eastward through Mixed Water region.**



from JCOPE HP

Remarks

- Transport of waters from Fukushima coast to Hokkaido should be negligible because mixing across the Oyashio front is weak.
- Mixed Water Region is a region of abundant biological production. It is important to monitor radioactivity in Mixed Water Region.