Press Release

Simulation of Radioactivity Concentrations in the Sea Area (the third report)

April 29, 2011
Ministry of Education, Culture, Sports, Science and Technology

1. Outline

The Ministry of Education, Culture, Sports, Science and Technology (MEXT) has been conducted monitoring study in the sea area off the coast of the Fukushima Dai-ichi NPP since March 23, 2011. It now used the JCOPE2(Note) numerical ocean forecasting system to simulate the distribution of radioactivity concentrations off the coast of the Fukushima Dai-ichi NPP.

(Note) JCOPE2: A model for forecasting path variations, including meander events, and movements of meso-scale eddies, etc. with regard to oceanic current systems such as Kuroshio and Oyashio, which substantially affect the oceanic conditions, in addition to forecasting water temperature and salinity variations in waters close to Japan. Developed by the Japan Agency for Marine-Earth Science and Technology (JAMSTEC). (Reproduction grid size: 8 × 8 km)

2. Method

In this simulation, only the diffusion of radioactive substances on the sea surface was simulated using the scenario and hypotheses shown below, since insufficient data is available on the amount of radioactive substances discharged from the NPP.

- A scenario is developed conservatively based on the data on radioactivity concentrations in the sea water at the coast up to April 22, which have been published by Tokyo Electric Power Company (TEPCO). [Figure 1]
- The above-mentioned radioactivity concentrations in the sea water are conservatively hypothesized to be diffused only on the sea surface of 8 × 8 km at 1/100 of the concentrations observed at the coast.
- The concentrations of radioactive substances are expressed as indices showing how many times they are higher than the effluent concentration limits for nuclear facilities.
- Fallout of radioactive substances discharged into the air from the NPP onto the sea surface is not taken into consideration.
- The diffusion of radioactive substances to subsurface sea water is not taken into consideration.
- As for the water near an outlet at the Fukushima Dai-ichi NPP, it is hypothesized that water of the same radioactivity concentration as that observed on April 22 was present until April 24 (no radioactive water was discharged to the sea on and after April 25).
- The half-lives of radioactive substances (iodine-131: approx. 8 days, cesium-134: approx. 2 years, cesium-137: approx. 30 years) are taken into consideration.

3. Results

Due to Japan Current Kurosho, Tsushima Current (Tsugaru warm current) and Chishima Current (Oyashio), the oceanic current of offing southern Tohoku, including Fukushima offing, flows intricately and slowly.[Figure 2]

In line with those complicated currents, the radioactive water near the NPP diffused to the offshore direction. In particular, the radioactive substances diffuse gradually and move slightly northward in the sea area off the coast of Fukushima Dai-ichi NPP in late April,.[Figure 3-1 to Figure 3-4]

In actual measurement, radioactive sabstances have not been detected since April 21in approximately 30km off the coast of the NPP sea area(current measurement method has a detection limit value of approximately 10Bq/L).

The cases that the calculated values fall below the detected limit values in all of sea areas in the simulation are followings: iodine-131 around mid-May, cesium-134 and cesium-137 around early June.

Note that this simulation provides results calculated for the conservative scenario above in 2., under various assumptions. In addition, it does not necessarily assure what the actual measurements will be.

4.Discrepancies with the second report

There are discrepancies between the second report on radioactivity concentration distribution, because the first day of the forecast was different. The simulation conditions were changed as follows in this report:

-Observation data up to April 22 were incorporated (the second report showed observation data up to April 13).

-The current pattern as of April 23 was used as the initial value (the initial value of the current pattern in the second report was as of April 11).

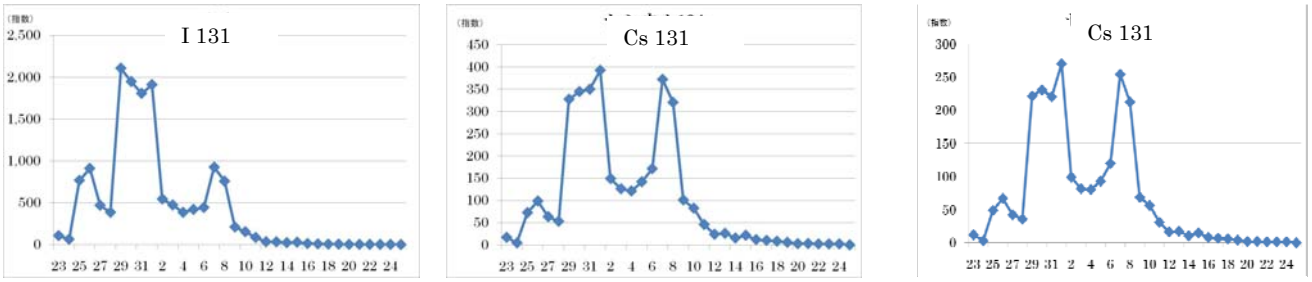
- As for the forecasting of wind conditions which affect the sea surface, the forecast as of April 23 was used (the relevant data in the second report was that as of April 11).

These conditions make a difference to the initial values in the result of the simulation.

Consequently, the discrepancies caused by use of new observation data, latest current patterns, etc. cannot be avoided.

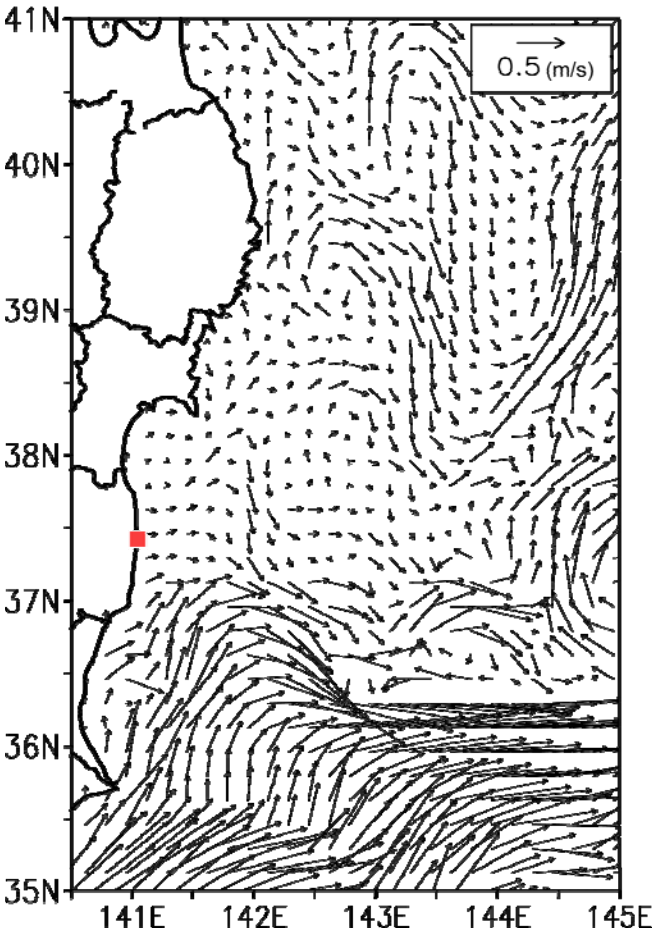
5. Point to note

This forecast was calculated by using JAMSTEC's supercomputer system on April 24, based on the current velocity pattern as of April 23 simulated by JCOPE2, and by incorporating the actual measurements taken by MEXT and TEPCO through monitoring up to April 22. It does not necessarily assure what the actual measurements will be. This must be revised to achieve a simulation which is closer to reality, by checking the actual measurements provided by the latest monitoring results and by mutual evaluation in comparison with simulations according to other calculation programs.



[Figure 1] Scenario of Radioactivity Concentrations in the Effluent Discharged from the Fukushima Dai-ichi NPP

The scenario assumes that radioactive substances diffuse on the sea surface of 8 × 8 km at 1/100 of the concentrations observed at the coast based on "Results of Nuclide Analysis of Seawater" (March 21-April 22) released by TEPCO, and the same level of discharge as that as of April 22 continues until April 22 (the discharge stops on April 25). The vertical axis indicates the assumed radioactivity concentration as an index showing how many times it is higher than the effluent concentration limit for nuclear facilities.

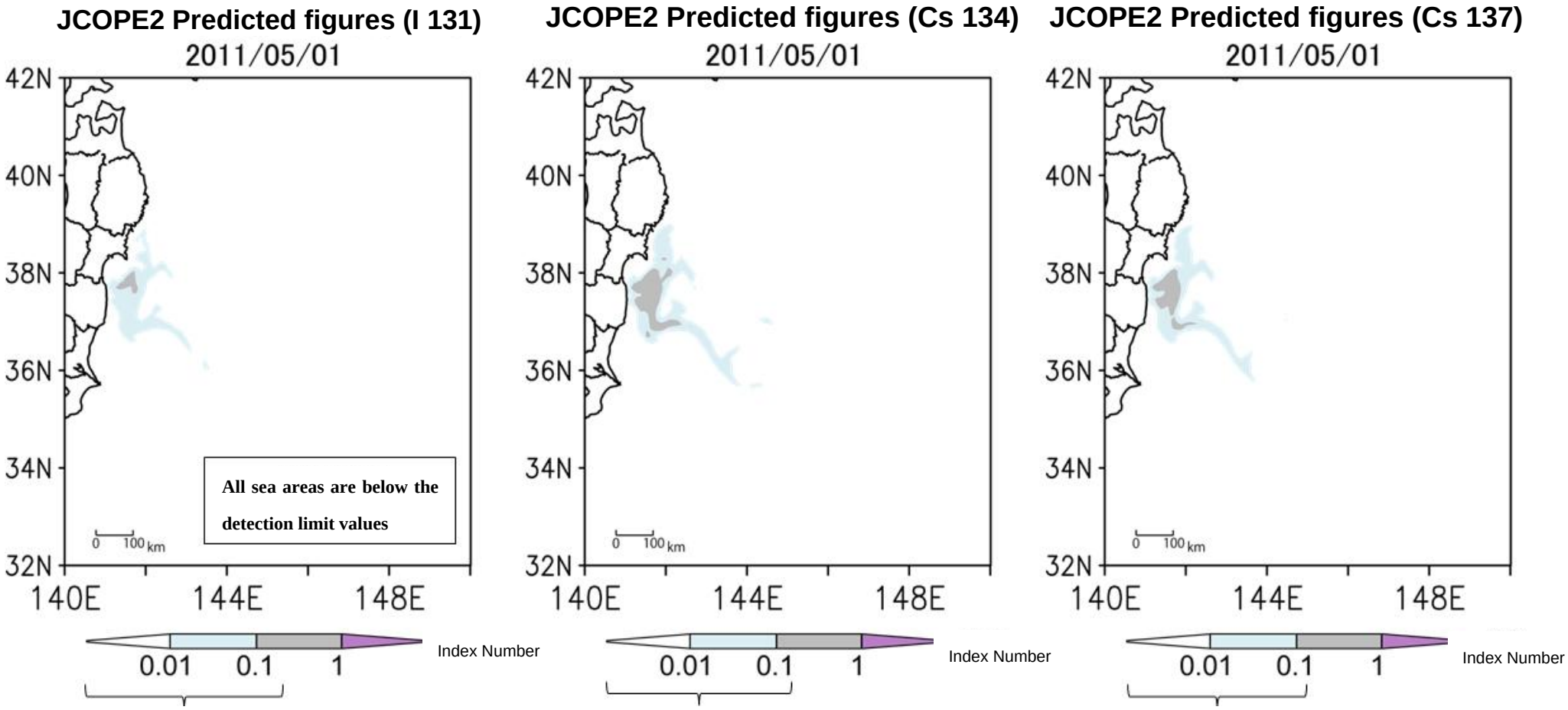


[Figure 2] Current Velocity Pattern Simulated by JCOPE2 (as of April 23)

The current volocity pattern simulated by JCOPE2 incorporates the on-site observation data and satellite observation data up to April 23. The half-lives of radioactive substances (iodine-131: approx. 8 days, cesium-134: approx. 2 years, cesium-137: approx. 30 years) are taken into consideration in the simulation.

[Figure 3-1] Simulation of Radioactivity Concentrations by JCOPE2 (May 1)

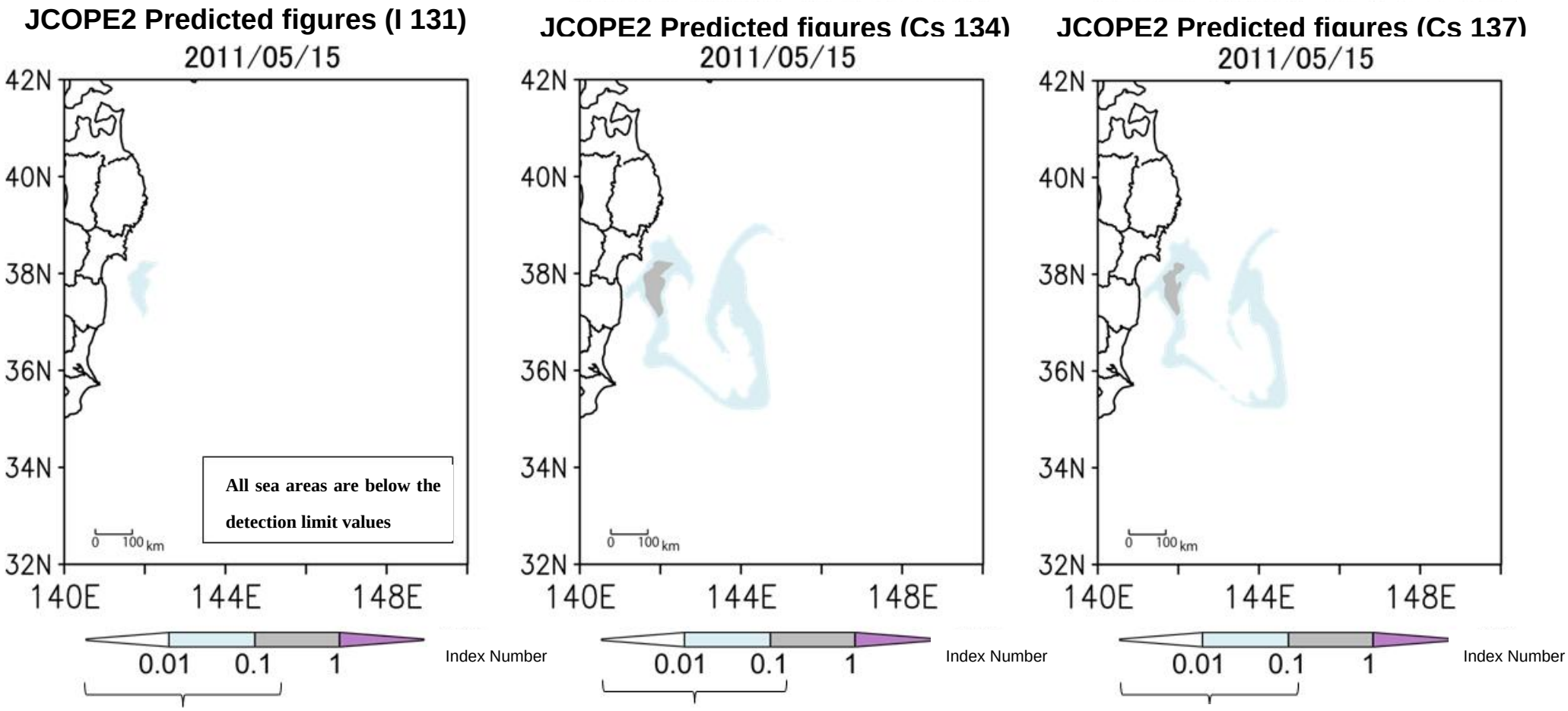
(based on data up to April 23rd)



*Currently, detection limit values are approximately 10Bq/L in monitoring of sea areas near Fukushima Dai-Ichi NPP by the Ministry of Education, Culture, Sports, Science and Technology.

{Note: Index number in the figure indicates a multiple of maximum radioactivity concentration determined by the regulation for the drain from nuclear facilities (I131: 40Bq/L, Cs134: 60Bq/L, Cs137: 90Bq/L) predicted on each point.}

[Figure 3-2] Simulation of Radioactivity Concentrations by JCOPE2 (May 15)
(based on data up to April 23th)



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{Note: Index number in the figure indicates a multiple of maximum radioactivity concentration determined by the regulation for the drain from nuclear facilities (I131: 40Bq/L, Cs134: 60Bq/L, Cs137: 90Bq/L) predicted on each point.}

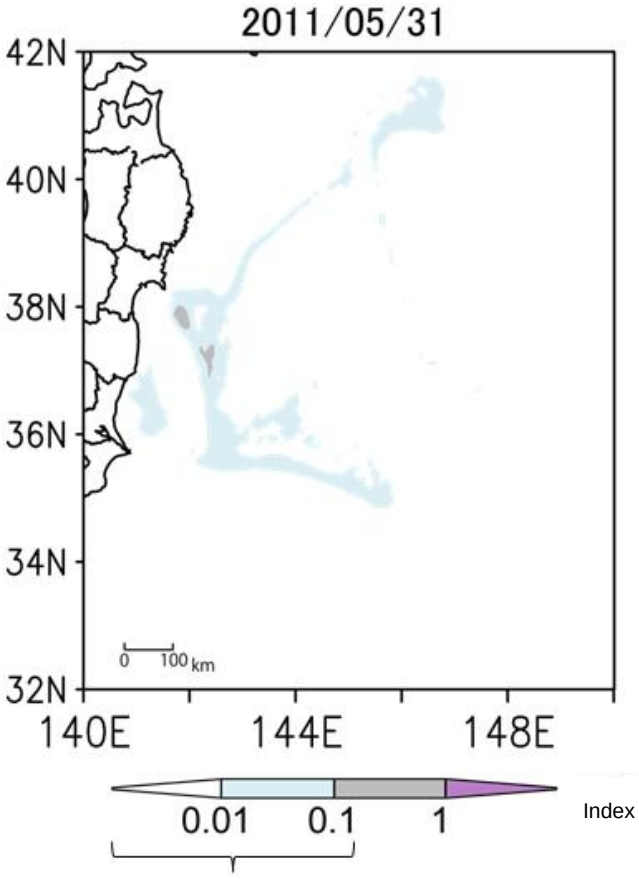
[Figure 3-3] Simulation of Radioactivity Concentrations by JCOPE2 (May 31st)
(based on data up to April 23rd)

JCOPE2 Predicted figures (I 131)

2011/05/31

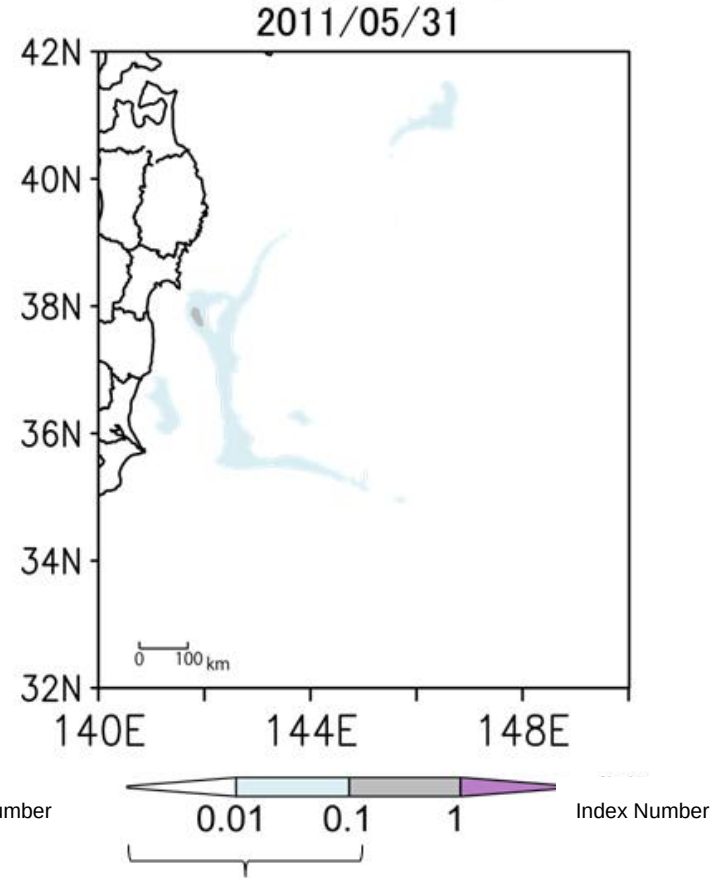
The index number is below 0.01 (0.4Bq/L) in all sea areas.

JCOPE2 Predicted figures (Cs 134)



Below the detection limit values

JCOPE2 Predicted figures (Cs 137)



Below the detection limit values

*Currently, detection limit values are approximately 10Bq/L in monitoring of sea areas near Fukushima Dai-Ichi NPP by the Ministry of Education, Culture, Sports, Science and Technology.

{Note: Index number in the figure indicates a multiple of maximum radioactivity concentration determined by the regulation for the drain from nuclear facilities (I131: 40Bq/L, Cs134: 60Bq/L, Cs137: 90Bq/L) predicted on each point.}

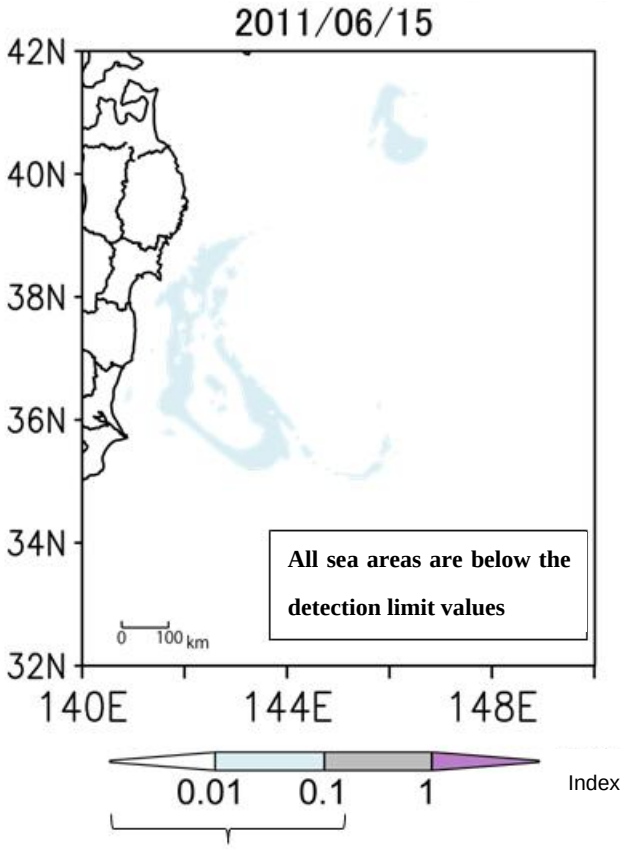
[Figure 3-4] Simulation of Radioactivity Concentrations by JCOPE2 (June 15th)
(based on data up to April 23rd)

JCOPE2 Predicted figures (I 131)

2011/06/15

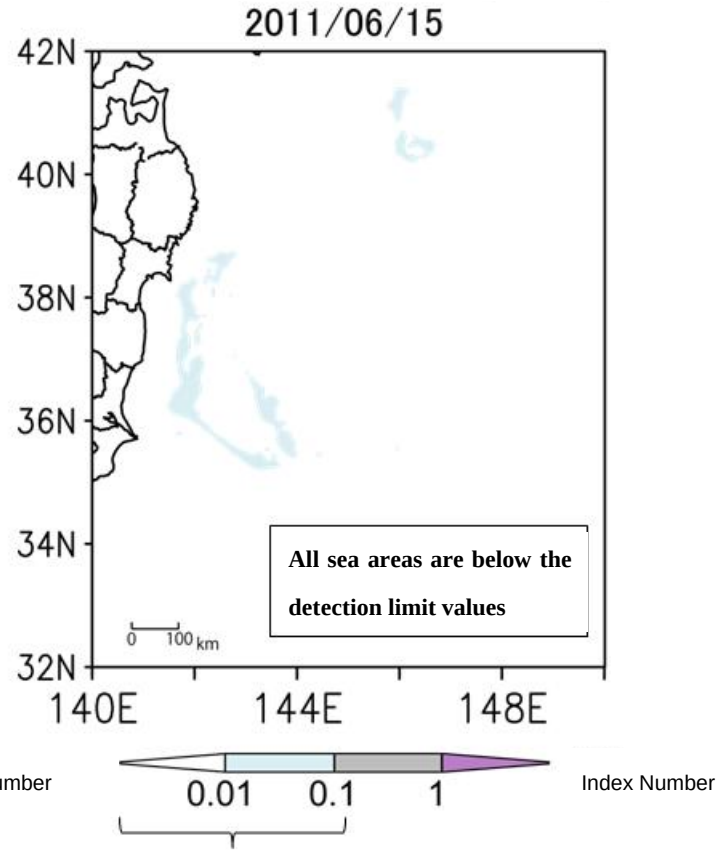
The index number is below 0.01 (0.4Bq/L) in all sea areas.

JCOPE2 Predicted figures (Cs 134)



Below the detection limit values

JCOPE2 Predicted figures (Cs 137)



Below the detection limit values

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