Press Release

Simulation of Radioactivity Concentrations in the Sea Area

April 12, 2011
Ministry of Education, Culture, Sports, Science and Technology

1. Outline

The Ministry of Education, Culture, Sports, Science and Technology (MEXT) has conducted monitoring in the sea area off the coast of the Fukushima Dai-ichi NPP since March 23, 2011. Based on the simulation results obtained by using a numerical ocean forecasting system, JCOPE2,(Note 1) the distribution of radioactivity concentrations off the coast of the Fukushima Dai-ichi NPP was simulated by using JCOPET,(Note 2) which also takes into account the latest data on the wind field and sea tides.

(Note 1) 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)

(Note 2) JCOPET: A model capable of making high-precision reproduction by increasing the resolution of the above model and incorporating the data on sea tides and more accurate data on ocean winds. Developed by the Japan Agency for Marine-Earth Science and Technology (JAMSTEC). (Reproduction grid size: 3 × 3 km)

2. Method

In this simulation, only the spread of radioactive substances on the sea surface was simulated using the scenario and hypotheses shown below, since no 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 8, 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 spread out 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 spread of radioactive substances in subsurface sea water is not taken into consideration.
- It is hypothesized that effluent discharge equivalent to that observed at the Fukushima Dai-ichi NPP as of April 8 continues until April 11 and that the discharge stops on April 12 (zero discharge on and after April 12).
- The half-lives of radioactive substances (iodine-131: approx. 8 days, cesium-137: approx. 30 years) are taken into consideration.

3. Results

The oceanic currents off Fukushima are complicated and slow-flowing. [Figure 2]

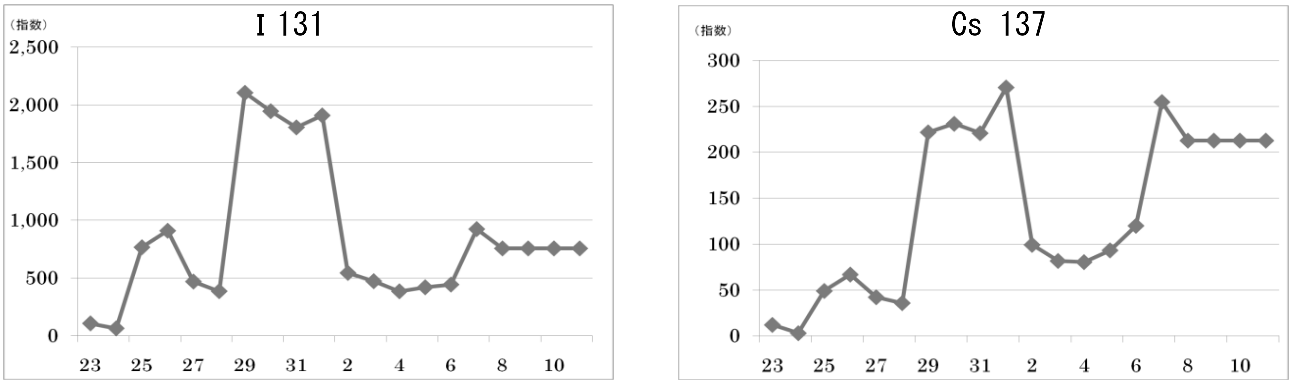
In line with those complicated currents, the effluent discharged from the NPP spreads in the offshore direction. [Figure 3-1] to [Figure 3-5]

In particular, in the sea area off the coast of Fukushima Dai-ichi NPP, the effluent moves in the offshore direction spreading gradually. Thus, according to the simulation results, the radioactivity concentrations in the sea area 30 km off the coast of the NPP are expected to be higher during the period from April 9 to 11 than during the period from April 4 to 7 (the actual measurements taken in the sea area monitoring conducted by MEXT on April 9 showed such tendency). [Figure 4-1] to [Figure 4-4]

The simulation results showed that, if the effluent discharge stops on April 12, there will be no sea surface with levels of iodine-131 exceeding 40Bq/L (the effluent concentration limit for nuclear facilities) nor with levels of cesium-137 exceeding 90Bq/L (the same as above) by May. [Figure 3-4] to [Figure 3-5]

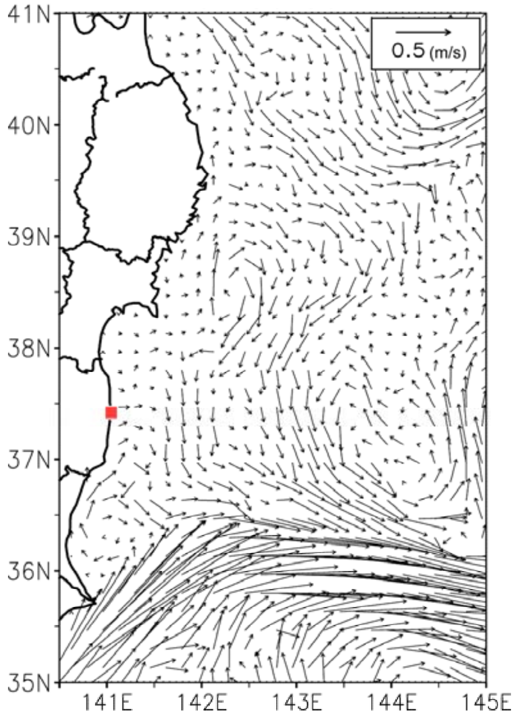
4. Point to note

This forecast is a preliminary report of the results of the simulation conducted by using JAMSTEC's super computer system on April 9, based on the current pattern as of April 2 simulated by JCOPE2, and by incorporating the actual measurements taken by MEXT and TEPCO through monitoring up to April 8. The data will be reviewed in the future by incorporating the actual measurements provided by the latest monitoring results.



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

The scenario assumes that radioactive substances spread 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 8) released by TEPCO, and the same level of discharge as that as of April 8 continues until April 11 (the discharge stops on April 12). 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.



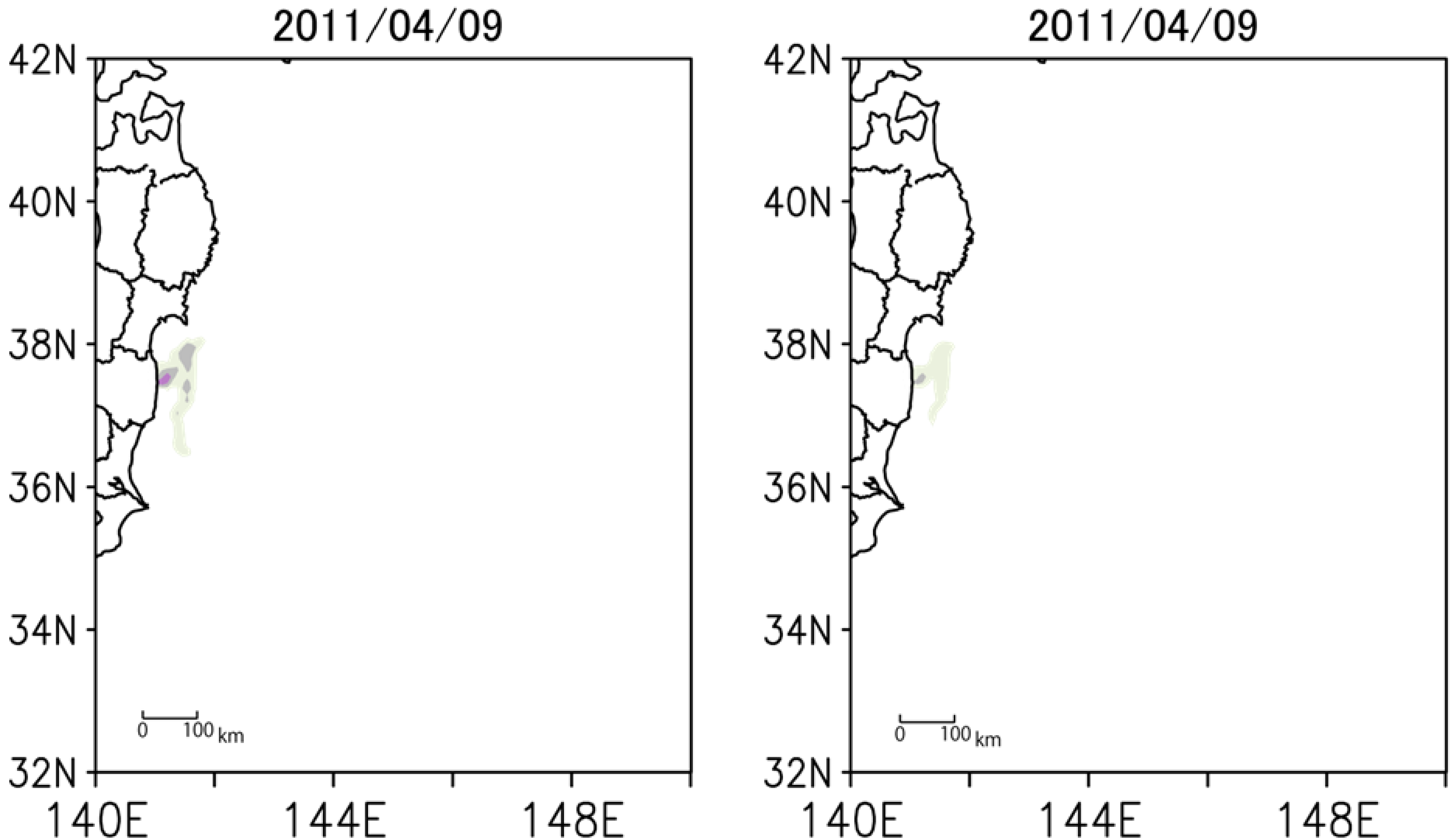
[Figure 2] Current Pattern Simulated by JCOPE2 (as of April 2)

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

【Figure3-1】**Simulation of Radioactivity Concentrations by JCOPE2(April 9th)**

（based on data up to April 8th）

JCOPE2 Predicted figures (I 131) | **JCOPE2 Predicted figures (Cs 137)**

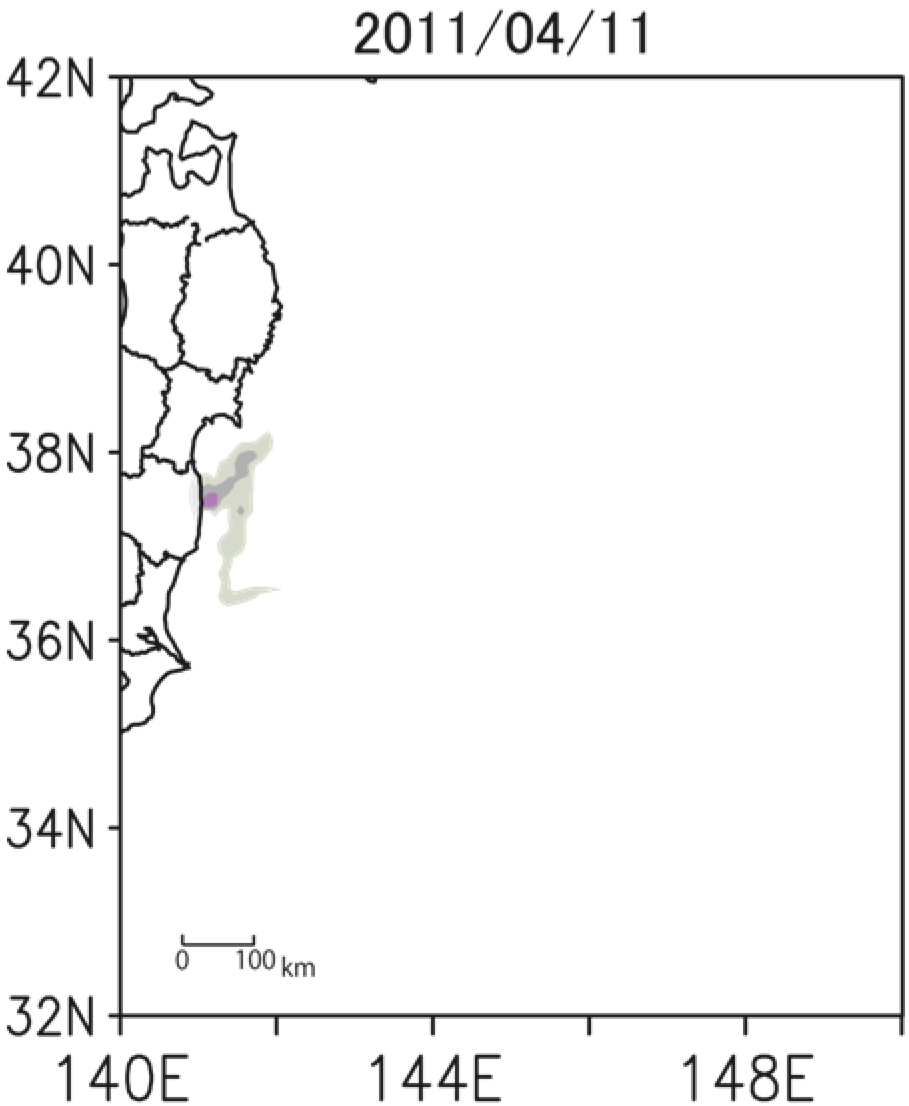


＜Remarks：Index number in the figure indicates a multiple of maximum radioactivity concentration determined by the regulation for the drain from nuclear facilities（I131:40Bq/L, Cs137:90Bq/L）predicted on each point.＞

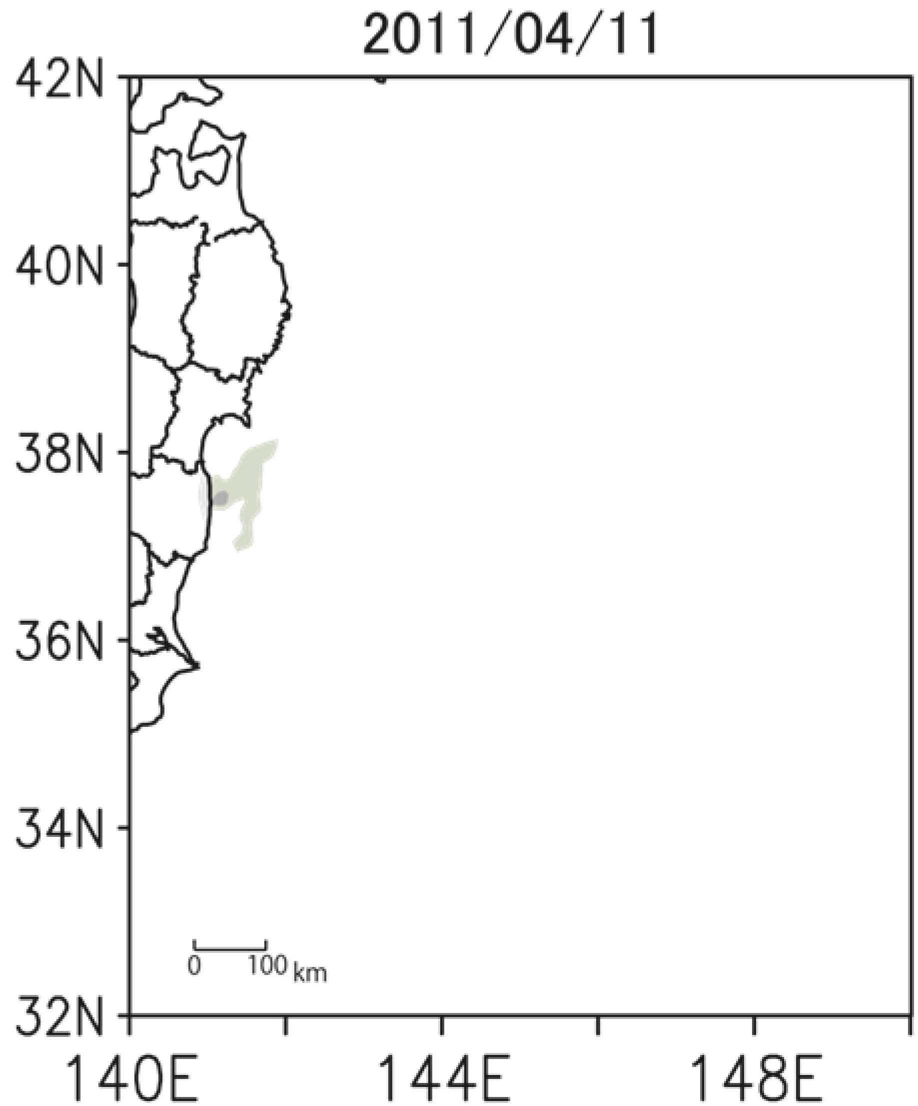
【Figure3-2】**Simulation of Radioactivity Concentrations by JCOPE2(April 11th)**

（based on data up to April 8th）

JCOPE2 Predicted figures (I 131)



JCOPE2 Predicted figures (Cs 137)

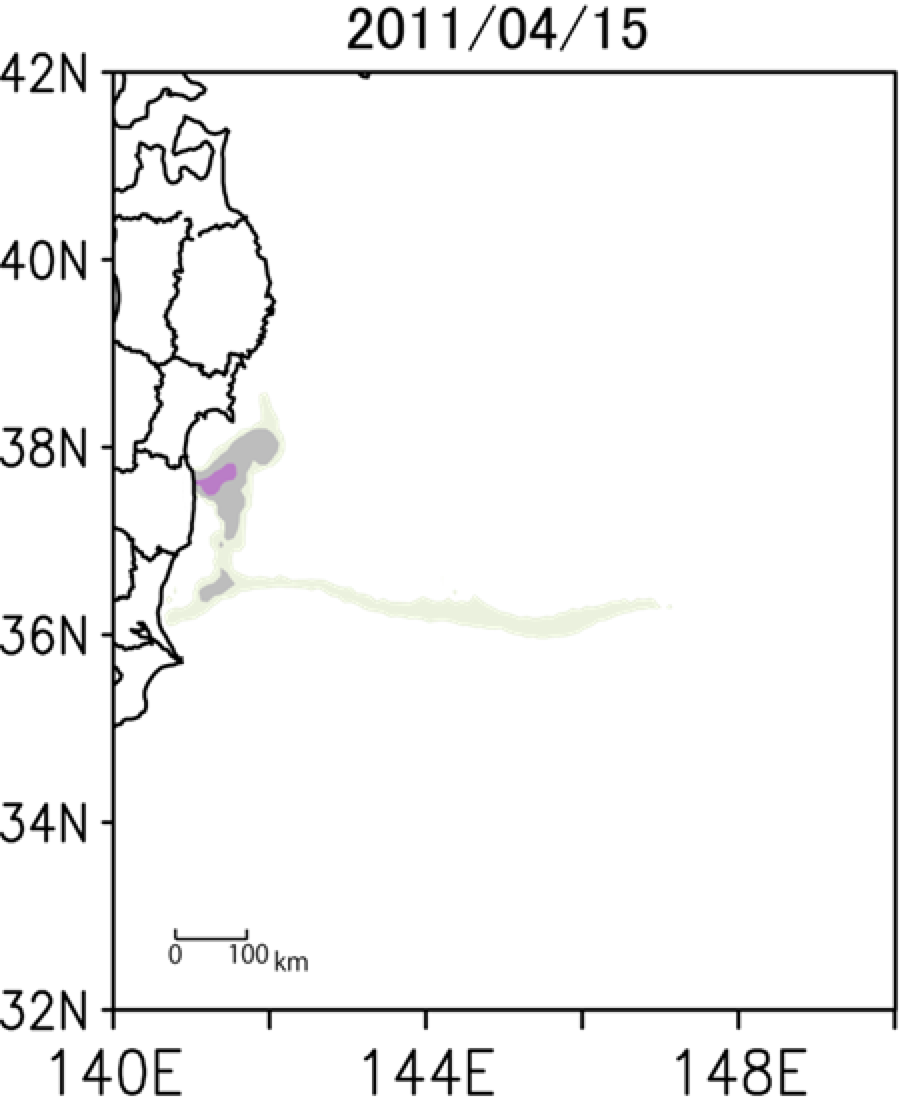


＜Remarks：Index number in the figure indicates a multiple of maximum radioactivity concentration determined by the regulation for the drain from nuclear facilities（I131:40Bq/L, Cs137:90Bq/L） predicted on each point.＞

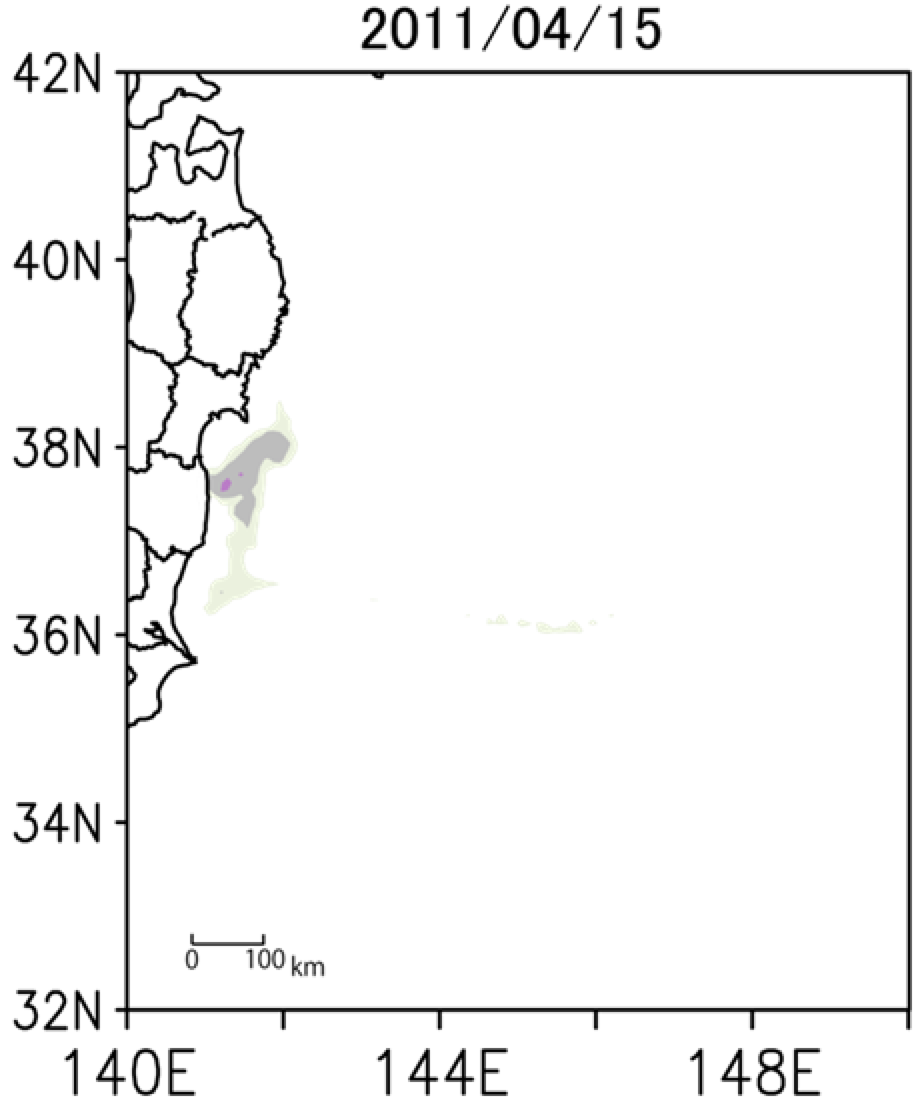
【Figure3-3】**Simulation of Radioactivity Concentrations by JCOPE2(April 15th)**

（based on data up to April 8th）

JCOPE2 Predicted figures (I 131)



JCOPE2 Predicted figures (Cs 137)

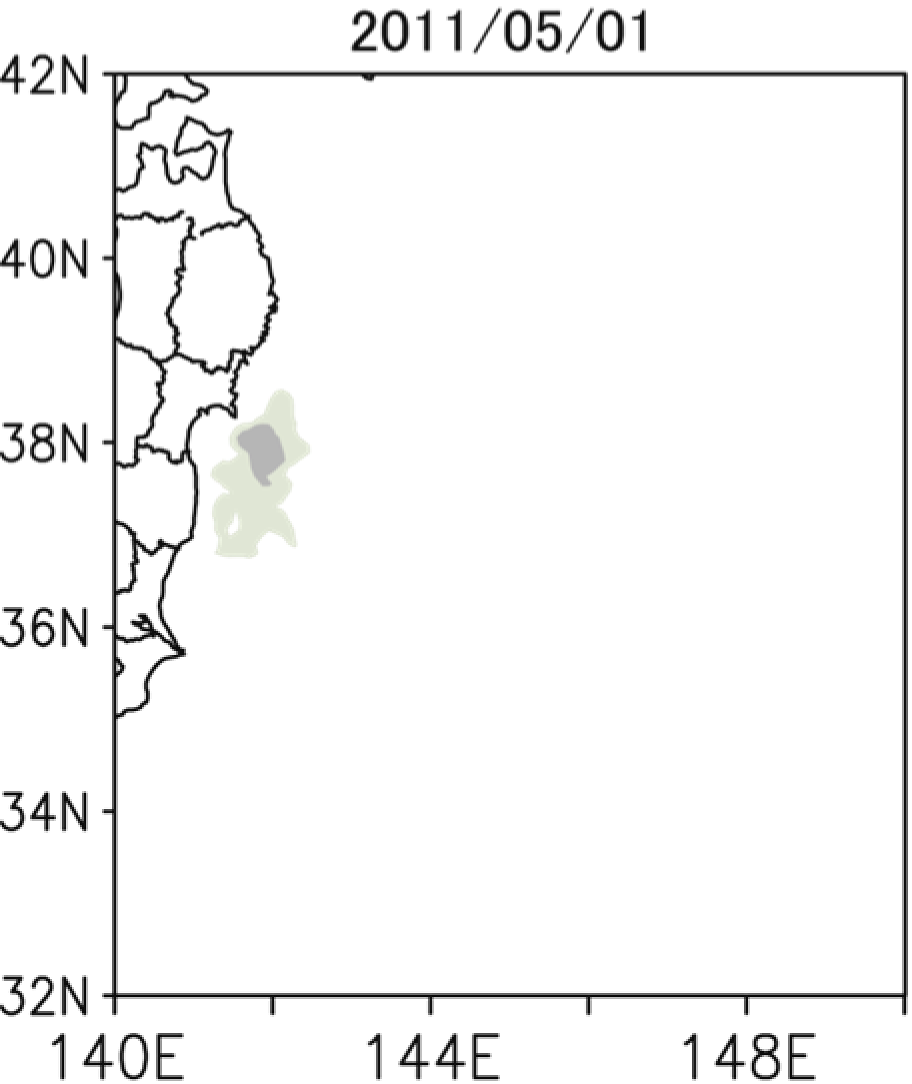


＜Remarks：Index number in the figure indicates a multiple of maximum radioactivity concentration determined by the regulation for the drain from nuclear facilities（I131:40Bq/L, Cs137:90Bq/L） predicted on each point.＞

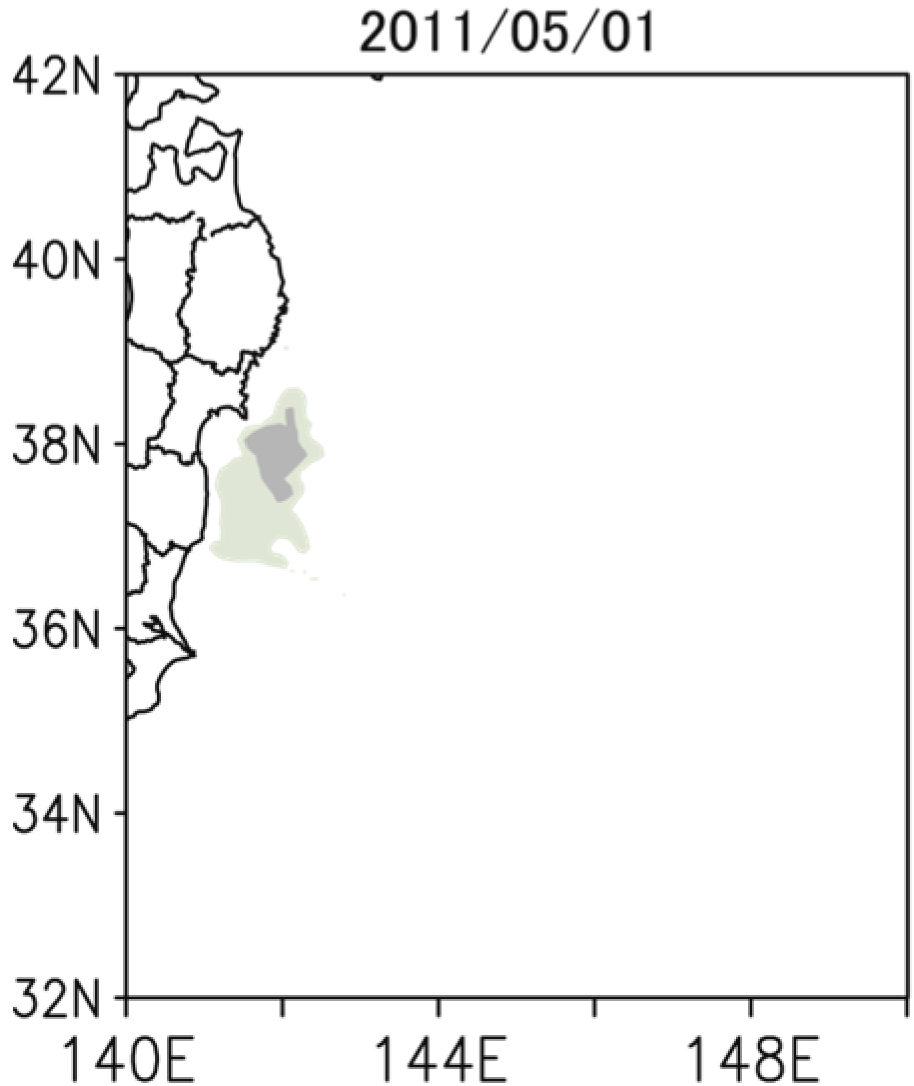
【Figure3-4】**Simulation of Radioactivity Concentrations by JCOPE2(May 1st)**

（based on data up to April 8th）

JCOPE2 Predicted figures (I 131)



JCOPE2 Predicted figures (Cs 137)

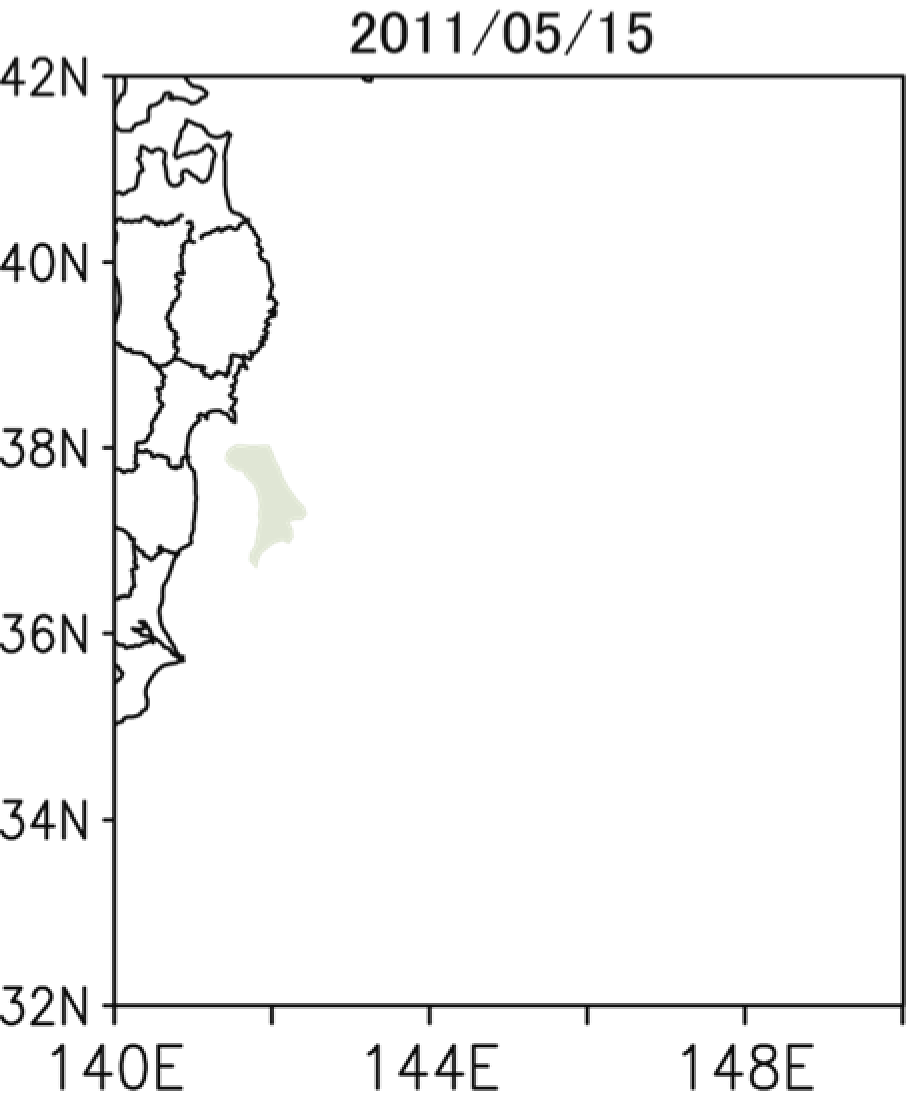


＜Remarks：Index number in the figure indicates a multiple of maximum radioactivity concentration determined by the regulation for the drain from nuclear facilities（I131:40Bq/L, Cs137:90Bq/L）predicted on each point.＞

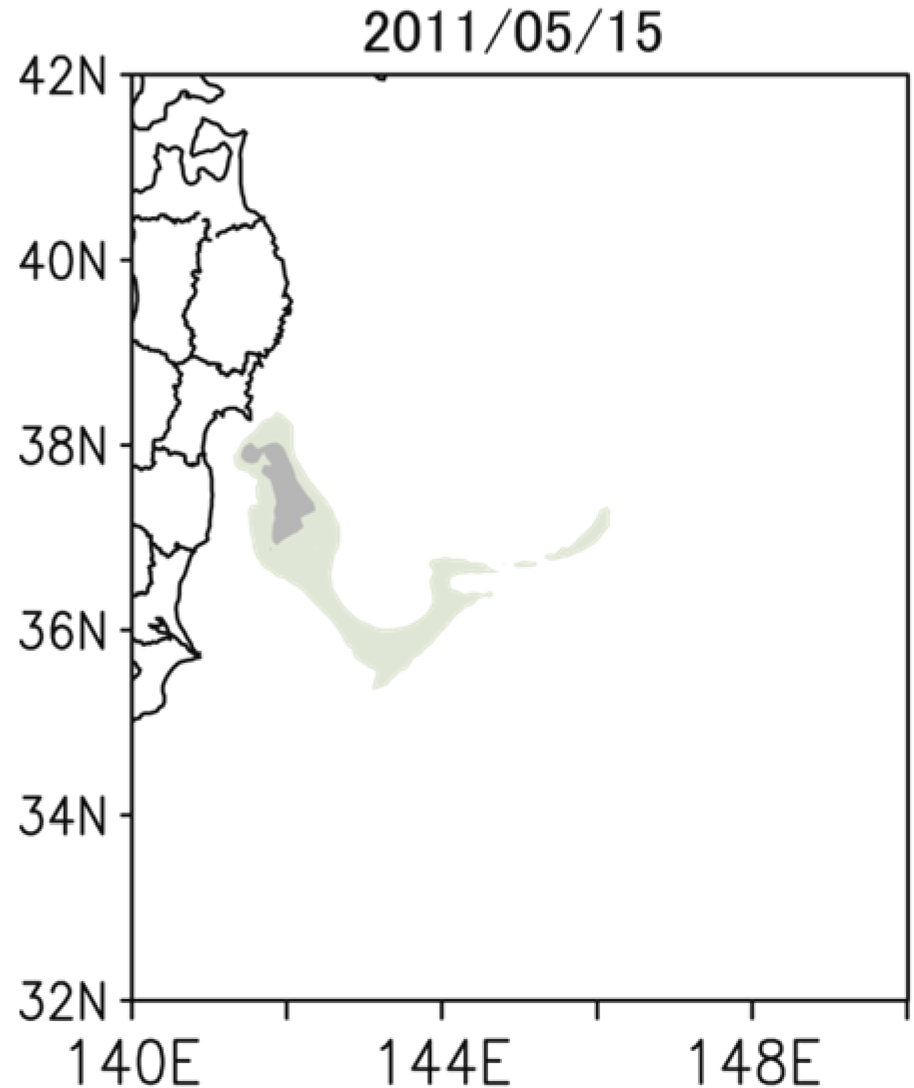
【Figure3-5】Simulation of Radioactivity Concentrations by JCOPE2(May 15th)

（based on data up to April 8th）

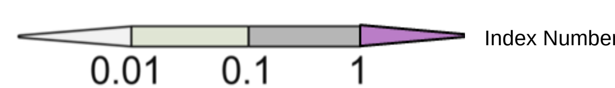
JCOPE2 Predicted figures (I 131)



JCOPE2 Predicted figures (Cs 137)

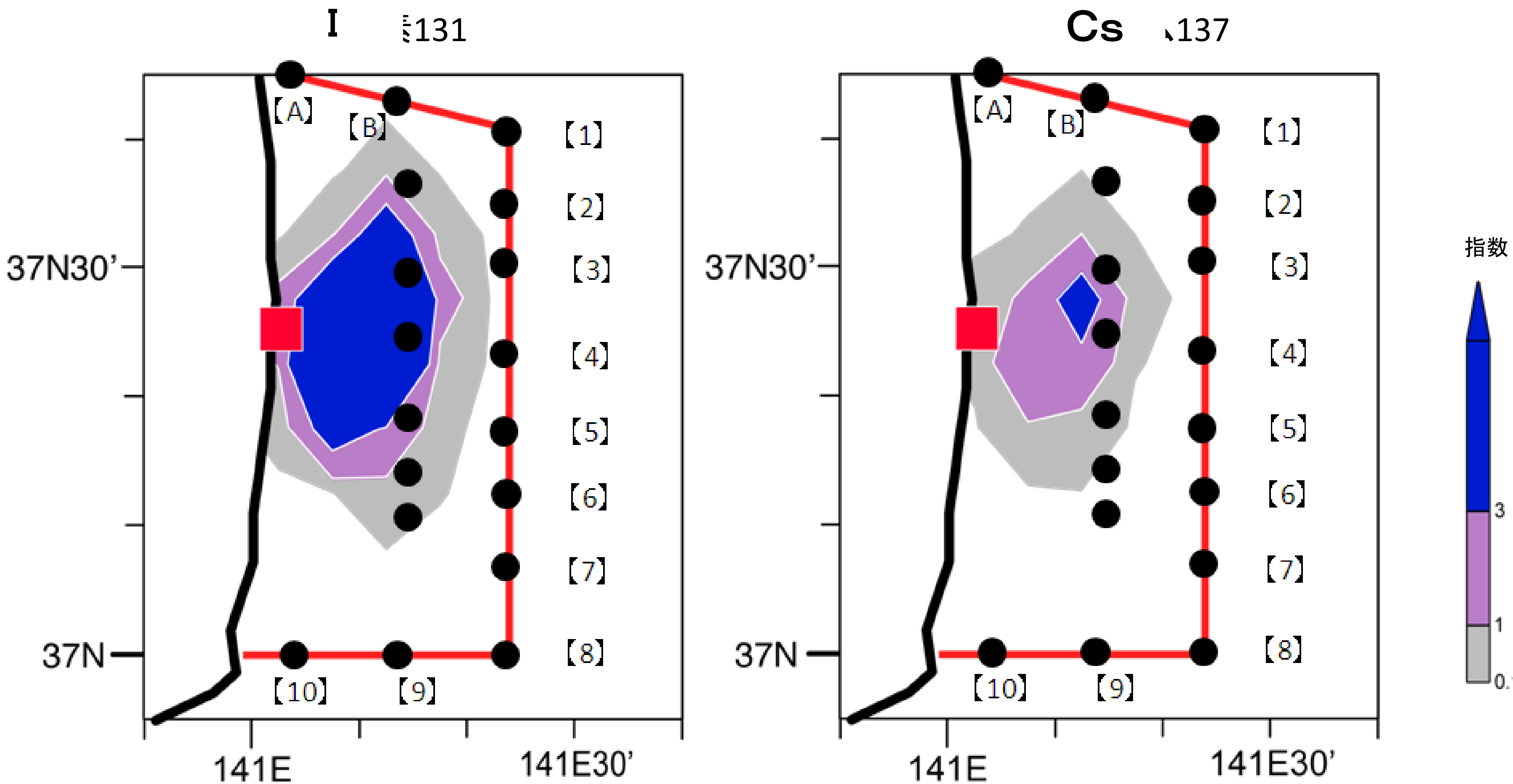


＜Remarks：Index number in the figure indicates a multiple of maximum radioactivity concentration determined by the regulation for the drain from nuclear facilities（I131:40Bq/L, Cs137:90Bq/L） predicted on each point.＞



【Figure4-1】**Simulation of Radioactivity Concentrations by JCOPET (April 4)**

(based on data up to April 8th)

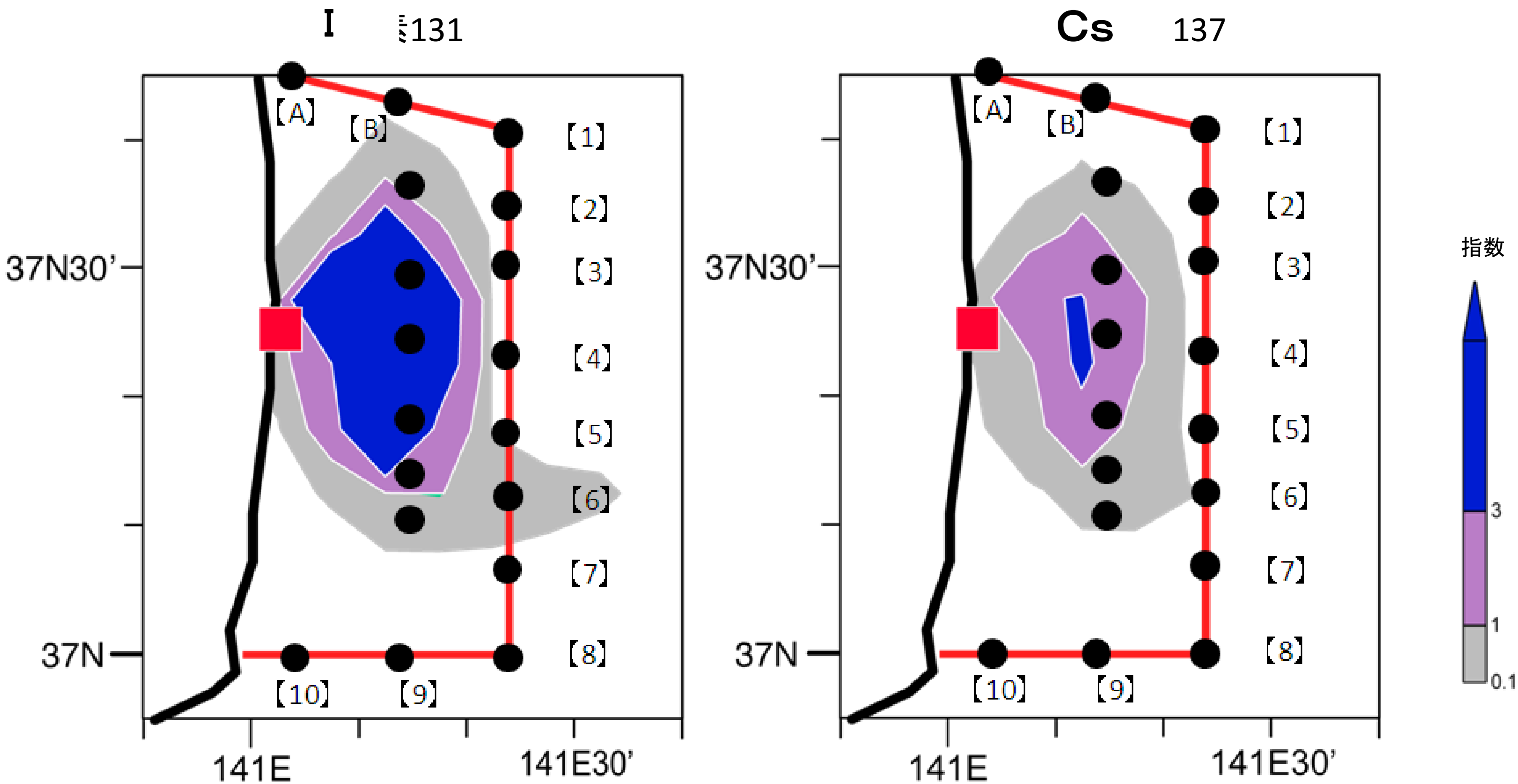


JCOPET suppose a half-life of I 131 as 8 days and one of Cs 137 as 30 years in the simulation.

＜Remarks：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, Cs137:90Bq/L） predicted on each point.＞

【Figure4-2】**Simulation of Radioactivity Concentrations by JCOPET (April 7)**

（based on data up to April 8th）

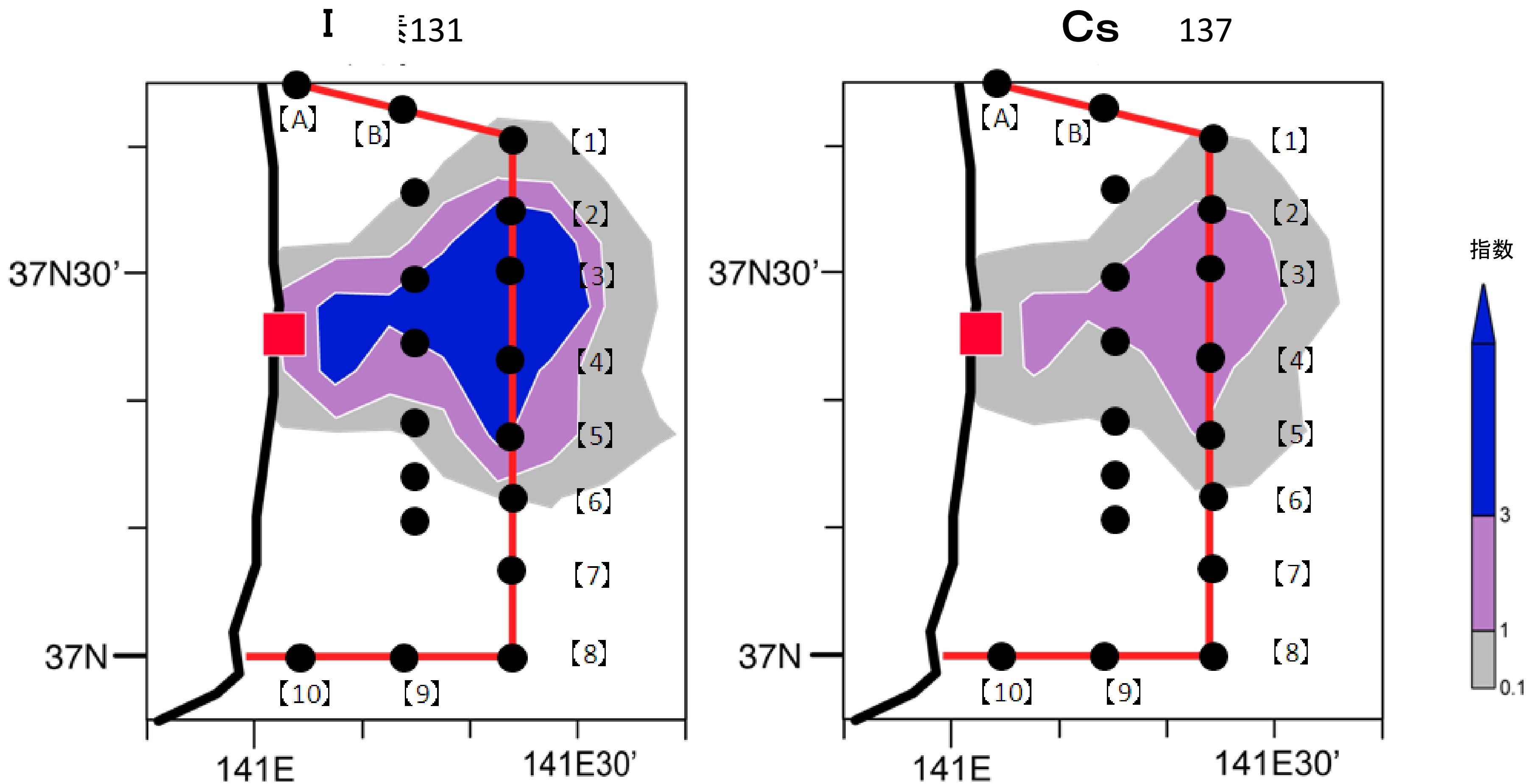


JCOPET suppose a half-life of I 131 as 8 days and one of Cs 137 as 30 years in the simulation.

＜Remarks：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, Cs137:90Bq/L） predicted on each point.＞

#【Figure4-3】**Simulation of Radioactivity Concentrations by JCOPET (April 9)**

（based on data up to April 8th）

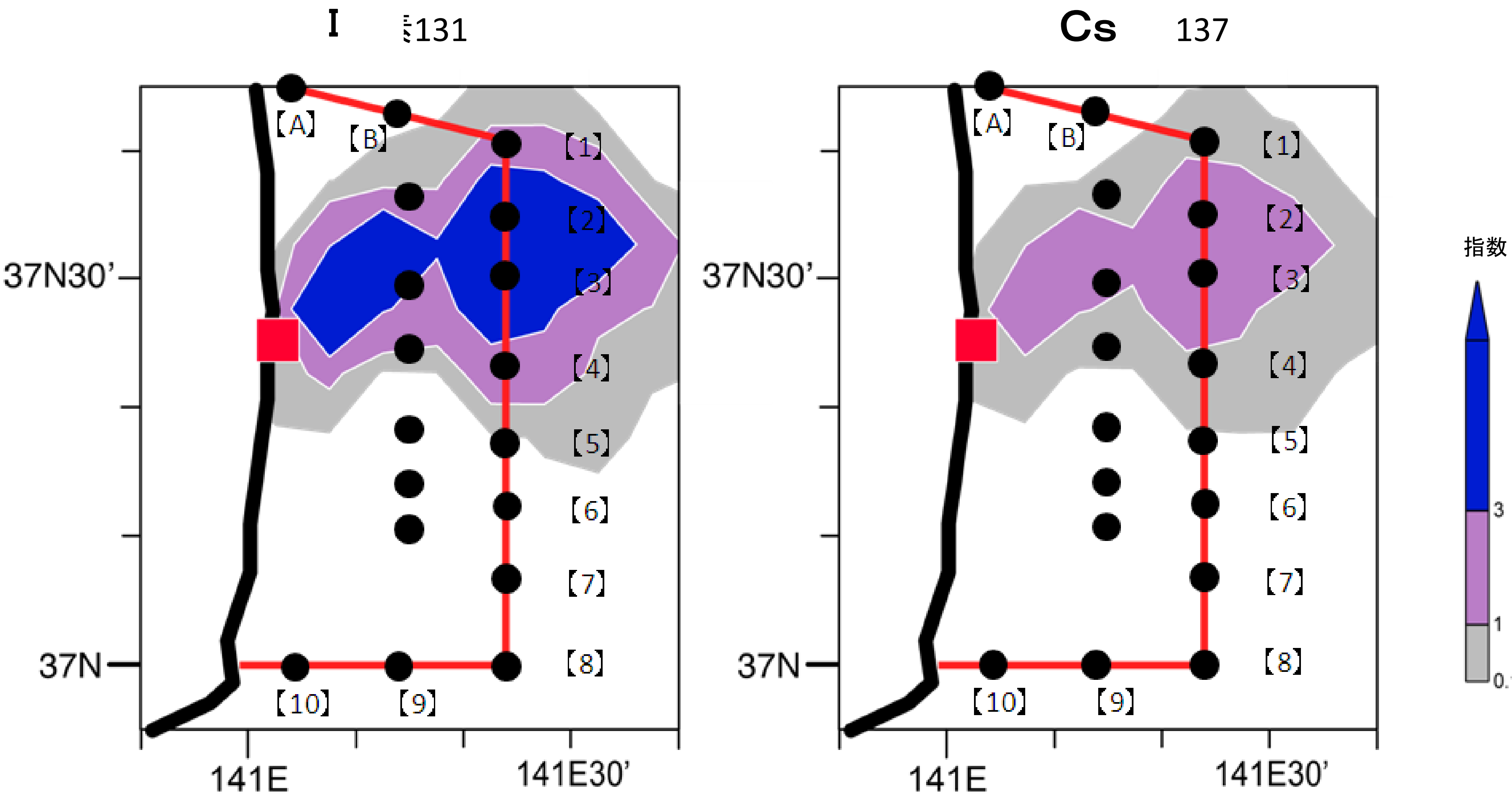


JCOPET suppose a half-life of I 131 as 8 days and one of Cs 137 as 30 years in the simulation.

<Remarks：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, Cs137:90Bq/L） predicted on each point.>

【Figure4-4】**Simulation of Radioactivity Concentrations by JCOPET (April 11)**

(based on data up to April 8th)



JCOPET suppose a half-life of I 131 as 8 days and one of Cs 137 as 30 years in the simulation.

＜Remarks：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, Cs137:90Bq/L） predicted on each point.＞