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Investigating the ocean

Activities for the Fukushima-TRACE (long-term assessment of Transport of RAdioactive Contaminant in the Environment of Fukushima) Project

"Now disconnecting the searching boat!"

A loud voice ringing out on the shipboard triggers the ship to sail out with its engine groaning. The unmanned searching boat (SB) gradually is moving away.

We are on the sea about 4 km off the coast of Ukedogawa, Fukushima Prefecture. It is approximately 10 km northeast offshore the Fukushima Daiichi Nuclear Power Station. The Restricted Areas (no-entry in principle) are designated in areas surrounding the power station. There is also the RA on the sea area. The "Seikai", a monitoring boat owned by JAEA, which we are on board, is about 200 m off the sea RA.

The unmanned SB tugged by the Seikai here has been disconnected and begun to sail on its own.

The sky is clear. However, strong winds slam the sea waters onto the deck every so often.

JAEA has been conducting the Fukushima-TRACE Project since FY 2012 in order to investigate the migration of radioactive materials released due to the accident at the Fukushima Daiichi Nuclear Power Station. Investigations have so far been conducted at

dams, forests, rivers, and so on. We are on the sea off the mouth of Ukedogawa River in order to conduct a test operation of the unmanned SB. The voice heard earlier was let out from Mr. Tadahiko Tsuruta of JAEA, who is responsible for the whole operation.

Tsuruta said, “To understand the migration of radioactive materials in the ocean, it is essential to investigate distribution and characteristics of the seabed soil, movement and quality of the sea water, and such. The unmanned searching boat disconnected a while ago is able to monitor seawater quality by remote control. There is a possibility for us to add functions, like measurement radioactivity contained in the seabed soil and sampling. We anticipate that the searching boat will become a useful tool to collect information more efficiently.”

Meantime, the unmanned SB was forced by wind to drift away. Professor Yasuhiro Senga of School of Marine Science and Technology, Tokai University aboard the Seikai gave an instruction to Mr. Hiroki Hagiwara at the land base, while watching the movement of the SB. Professor Senga is the developer of the unmanned SB. Today, the test operation has been materialized thanks to his cooperation.

Mr. Hagiwara operated a computer following the instruction by the Professor, and sent signals to the SB via mobile a phone communication. The SB started to modify its sailing track.

Soon the engine of the SB stopped. It slowly lowered a monitoring device from its bottom into sea. We could see the SB heavily swaying on the rough sea from the shipboard of the Seikai, but as a matter of course could not see the monitoring device submerged in the sea. However, the monitor of the computer at the land base started to display in real time the data collected by the device, such as the depth, water temperature, and salinity.

A cloud was floating in the south sky. Its shape was almost lens – a sign of bad weather approaching. It was early in the afternoon, about 4 hours after our departure from the port. The waves became higher, and the instantaneous wind speed exceeded 20 m per second. Whitecap waves crashed into the hull, making the Seikai heavily heeled over now and again. Being unable to stand straight, everybody clung on the handrails.

Hiroki Hagiwara (left) receiving lectures on operation of the unmanned observation boat and water quality censor from Professor Yasuhiro Senga (right) prior to the test operation.

The captain decided to withdraw to ensure the safety. The Seikai started approaching the SB that had already retracted the monitoring device. An incorrect timing of action would lead to a collision of the two boats because of the rough sea.

The Seikai maneuvered by Mr. Masashi Nemoto slowly approached the SB. The chief engineer, Mr. Tokuju Isozaki leaned out and tied a rope to the SB, then the Seikai moved forward at full throttle to keep a distance large enough to avoid crashing by two boats. Isozaki's face was drenched with the sea water splashes.

After arriving back at the port, Mr. Tsuruta concluded, "A variety of information was acquired in this test operation, like that on selection of observation location, observation methods, and placement of personnel, for monitoring using the searching boat. Especially, we found that several well-thought-out monitoring options must be prepared in advance, so that the plan can be flexibly modified according to the ocean weather conditions that can abruptly change like this time. The results obtained in this test operation will be examined and reflected in future investigations."

Left picture: The bottom part of the unmanned searching boat Kan-chan

Unmanned Searching Boat

The unmanned searching boat was developed by Professor Yasuhiro Senga of the School of Marine Science and Technology, Tokai University. The original task of the boat was to survey the ocean surface atmosphere aerosols in the oceanic regions around Japan, as part of the Strategic Basic Research Programs of the Japan Science and Technology Agency, from 1998 to 2003. The boat is named Kan-chan and equipped with a diesel engine driven electricity generator to rotate the screw. It is, so to speak, a ship-version of an electric car.

On the deck of the Kan-chan there are meteorological instruments to monitor the temperature, humidity, wind direction, and wind speed. In addition, there are sensors at both sides of the bilges to measure the water temperature, salinity, turbidity, and phytoplankton, and at the keel on the bottom of the boat a water quality sensor YOYO, which can be submerged down to 100 m deep.

Monitoring boat Seikai

The Seikai we were aboard is a monitoring boat built for investigations of the effects of radioactive liquid waste discharged from the JAEA's reprocessing plant to the marine environment. The Seikai was built in 1985, and reconditioned in 2009. The Seikai has been continueing monitoring off the coast of Ibaraki Prefecture before and after the accident at the Fukushima Daiichi Nuclear Power Station. That was the first time for the Seikai to sail out of Ibaraki Prefecture for investigations.