

A Physical Oceanographic Study of the Sanriku Coastal Seas

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There are a dozen or more small bays on the Sanriku ria coast, located in the northeastern part of Japan. The bays have lengths of several to a few tens of kilometres, and depths of several tens to a few hundred meters, and they are well known important areas of inshore fisheries, where a variety of seaweeds and shellfish are farmed. The farming is characterized by a non-feeding type.

After the 2011 off the Pacific coast of Tohoku Earthquake, the Atmosphere and Ocean Research Institute (AORI) of the University of Tokyo launched a research program to clarify the factors controlling the dynamics of the ecosystems in the Sanriku coastal seas, which will clarify what is needed to restore the area's fishing industry. The program consists of multidisciplinary researches with scientists in the fields of physics, chemistry, and biology, and it has been supported by Tohoku Ecosystem-Associated Marine Sciences (TEAMS) from Ministry of Education, Culture, Sports, Science, and Technology of Japan (MEXT).

We have investigated the seawater circulation in this area, especially from a view-point of physics (physical oceanography): Shipboard surveys were conducted many times in Otsuchi, Kamaishi, and Hirota Bays, using a ship-mounted acoustic Doppler current profiler (ADCP) and a conductivity-temperature-depth profiler (CTD profiler). Moreover, a variety of monitoring instruments, such as current profilers, thermometers, wave sensor, and so on, have been deployed in Otsuchi Bay (see Figure). Furthermore, oceanic observations were also conducted outside the bays, using a research vessel.

As a result, a large amount of hydrographic data were collected to successfully provide clear images of the seawater circulation in the Sanriku coastal seas: In summer, for example, a prominent baroclinic circulation with a three-layer structure extends over the greater part of the ria bay, and its flow directions change on time scales of several to a few tens of hours.

In addition, we continue to find a way to solve not only academic problems, but also social problems simultaneously and synergistically, together with the local community. This is because the hydrographic observations over the inshore fishery areas cannot be made without support from fishermen and their cooperative associations. At the same time, there are many fishery problems that cannot be solved without an academic approach; for example, the physical oceanography is needed to reveal the seawater circulation that conveys nutrients into the "non-feeding" sea farming areas.

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