

Environmental Monitoring System of Ago Bay

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Ago Bay is a small semi-enclosed coastal sea of Japan. It locates in the center of Honshu island and faced to the Pacific Ocean. The deeply indented, rias-type, coastline of the bay protects the intrusion of ocean waves and it provides an adequate place for the pearl culture. The culture began about a century Ago and has prospered until now. Recently, the deterioration of the sediment began to be serious. The COD value of the sediment in the bay head has been increasing for 30 years and already exceeded the pollution limit defined by a regulation. Since the sludgy sediment brings about the oxygen depleted water and degrades the water quality in summer, it gives bad effect to the pearl culture. The cause of deterioration is unclear although the pollution load from land area as well as those from the pearl culture is suspected. In such a situation, Mie Prefecture, who is the local government, started the research project for investigation of the mechanism of deterioration process of the sediment and for developing the purification technologies.

This article outlines the environmental monitoring system of Ago Bay, which plays an important role of the project. It consists of five sets of the automatic water quality observation stations (WQOS) and two sets of the automatic flow observation stations (FOS). One of the WQOS is placed out of the bay mouth and it gathers information of outer sea, while the rest of the WQOS are distributed to the bay head area in order to get information of the whole bay. The two FOS are placed in line on the transverse section just inside the bay mouth. The observation items of the WQOS are water temperature, salinity, chlorophyll fluorescence, dissolved oxygen, and turbidity. The small sonde, in which the observation sensors are unified, goes up and down by the winch on the floating platform, and acquires the data for every water depth. In order to prevent bio-fouling, the sonde is pulled up and settled in the air during the time between operations. This significantly reduced the frequency of maintenance and has contributed to raise the operating ratio. The WQOS already has been operated for two years and a half, and attained the high operating ratios of 90 - 95%, including the system stops at the time of typhoon attacks. The FOS consists of the sea bed installation type ADCP and the acoustic modem which performs communication with the floating platform. The communication system will work from November 2005, however, the two ADCP have already been gathering the data since July 2003. The analysis of the recorded data showed the effectiveness of the FOS to predict the variation of the water quality of the bay.

The observation data of the WQOS and the FOS is transmitted to the core laboratory of the project with one hour interval, using a cellular-phone network, and the data processed with the personal computer of the laboratory is distributed to the Internet through the Web server, immediately. The homepage is actively used not only for researchers but for contractors of the pearl culture, consequently, it contributes to advertising the significance of the project to local residents.

Another objective of the environmental monitoring system is a short term prediction of water quality. The observation data is used as the input data and the numerical simulation model under development is expected to perform the task. The dynamic behaviors of the water quality of the bay have begun to be disclosed by the environmental monitoring system. These will be described in the full paper. The present study is a part of the Ago Bay Environmental Restoration Project under the program of Japan Science and Technology Agency.

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