Numerical Analysis and Characteristics of the Ise Bay

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Water pollution has progressed in Ise Bay in the middle of Japan, to the same extent as in Tokyo Bay. The reasons for this are the closed structure with a narrow entrance, a cavity in the central portion which inhibits exchange of seawater with the open sea, and the pollutants from nearby metropolises such as Nagoya which flow into Ise Bay. The research project consists of developments of two and three dimensional computer programs and investigations of flow fields of the bay. In this presentation, numerical results computed in the two and three dimensional programs proposed here are described. A new numerical scheme based on F.D.M. on general curvilinear coordinate system is developed. Simulations of flow fields of Ise Bay subject to M_2 tidal oscillation were carried out as the first trial of the computer program. Several data such as amplification factors of wave height to the inlet of the bay, flow fields of residual currents, and exchange rates of sea water at the inlet of Ise Bay were computed by post-processing the simulation results. To evaluate the accuracy of the computer code, comparisons with observed data were made and fairly good agreements were found between them. Secondly, we computed the case which low salinity waters were discharged into the bay from major rivers. During a period of time ranging from half a day to several days, soluble matters drifting in and out with the tide gradually spread out as they get caught in the flow of residual currents. As this process is repeated over and over, soluble matters eventually spread across the entire bay. Beginning in spring, the surface strata warm up, and the supply of river water increases, gradually producing saline stratification. Around May, 17‰ chlorinity diluted by the water from the land is achieved at the surface layer up to the Irako Channel at the entrance to the bay. The coincidence between our computational results and observed chlorinity values reported by Unoki et.al. during August in 1974 is satisfactory. Stratification reaches its peak in summer, with warm water at the surface layer and cold water at the bottom layer, and the isopleth becomes horizontal for both water temperature and chlorinity.