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Abstract

Recently, the serious environmental problems are occurring in Ariake Bay which was the sea of the abundant harvest. In order to determine the effective policy about environmental and ecosystem restoration project, we developed a pelagic-benthic coupled ecosystem model for Ariake Bay and carried out hind-cast simulation during 7 years. Simulation results of hydrological features and water quality were consistent with those of observed one. Furthermore calculated concentration of dissolved oxygen indicated distinct variability in spring-neap tidal cycle and variation of hypoxia during recent 7 years from 2000 to 2006 in high accuracy. These features of calculated hypoxia water were consistent with results of many observational aspects. In order to clarify these hypoxia generation mechanisms, fluxes of dissolved oxygen due to diffusion, advection and many biochemical processed were calculated from simulation results. Calculated fluxes suggested that vertical diffusion was dominant process for oxygen supply to bottom water at Isahaya Bay and near the edge of tidal-flat at head of bay and it was controlled by river discharge through strength of stratification. On the other hand calculated oxygen consumption rate in pelagic system was larger than benthic system in hypoxia water except for near head of bay, where oxygen consumption in benthic system was not negligible. Furthermore flux analysis of biochemical processes indicated that about a half of oxygen consumption in pelagic system was caused by decomposition of POM originated by primary production. However POM production was occurred over relatively wide area, horizontal distribution of POM flux indicated the convergence area at head of bay and setting flux to sediment was dominant near this area at same time. It was considered that oxygen consumption rate in benthic system was maintained at larger value as a result of physical accumulation of POC and respiration of benthos in these area. Therefore, transport processes of POC through the estuarine circulation plays a crucial role about generation mechanism of hypoxia water in Ariake bay.