

Eutrophication and Material Transport of Osaka Bay, the Seto Inland Sea, Japan

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Abstract

Osaka Bay is the semi-closed coastal bay in the Seto Inland Sea of Japan, which is surrounded by highly developed industrial areas and has been subjected to the effect of human activities since 1960's. Tomogashima Strait is very important area for material transport because at least over 75% of nitrogen and phosphorus outflow from Osaka Bay are done through this strait. Trend of eutrophication and magnitude of marine-derived organic matter (MOM) contributing to organic pollution were investigated in Osaka Bay. We also have investigated cross sectional structures of current and material fluxes such as total suspended matter (TSM), particulate organic carbon (POC), and individual nitrogen and phosphorus compartments at Tomogashima Strait.

Average standing stocks of total nitrogen (TN) and total phosphorus (TP) in the bay during the 1990's were estimated to be 11,930ton and 1,620ton, respectively. These values decreased by 22% and 13% of those during the 1980's, respectively. The eutrophic level during the 1990's was approximately same as that during the mid 1970's. This fact must be based on the effort of the load reduction by administration, enterprises, citizens, etc over recent twenty years. Results from carbon stable isotope ratio($\delta^{13}\text{C}$) indicate that more than 80% of POC standing stock in Osaka Bay came from MOM in Osaka Bay. The deposition rate of TOC was 63,000 ton C/year. The deposition rates for terrestrial organic carbon and marine-derive organic carbon were 13,200 and 49,800 ton C/year, respectively. The deposition rate of marine-derived organic carbon occupies of 80% of that of TOC.

At Tomogashima Strait, TSM and POC, and individual nitrogen and phosphorus compartments in Osaka Bay always flowed out of the bay. The average outflow of TN and TP at Tomogashima Strait over a year were calculated to be 145 ton/d and 30 ton/d, respectively. The average outflow of DIN and DIP at Tomogashima Strait over a year were 95 ton/d and 13 ton/d (DIN/DIP=16), respectively. Residence times of both DIN and DIP in Osaka Bay were estimated to be about two months.