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CHARACTERISTICS OF HEAVY METAL CONCENTRATIONS OF SURFACE AND CORE SEDIMENTS IN THE OSAKA BAY, THE EASTERN SETO INLAND SEA, JAPAN

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Abstract

Osaka bay is one of the most polluted sea areas in the Seto Inland Sea, Japan. Water quality in the head of bay has been improved gradually since 1970's. In addition, it was reported that the concentrations of organic matter, nutrients and heavy metals in bottom sediments have been decreased during the period between 1984 and 1993. To evaluate the changes of bottom sediment since 1990's, we studied the concentrations of heavy metals in surface and core sediments.

Bottom sediments were taken by using a gravity core sampler and a Smith Macintyre grab sampler in 2003. Heavy metals, which are lead, cupper, zinc, manganese, chromium, and nickel, were analyzed by an atomic adsorption spectroscopy after extraction using nitric and hydrochloric acid. A sedimentation rate was also measured with ^{210}Pb.

The horizontal distributions of heavy metal concentrations were similar to the results measured in 1984 and 1993, which the higher concentrations of heavy metals, except for manganese, were observed in the head of bay. These distributions were related to grain size, that is, heavy metals were concentrated in muddy sediment. The highest concentration of manganese was observed in the middle area, and the lower concentrations were found in the head and mouth of bay.

The mean values of heavy metals demonstrated a decreasing tendency compared to the results in 1984 and 1993. Although the grain size of bottom sediment changed finer in some sea areas during the investigation period, the concentrations of heavy metals decreased. The vertical distribution of heavy metals except for manganese and nickel showed a clear peak at the depth of 24 to 30 cm, respectively. The sedimentation age, which was determined by using the sedimentation rate, was 1950'. Then, the concentrations decreased toward the surface. On the other hand, manganese and nickel increased from lower to surface layer.

These results demonstrated that the concentration of heavy metals have decreased in whole area of Osaka bay since 1950'. The decreasing tendency of heavy metals in bottom sediment reflected the effect due to the cut of pollutants loadings to Osaka bay through a long-term period