

**Historical Load of Pollutants in the Coastal Sediment:  
Time Trends of Heavy Metal Fluxes in the Water-Sediment  
Interface in Osaka Bay, Japan, since 1850 a.d.**

Yamazaki, Hideo

School of Science and Engineering, Kinki University, Osaka, Japan

The coastal sediment cores were analyzed to assess historical inputs of pollutants from an urban region. Osaka Bay is largest enclosed bay in Japan, with a large catchments area. Osaka City and Kobe City are at the northeast corner of Osaka Bay. The industrial and residential activities are very high through a circumference in the bay, but it was the no industrial area before the 1900s. The quality of water in the bay has been profoundly influenced by the economic development of Japan. Sampling sites of the sediments were at the north central of Osaka Bay. Sediment cores were collected by a diver using an acrylic tube (10cm i.d.) sampler. The sediments were dated by the vertical profiles of  $^{210}\text{Pb}$  and  $^{137}\text{Cs}$  activities. The redistribution of the pollutant by biological mixing in the sediment surface was described about a time-dependent eddy diffusion model. The vertical profile of nickel in the sediments shows constant distributions, whereas the concentrations of other heavy metals such as chromium, copper, zinc, mercury and lead increased in the surface layer of the sediments. After the 1900s, the concentrations of the heavy metals increased 2-10 folds in the background levels. The vertical profiles of the heavy metals in the sediments could be explained by an anthropogenic discharge from the hinterland and its historical changes. The inventories of the heavy metals in the Osaka Bay sediments were calculated for 100 years from 1900, at  $4.3 \text{ g/m}^2$  for Cr,  $5.8 \text{ g/m}^2$  for Cu,  $47 \text{ g/m}^2$  for Zn,  $0.11 \text{ g/m}^2$  for Hg, and  $6.1 \text{ g/m}^2$  for Pb. Time trends of the fluxes in the water-sediment interface were also estimated retrospectively more than 100 years by a computer simulation using a convection-diffusion equation. The mass fluxes of dry matter in Osaka Bay were about  $1 \text{ kg/m}^2\text{yr}$  in the period from 1850 to 2000. The anthropogenic fluxes of the heavy metals increased from 1900s, reaching levels of  $0.2 \text{ g/m}^2\text{yr}$  for Cr and Cu,  $2.5 \text{ g/m}^2\text{yr}$  for Zn,  $0.0045 \text{ g/m}^2\text{yr}$  for Hg, and  $0.25 \text{ g/m}^2\text{yr}$  for Pb. The fluxes exhibited the maximum in the mid 1940s and the mid 1960s, and then decreased fast to the 1980s. The first peak flux coincided with World War II in 1940-1945, and the second peak flux agreed with the period of the advanced economic growth of Japan in the 1960s-1970s.