

Distribution of heavy metals in bottom surface sediments of Beppu Bay, Oita Prefecture

Atsuko Amano[1]; Michinobu Kuwae[1]; Tetsuro Agusa[1]; Koji Omori[1]; Hidetaka Takeoka[2]; Takashige Sugimoto[3]

[1] CMES, Ehime Univ.; [2] Center Mar. Environ. Studies, Ehime Univ; [3] Oceanic Research, Tokai Univ.

Located in the eastern Bungo Channel of Oita Prefecture, Beppu Bay is heavily used by industry and shipping, and receives considerable urban, industrial and agricultural inputs through three main rivers including non-point sources of pollution. Near the mouth of the bay the bottom topography constitutes a benthic sill which separates the Beppu Bay basin from the main channel. Benthic water flow is therefore severely restricted and results in stagnant and highly anoxic conditions in the deepest parts of the bay. High anthropogenic inputs to the bay coupled with limited bottom water flow likely accelerates contamination to Beppu Bay, and it is highly possible that sediments hold a record of the spatial and temporal variations of these inputs. Thus, this study focused on spatial distribution of heavy metals in bottom surface sediments to determine the present seafloor environment and conditions of heavy metal contamination. Sixteen surface sediments (the uppermost 1 cm) were collected using a Smith-McIntyre grab sampler in August 2006. Concentrations of heavy metals (Al, V, Cr, Mn, Co, Cu, Zn, Mo, Ag, Cd, In, Sb, Re, Tl, Pb, Bi) were analyzed using ICP-MS, and compared with data of terrain conditions, contents of organic carbon, nitrogen and sulfur, stable carbon and nitrogen isotope ratios from Kuwae et al. (2007).

Concentrations of V, Cr and Co were relatively high at the southern part of the bay, within proximity of an industrial zone and river inputs; concentrations of these elements were significantly correlated with the ratio of organic carbon and nitrogen, and negatively with carbon and nitrogen stable isotopes. This result suggests that heavy metal concentrations of V, Cr and Co and organic matter from the catchment basin have a common source. Concentrations of Mo, Cu and Cd were high at the southwestern deeper part of the bay, and decreased toward the eastern part. Metal of Mn were relatively high around the coastal area at the southern and northern part of the bay, with being particularly very high at the northern.