

APE031-P14

Room:Convention Hall

Time:May 25 10:30-13:00

Paleoenvironmental variability of the Beppu Bay during the last 3000 yrs based on mineral composition of the sediments

Tomohisa Irino^{1*}, Ken Ikehara³, Michinobu Kuwae²

¹Hokkaido University, ²Ehime University, ³Geological Survey of Japan, AIST

The Beppu Bay is located at the Pacific side of the southwest Japan opening to the east. Sea surface temperature varies from 10 to 27 degree C nearly in harmony with the seasonal variation of local air temperature. The Bay is also famous for its fishery products. The water depth is 35 m in average and approximately 70 m in the deepest which is located nearly at the center of the Bay. This basin bathymetry makes the bottom water anoxic and scales of sardine and anchovy are well preserved in the sediments. The circulation and ecology in the Bay seems to respond very sensitively to the regional climate, and the past variability is expected to be well-preserved as the sediment archive due to its anoxic condition.

In order to reconstruct the primary production, bottom redox condition, and sediment supplies from the surrounding area, and examine the interrelationship among them, we corrected a 10 m long sediment core BP09-3 at the deepest part of the Beppu Bay. The sediments consists of dark olive or gray diatomaceous mud intercalated by some sand layers. The core covers approximately 3000 yrs from the present. We conducted an powder X-ray diffraction analysis (XRD) and color (visible light reflectance) measurement to determine the major mineral composition. Used samples were extraction residues by organic solvent, which were dried and powdered before XRD and color measurement. Major minerals were identified and evaluated semi-quantitatively using the height of their diagnostic peaks. The sediment color was examined through L*, C*, and H indices which correspond to brightness, metric chroma (vividness), and metric hue, respectively.

Major minerals detected are illite (or muscovite), chlorite (or kaolinite), quartz, anorthite, pyrite, calcite, opal-A, and halite (sea salt). Opal-A (biogenic silica) is semi-quantified from the hump of background at 22.5 degree 2theta relative to 16 degree 2theta. Clays were roughly quantified using the peak height at 19 degree 2theta. Opal-A is higher between 250 and 550 cmbsf and between 700 and 1000 cmbsf. High opal-A intervals are associated with high L*, C*, and low pyrite. Anorthite/quartz ratio is higher in sand layers which is associated with lower H (slightly reddish color). In non-sand layer intervals, anorthite/quartz ratio is lower between 250 and 550 cmbsf and between 700 and 1000 cmbsf. Quartz/clays ratio is nearly constant except for some high values in sand layers. Calcite is generally minor but sometimes higher between 250 to 550 cm.

The appearance of sediment core is bright and vivid at the interval of high opal-A (biogenic silica) which is rarely associated with higher calcite. General anti-phasing between opal-A and pyrite suggests that bottom anoxia was relaxed when high productivity. This could be controlled by storminess which promotes higher nutrient supply to the surface and oxygen supply to the bottom through vertical mixing. Higher opal-A intervals are also associated with lower anorthite/quartz ratio, which suggests the supply of less-sandy detritus or change of provenance in surrounding drainage area. General trends of shown in sediment mineral composition suggest the close relationship between regional climate and circulation in the Beppu Bay.

Keywords: mineral composition, XRD, color measurement, paleoenvironment, Beppu Bay, Southwest Japan