

## The chemical composition and temporal change of varve-like sediment in Beppu Bay.

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In Beppu Bay, Pref. Oita (central Japan), we aimed to reveal the way to record events such as anthropogenic activities and hazards into the sediment. For this purpose, we obtained several surface sediment cores using G.S.-type surface sediment sampler (Ashura) and gravity core sampler in 2017 and 2019. These sediment cores were CT-scanned and analyzed by the micro XRF scanner (ITRAX). We also measured radioactivities of  $^{137}\text{Cs}$  and excess  $^{210}\text{Pb}$  by 4cm intervals for age determination.

We investigated 4 points in the bay and checked the depth distribution of the sediment in 2017. At the deepest part of Beppu Bay, 70m depth, we found laminated semi-pelagic sediment with clear lamination with 6-7mm thickness. In the shallower area of the bay, we cannot find lamination. Based on the result of ITRAX measurement and Soft-X images, it is revealed that lamination is caused by the change in the amount of detrital material. The amount and composition of detrital material also show several positive spikes. Some of them can be observed by naked eyes as light gray or reddish-brown colored thin layers (minor event layers), suggesting that they were supplied from different provenance than usual. These layers are considered to be caused by the occurrence of floods, earthquakes, or eruption. The results of Pb and Cs measurements agree with the age of Ev-1a, which is considered to be caused by the Hyuga-Nada earthquake in 1968 (Kuwae et al., 2013). Counting of lamination also agrees with Pb and Cs based age model when unclear lamination is interpolated by the average thickness of laminations.

In the survey on Sep. 2019, we aimed to verify newly deposit sediments in the last two years. We also aimed to obtain the core with sufficient length from the sediment-water interface to the horizon below the  $^{210}\text{Pb}$  would be attenuated. Using Ashura sediment sampler with 120 cm-long acrylic pipes, we could obtain the cores with 90cm length. Based on the correlation of the cores of 2019 and 2017, we found newly deposited sediment with 2 cm thickness at the top part of the 2019 core. This accumulation rate agrees with the thickness of laminations found in both cores. These results strongly suggest that lamination at the bottom of Beppu Bay is annual lamination, varve. The inflow of detrital material by heavy seasonal rain could be the generation factor of varve. Lamina preservation becomes clear gradually after around 1960. there is a possibility that the submarine stratified structure has been strengthened by the change of a marine environment with economic growth. We are conducting the measurement of Cs and Pb isotopes of the 2019 core.

Keywords: Beppu Bay, annual lamination, varves, event layers