Spatial variations of a sedimentary environment based on CT and XRF scanner results in the western part of the Tokyo Bay

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The Tokyo Bay is enclosed and one coastal area in the world has heavily populated area in the drainage. Amano et al. (2021) demonstrated element profiles of four core sediments collected in the offshore Shinagawa and mouth of the Tama River facing tha Tokyo Bay measured by XRF core scanner and discussed marine environment changes by anthropogenic eutrophication and pollution. This study adds eight sediment cores collected in June 2021 and discusses spatial variations of element profiles by XRF core scanner and sedimentary processes in the Tokyo Bay.
The sediment cores in this study were collected by gravity corer which has maximum core length of 150 cm in the western area around the offshore of the Tama River mouth facing the Tokyo Bay, in October 2020 and June 2021. We measured these cores by the CT scanner (Supria Grande, Hitachi) in 80kV and 120 mA and XRF core scanner (Itrax, Cox Analytical Systems, CS-49) in 30kV, 55mA and 10 seconds of exposure times using Molybdenum X-ray tubes at 1.0 mm intervals, respectively. All the XRF spectra were reevaluated by the Q-Spec software (version 15.1) to obtain individual element peak area. These cores were subsampled at 1 cm interval and measured water contents.
The sediment cores used in this study were mainly consisted by silt and separated two layers in perspective; the upper layer showed darker and lower density of CT image than the lower layer. Element profiles of these silt cores showed that Cu, Cr, Zn and Br of the upper layer were higher than that of the lower layer, Si, Ti and Fe were lower. These results indicate that the upper dark layers contained more metals and organic matters than the lower affected by the eutrophication and pollution. While two cores collected at the river mouth of the Tama River were consisted by silty sand including plants and shell fragments and element profiles of these cores showed higher values of Si, Ti and Fe and lower values of Br than those of the other cores. These results suggest that the sedimentary environment at these core sites strongly influenced by the river discharge in this study area.
In silt cores, some distinctive peaks of element profiles were observed. The peaks observed from cores near the mouth of the Tama River mainly showed higher Si, Ti, Fe and Mn with higher density of CT image and lower water contents. While the peaks of other cores mainly showed higher Cr, Cu, Zn and Br with lower density of CT image and higher water contents. The peaks of Si, Ti, Fe and Mn means increases in supply of lithogenic fraction, Cr, Cu, Zn and Br peaks metal and organic matters. These peaks likely suggest flood-induced deposition and its formation process varied by influence of discharge; Si, Ti, Fe and Mn peaks were contained by coarser sediment by lithogenic fragment affected by strongly discharge around the mouth of the Tama River, while Cr, Cu, Zn and Br peaks were concentrated metal and organic matter absorbed to finer sediment. However, difference features in element peak were observed with the above. We will conduct grain-size and CNS element analysis and statistics of XRF core scanner data and discuss the formation process of these peaks.

Keywords: sediment, XRF core scanner, Tokyo bay, flood-induced deposition

