Development of the Estimation Method of the Sediment Transport using the Chemical Composition

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1. Introduction

In the port and harbor, we have to manage the earth and sand sediments and sediment transport appropriately on the view point of not only the maintenance of the basic functions of the port such as to ensure the sea route but also the environmental interest such as the cause of water contamination and basis of the inhabitation of living substances.

If we view it from the environment, microscopic particles are likely to catch organic substances and harmful chemical substances and the accumulation of such particles are making the sediment worse. Therefore it is important to grasp the transport of the microscopic particles for actions to improve the sediment. Now that it is currently remarked that radioactive substances adhered to microscopic particles are also moving into the marine area from the land and accumulating, it is increasingly important to grasp the transport of the microscopic particles to improve the sediment. On the other hand, fine sand and sand have functions as good basis for the inhabitation of living substances. It is imperative to grasp the moving route of the fine sand and sand so as not to accidentally block such routes by various works and affect the existing habitats.

Therefore, in this research we have developed a method to use chemical composition of the sediment as a new method to estimate the transport of the sediment.

2. Method

We have implemented an analysis using sediments collected from many points in the Tokyo bay. We have used a Wave Length-dispersive X-Ray Spectroscopy1). As this system is applicable to measure from light elements (F) to heavy elements (U) on the Periodic Table, this time we have used the values of Al, Fe, K, Mg and Si. The analysis was implemented on classifying each sample into the silt fraction under 63□m and sand over 63□m as we have considered the adhesive capability of the chemical substances and difference in transport characteristics caused by the current.

3. Result

All of the collection points of sediments were classified into five groups as for the silt fractions through the cluster analysis (Fig.). Chemical composition of the silt fractions moved in from the Sumidagawa River, Arakawa River and Edogawa River have belonged to the same group ■. Based on the distribution range of the points of ■, we have estimated that the silt fractions moved in from the Sumidagawa River, Arakawa River and Edogawa River were giving strong effects within the Port of Tokyo and over Heiwajima of the Keihin-Unga (Tokyo side). Silt fractions ■ that moved in from the Tamagawa River were estimated to have strong effects river mouth of the Tamagawa River as far as Heiwajima through Ebitorikawa River northward and as far as Daishi-Unga through Tama-Unga southward. The strong effects on the area offshore of the were not clear. Although we have been predicting that there must be difference between the mouth side and head side of the Tokyo bay, they both belonged to the group of the same chemical composition ■.

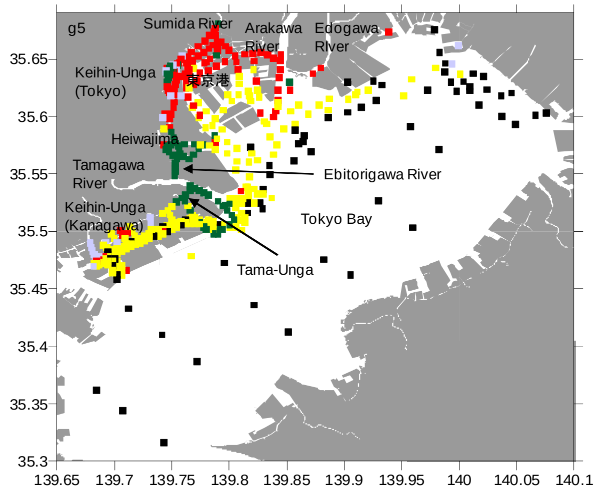

Fig. Grouping through the cluster analysis against the chemical composition of the silt fraction

4. Conclusion

We have shown the possibility of using the chemical composition as a new index to estimate the effect range and transport routes of the sediments of different origins. We are further studying the crystal construction as an additional index. This is to segmentalize the elements evaluated as same group based on the chemical composition. Those methods are expected to become useful methods to grasp the sediment transport and implement appropriate management of the earth and sand.

【Reference】

1) OKADA Tomonari et al (two) (2009) , Estimation of the spacial distribution of sediment using chemical composition and particle-size distribution, Annual Journal of Coastal Engineering, 56, 976-980.