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Distribution of heavy metals in bed sediment in the Ohori River basin, Chiba Prefecture

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There are many studies about distribution of heavy metal elements in bed sediment. But, we know little about high-resolution distribution of heavy metal elements and concentration processes of metal elements. Such kind of knowledge is, however, important for local people and ecosystems especially in small rivers running in urban areas. This study aims to elucidate the distribution characteristics of heavy metal elements in bed sediment of the Ohori River basin.

Ohori River basin located on Kashiwa City and Nagareyama City in Chiba Prefecture, is composed of Honryu river system and Jiganebori river system. The source of Honryu river system is "Pond Hotaru". The sources of Jiganebori river system are "Pond Konbukuro" and "Pond Benten", those runoff water join to adjoining artificial watercourse on the immediate downstream point. Both river water and river bed sediments were collected at the 36 sites in total to cover all area of Ohori River basin on March 2009, May 2010 and October 2010. Grain size, moisture content and ignition loss of sediment samples were measured. Then, both major elements and heavy metals measured by WD-XRF quantitatively. Water samples were analyzed by Atomic Adsorption Spectrometer and Ion Chromatograph.

The followings were clarified in this study.

1) The distribution patterns of the heavy metals are not homogeneous even in small area. This suggests that behavior of heavy metal in this study area is strongly effected by the local geochemical environment.

2) The heavy metal concentrations show similar value among 3 different times, implying heavy metal concentrations are rather stable thorough the investigation time scale than the sampling locality.

3) Fluctuations of heavy metal concentrations from upstream to downstream is similar with those of the amount of ignition loss (regard as organic matter). This suggests heavy metal has some relation with organic matters because samples of this study depend on the amount of organic matter.

4) Although bed sediment in Pond Konbukuro, Pond Benten and Pond Hotaru includes much amount of organic matter in Pond Konbukuro, Benten and Hotaru pond sediments did not show high Zn concentration. This is because both river and spring water has quite low Zn (below the detection limit). Zn in water that often flows back from artificial watercourse may effect to sediment in Pond Konbukuro. And some of Zn is probably sulfide because of the positive correlation between Zn and sulfur.

5) In the short core sediment, surface layer generally shows high heavy metal concentrations, while heavy metal concentrations in the deeper part (ca. deeper than 30cm) show low. Heavy metal concentrations and the amount of organic matters are uncorrelated in the deeper layers, but are positively correlated in upper layer. So that, heavy metal elements are affected by organic matter on the aerobic surface layers. Thus, after the deposition of heavy metal elements, bed sediment accumulate heavy metal depending on the amount of organic matter under it is on the aerobic condition.

Keywords: bed sediment, heavy metal, concentration distribution, organic matter, Ohori River