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Geographical distribution changes of heavy metals for the last 10,000 years in the Nobi Plain

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This study aims reconstruction of the geographical distribution of the heavy metals in the Nobi Plain, central Japan. We used 412 samples obtained from 10 cores (AN, MC, KM, KNG, KZ, NK, MW, KZN, OYD, YM) drilled at the various portion of the Nobi Plain. Samples were collected at an interval of about 1m. The element analysis (Ti, Mn, Fe, Ni, Cu, Zn, Si and Al) by WD-XRF (ZSX Primus 2, RIGAKU), the grain size analysis equipment (SALD3000S, SHIMADZU) were performed. The geographical distribution was discussed based on chemical composition and sedimentary units which were classified into 5 units (Unit A is basal gravels, B is fluvial and intertidal sediments, C is pro-delta sediments, D is delta-front-slope sediments and E is delta-front platform sediments).

Depth in 10 cores was converted into ages by using detailed age-depth curves to create the geographical distribution of each element every 1,000 years in between 8,000 and 1,000 cal yrs BP. GIS software (ArcGIS9.3, ESRI) was used to do this.

Geographical distribution of Al₂O₃ showed lower in the northeastern portion and higher in the southwestern portion from 8,000 to 6,000 cal yrs BP. This tendency became obscure in 5,000 cal yrs BP. In between 4,000 and 3,000 cal yrs BP, it showed same tendency with between 8,000 and 6,000 cal yrs BP. It was changed to opposite tendency in between 2,000 and 1,000 cal yrs BP. SiO₂ showed reverse pattern with Al₂O₃. This suggests SiO₂ content indicates the amount of detritus particles and Al₂O₃ content indicates the amount of clay minerals.

As geographical distribution of heavy metals show similar trend with Al₂O₃, heavy metals are estimated to absorb to the clay minerals in cores. TiO₂, Fe₂O₃ and Ni showed same tendency, which is those were high in the southwestern portion and low in the northeastern portion in the period 8,000 - 3,000 cal years BP. However Cu and Zn showed a little different tendency; only during 8,000 - 7,000 cal years BP, elemental gradient that south part is low and north part is high, has been observed. MnO showed different tendency from other heavy metals. Each heavy metal show different tendency in each other, especially in between 2,000 and 1,000 cal yrs BP. This suggests artificial pollution of heavy metals though further investigation is needed.

Keywords: alluvial sediment, heavy metals, geographical distribution, Nobi Plain, Holocene