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Provenance and mixing ratio of the sediments discharged from Yangtze River based on ESR signal intensity and Crystallini

Keita Saito[1*], Ryuji Tada[1], Tomohisa Irino[2], Zheng Hongbo[3], Chao Luo[4], Mengying He[4], Yoshiaki Suzuki[1], Wang Ping[4]

[1]EPS, Univ of Tokyo, [2]Univ. Hokkaido, [3]Nanjing Normal Univ., [4]Nanjing Univ.

The Yangtze, the largest river in east Asia, is 6300km long and its drainage is 1.94x106km2. Since its drainage has over 400 million habitats, the flood of the Yangtze can damage human activities seriously. According to the observation, floods in the middle-lower reaches of the Yangtze are affected by the ENSO. However, floods in the upper reaches are affected by the South Asia Monsoon. So, to investigate floods, not only temporal but also spatial fluctuation is important.

To reconstruct the flood history before the observation records, it is possible to estimate the provenance of flood sediments. For that purpose, it is necessary to establish the proxy to distinguish sediments from each tributaries of Yangtze.

The suspended particle matter, SPM, occupy over 98% of the sediments discharged from Yangtze. Its mean diameter of SPM during normal weather at lower reaches is around 10um. In the flood deposits from the Yangtze estuary, however, the median diameter is 25-35um, which is much larger than that of SPM.

Yang et al., (2007) and Mao et al. (2011) analyzed Sr and Nd isotope in SPM of the Yangtze. CIA is also analyzed by Shao et al. (2012). Their results suggest that it is possible to distinguish sediments from the upper reaches from that in the middle-lower reaches. However, Sr-isotope and CIA can be altered by chemical weathering, and they didn't evaluate qualitative differences depending on particle diameters.

The objective of this study are 1) to distinguish the particles of different tributaries by using ESR(Electron Spin Resonance), CI(Crystallinity Index) and 2) to confirm whether these parameters can estimate the provenance of sediments, which are separated into three fractions.

The result revealed that the ESR values are lower than 2 in the tributaries of the upper reaches, which are gradually rising to 7-10 in the tributaries of the middle reaches. The combination of ESR and CI values can be used to distinguish particles from each tributaries. It is important to select appropriate fractions to analyze, since the ESR values of different fractions are not necessarily the same.

The ESR and CI values at lower reaches are estimated from ESR and CI values of each tributaries and the median sediment budget based on observation. The analyzed values of the lower-reach sediments are slightly different from the estimated values. The sediment budget of each fractions are needed to be improved.

Assuming the sediment flux of tributaries in the upper or middle reaches increases, the magnitudes of changed in ESR and CI values of the sediment from the lower reaches are estimated. These parameters turned out to be more sensitive to the flood of the middle-lower reaches than that of the upper reaches.