



HOKKAIDO UNIVERSITY

Title	Provenance and depositional variability in response to climate and sea level changes in the subaqueous Yangtze delta and the inner shelf of the East China Sea during the middle and late Holocene [an abstract of dissertation and a summary of dissertation review]
Author(s)	王, 可
Degree Grantor	北海道大学
Degree Name	博士(環境科学)
Dissertation Number	甲第11788号
Issue Date	2015-03-25
Doc URL	https://hdl.handle.net/2115/59345
Rights(URL)	https://creativecommons.org/licenses/by-nc-sa/2.1/jp/
Type	doctoral thesis
File Information	Ke_Wang_abstract.pdf, 論文内容の要旨



学 位 論 文 内 容 の 要 旨

博士（環境科学）

氏名 王 可

学 位 論 文 題 名

Provenance and depositional variability in response to climate and sea level changes in the subaqueous Yangtze delta and the inner shelf of the East China Sea during the middle and late Holocene

（中期－後期完新世における気候および海水準変動に応答した揚子江デルタおよび東シナ海陸棚の堆積物供給源および堆積様式の変化）

Hydroclimate variations associated with the East Asian summer monsoon (EASM) exert significant impacts on lives of people inhabiting within the Yangtze River drainage and coastal zone. The subaqueous Yangtze delta and the inner shelf of the East China Sea (ECS) are of primary importance owing to massive inputs of terrestrial materials from the Yangtze River, one of the largest rivers in the world in terms of sediment load and freshwater discharge with complex ocean circulation on the shallow and broad ECS shelf. The variation of the EASM precipitation controls the Yangtze River discharge being associated with the change in detrital provenance, which affects the Yangtze-derived sediment dispersal, transport, deposition processes. Therefore, we could expect to recognize these changes in core sediments taken from the Yangtze subaqueous delta and the inner shelf of ECS. In order to reconstruct the Holocene EASM variability from these sediment records, it is necessary to examine the transportation mechanism of Yangtze-derived sediment including sediment reworking / re-deposition by coastal current and/or local input, the shifts of the Yangtze River channels, and the change of depocenter in the Yangtze delta - mud belt region as well as migration of shoreline associated with the postglacial sea-level changes.

The postglacial sea-level rise provided a large accommodation for river-derived sediment, which gave a significant influence on the sedimentation of the Yangtze delta and the inner shelf of the ECS. Core MD06-3040 recovered from the inner shelf of ECS consists of 3 m-transgressive systems tract (TST) and 16 m-highstand systems tract (HST) after Melt Water Pulse (MWP)-1B transgression at 11,500 BP. As a tide-dominated Yangtze delta began to prograde seaward under the condition of the decelerated sea level rise after

7500-8000 yr BP underlain by the Maximum Flooding Surface (MFS), the sedimentary evolution of the Yangtze delta has been illustrated by core YD13 recovered from the subaqueous Yangtze delta, consisting of 1 m thick transitional sequence from TST, and 10 m thick prodelta sequence.

Provenance of sediment particles were evaluated on the basis of the electron spin resonance (ESR) signal intensity and crystallinity index (CI) of quartz grains. As a result, the Yangtze River would be a predominant source of the mud wedges in the inner-shelf and subaqueous Yangtze delta deposits. Moreover, detailed examination of quartz provenance using ESR and CI made it possible to discriminate the sediment contributions from the upper/middle/lower reaches, southern tributary, and northern tributary of the Yangtze drainage. Comparison between the reconstructed temporal variability of quartz provenance and historical records of floods and droughts indicated that the area of heavy precipitation within the Yangtze River drainage has been changed in 10-1000 yrs time-scales. ESR in the fine fraction of YD13 could be used as a proxy of the suspended particle flux from the Yangtze River reflecting relative precipitation in each Yangtze reaches. A millennial-scale variability of the location of EASM precipitation was detected from this result which showed heavier precipitation in the lower reaches during 4-3 kyr BP, and in the upper reaches during 3-2.2 kyr BP and 1kyr BP. Consequently, ESR variation in the fine fraction of YD13 reflects the balance of EASM precipitation between upper and lower reaches, while ESR variation in the coarse fraction represents the variation of river discharge sensitively responding to flooding events.

Grain size of MD06-3040 showed notable decreases at the timing of drought events in the EASM precipitation such as 6000 yr BP, 5300 yr BP, 4500 yr BP, 3700-3300 yr BP, 2200 yr BP, and 1400-1300 yr BP, which also coincide with other EASM proxies from southern China and northern ECS. Such co-incidence of drought events and grain size minima suggests that the Yangtze River discharge supplied by EASM precipitation has been a prevailing control on the sedimentation in the inner shelf of ECS.

The evolution of monsoonal climate with abrupt events in the Yangtze River drainage have been associated with spatio-temporal heterogeneity of precipitation within the Yangtze drainage as well as repositioning of the EASM front. Both YD13 and MD06-3040 well captured them through the transportation and deposition mechanism of Yangtze-derived sediment with some influence from human disturbance, tide, and coastal current.