Paleoenvironmental reconstruction in the East China Sea during past 20,000 years

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The intensity of the East Asian summer monsoon has changed in the past [Dykoski *et al*.,2005], and this variability is considered to be recorded in the marine sediments changes in the Changjiang discharge. The modern sea-surface temperature (SST) and sea-surface salinity (SSS) distribution in the northern part of the East China Sea shows distinct effect reveals that the fresh water discharge from the Changjiang river. Therefore the reconstruction of the SST and SSS in this area is an effective approach to understand the changes of the East Asian summer monsoon in the past. However, this area is also influenced by the Kuroshio Current, which originates from the North Equator Current (NEC) and carries warm and saline water. Therefore changes in both East Asian monsoon (EAM) and the Western Pacific Warm Pool may influence SST and SSS in this area.

Piston core KY0704 PC-1 ($31^0$38.3540N, $128^0$56.6437E), 15m in length, was retrieved from the northern East China Sea at the water depth of 758m. KY0704 PC-1 core consists of olive black silty clay with two ash layers at 364.5-488.5cm and 910.5-919.5cm. The first ash layer likely corresponds to the K-Ah tephra, which was deposited at ˜7.3 kyr B.P. By comparing the lightness (L$*$) and color variations (a$*$and b$*$) of KY0704 PC-1 with those of MD98-2195 core, whose age model was established based on ^{14}C dates , the bottom of KY0704 PC-1 core is estimated to be 20,000 years ago.

The planktonic foraminifera, *Globigerinoides ruber*, which lives in the upper 30m of the water column, was used for analyses of oxygen isotope and magnesium-calcium ratios (Mg/Ca). Lea *et al*. (2000) demonstrated that Mg/Ca of foraminiferal shells is the useful tool for reconstruction of the past SST. δ^{18}O of foraminiferal tests ($\delta^{18}O_{carb}$) is dependent on water temperature and δ^{18}O of the ambient seawater ($\delta^{18}O_{sw}$). In this study, we estimate the variability of seawater δ^{18}O during the past 20,000 years, by inputting Mg/Ca-derived SST and $\delta^{18}O_{carb}$ to the equation of Shackleton (1974). $\delta^{18}O_{sw}$ is dependent on the salinity and the volume of the ice sheet. As the volume of the ice sheet is roughly constant during the Holocene, the change in $\delta^{18}O_{sw}$ is considered to reflect the change in the salinity.

The result suggests that Last glacial SST in the East China Sea was 3-4 ^{0}C lower than modern SST. The light $\delta^{18}O_{carb}$ peak possibly correlated to the warm period, and the heavy$\delta^{18}O_{carb}$ peak possibly correlated to the Younger Dryas cold period are also recognized. The heavy $\delta^{18}O_{carb}$ peak was observed at 6 ka. SST minimum event is recognized at 3-4 ka during Holocene.

SST and $\delta^{18}O_{sw}$ have positive correlation during Holocene, which is considered as reflecting the mixing of the cold low-salinity coastal water and warm saline water originated from Kuroshio Current.

The calculated $\delta^{18}O_{sw}$ shows oscillations which have ca. 1,500 year cycle during the early/mid Holocene. After the heavy $\delta^{18}O_{sw}$ peak at ˜6ka, $\delta^{18}O_{sw}$ started to decrease and have gradually increased since around 4 ka. This result suggest that the fresh water supplied from Changjiang started to increased since ˜4 ka. However, this is not necessarily in harmony with the hypothesis Dykoski *et al*.(2005) that the intensity of the East Asian summer monsoon started to decrease at the middle Holocene .