Variations of East Asian Summer Monsoon Since the Last Deglaciation in the northern East China Sea

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Knowledge on the variability and extremity of the East Asian summer monsoon (EASM) is of prime importance for our future because one third of the world population lives in the area strongly influenced by the EASM. Stalagmite $d^{18}O$ records from Hulu and Sanbao caves in South China demonstrated the millennial scale tele-connection between the EASM and North Atlantic climate during the last deglacial period. As to the Holocene, Wang et al. (2005) proposed that eight weaker summer monsoon events occurred during Holocene that are associated with the IRD events in North Atlantic based on stalagmite $d^{18}O$ record from the Dongge Cave in South China. However, when weaker monsoon events in the 4 stalagmite record from various caves within the Yangtze River drainage are compared with one another, their numbers, timings, and magnitudes are not necessarily the same, suggesting the minima in summer monsoon precipitation were highly localized within the Yangtze basin, even within the same cave.

The observational data demonstrated that modern sea-surface salinity (SSS) in the northern part of the East China Sea (ECS) reflects the volume of the Yangtze River (Changjiang) discharge. Because the drainage area of the Yangtze River occupies a major part of South China where the EASM influence strongly, the discharge of the Yangtze River during summer is considered as a good indicator of the EASM intensity. Piston core KY07-04 PC-1 (128^o56.6'E, 31^o38.3'N) used in this study was retrieved from the northern part of the ECS at a water depth of 758 m. In order to reconstruct paleo-SST and -SSS, the planktic foraminifera Globigerinoides ruber was used for analyses of oxygen isotope ($d^{18}O_{ruber}$) and Mg/Ca. Oxygen isotope ratio of the ambient seawater ($d^{18}O_{sw}$) of the past was estimated from 18Oruber and Mg/Ca-derived SST. The result suggests that SST in the studied location was approximately 4^oC cooler, while SSS was approximately 0.5 psu higher than the global average SSS at the end of the last glacial maximum. This higher SSS was consistent with weaker summer monsoon at 18 kyr B.P.

Millennial-scale variations between relatively warm and saline water and relatively cold and less saline water were recognized during the early deglacial and the Holocene periods, suggesting the changes in the mixing ratio between the Changjiang Diluted Water and the Kuroshio Water during these periods.

Holocene dry events deduced from SSS record of northern ECS occurred at 9.4, 8.0, 6.0, 4.3, 3.3, 2.1, 0.6, and 0.3 kyr B.P. and these events agree with some of the minima in $d^{18}O$ records of stalagmites obtained from various caves within the Yangtze River drainage. Moreover, millennial scale SSS variations in the northern ECS are more or less similar with the quantitative precipitation reconstruction using based on the difference between two stalagmites $d^{18}O$ records along the summer monsoon wind transect. This agreement supports that our SSS record properly captures the millennial-scale weaker East Asian summer monsoon events during Holocene. In addition, these dry events are in good agreement with North Atlantic Ice rafted events, suggesting a tele-connection between North Atlantic Climate and the EASM during the Holocene.