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Quantitative reconstruction of freshwater discharge of Yangtze River during the past 7000 years based on oxygen isotope

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In this study, $d^{18}O$ of seawater ($d^{18}O_w$), which is a indirect indicator of sea surface salinity, in the northern ECS during the last 7 kyr is reconstructed using Mg/Ca ratio and $d^{18}O$ of planktic foraminiferal shells. According to modern observation, interannual variations in sea surface salinity in summer in the northern past of the ECS is mainly controllled by the discharge from the Changjiang, i.e., rainfall in the drainage area of the Changjiang River. Thus, changes in the sea surface salinity in the northern ECS are interpreted as reflecting variations in the EASM precipitation in South China. It is confirmed that the relationship between salinity in the northern ECS and Changjiang discharge by analyzing the observational salinity data from 1950 to 1994.

However, it is difficult to obtain absolute salinity value with high accuracy in the past, because there are large uncertainties in salinity-$d^{18}O_w$ regression slope or end-member salinity or $d^{18}O_w$ values. Hence, I used $d^{18}O_w$ balance calculation for estimation of freshwater contribution on the northern East China Sea in the past to avoid the large uncertainty in past salinity reconstruction generated by the process of conversion from $d^{18}O_w$to salinity scale. Today, there is a positive relationship between salinity and $d^{18}O_w$, $d^{18}O_w$can be used for estimation of freshwater contribution on a given site when end-member $d^{18}O_w$ values are available. This method is better than reconstruction of the past salinity.

During the Holocene, temporal $d^{18}O_w$ record from the southern East China Sea where the Kuroshio Current lies is used as seawater end-member. While, temporal $d^{18}O_w$ obtained by calcite equilibrium equation using speleothem records. During the Holocene, temporal $d^{18}O_w$ record from the southern East China Sea where the Kuroshio Current lies is used as seawater end-member. While, temporal $d^{18}O_w$ obtained by calcite equilibrium equation using speleothem $d^{18}O_w$ from Chinese cave. Then, temporal variations relative contribution of the freshwater on the core site is calculated by using two temporal data of end-member $d^{18}O_w$, indicating that there is no long-term decreasing trend in the Changjiang freshwater discharge since the middle Holocene. This suggests that the temporal changes in precipitation amount in the South China do not follow the gradual insolation change from middle to late Holocene.

In order to estimate the Holocene flux of Changjiang freshwater (Q_{CFW}) into the ECS, modern relationship between Q_{CFW} and the relative contribution of the freshwater KY site is examined at first. Then temporal changes in the flux of the Changjiang freshwater are estimated during the Holocene using the regression line derived from the modern relationship between relative contribution of the Changjiang freshwater at the core site and the flux of the Chanjiang freshwater analyzed from 1951 to 1998. The result reveled that variability of the flux of the Changjiang freshwater during the Holocene on centennial to millennial timescale is much lower than interannual time scale, but similar to decadal time scale.