Geophysical Research Abstracts
Vol. 20, EGU2018-11550, 2018
EGU General Assembly 2018

East China Sea oceanographic response to East Asian Monsoon: Insights from seasonal Sr/Ca and δ18O coral records from Mid-Late Holocene (Kikai Is, Japan)

Kevin Garas (1), Tsuyoshi Watanabe (2), and Atsuko Yamazaki (2)

(1) Department of Natural History Sciences, Graduate School of Science, Hokkaido University, Japan (kgaras@sci.hokudai.ac.jp), (2) Faculty of Science, Hokkaido University

East Asian Monsoon (EAM) affects temporal and spatial rainfall distribution in the East Asian region. Intensification/weakening of EAM results to floods and drought in the Asian continent. Modern instrumental records show sea surface temperature (SST) and salinity (SSS) of East China Sea are highly controlled by the seasonal behavior of EAM. However, SST and SSS variability in ECS has yet to be reconstructed in seasonal scale throughout the Holocene. Holocene is characterized by abrupt and complex shift from warming to cooling periods. Seasonal-scale reconstruction will help us understand SST and SSS responses to climate regime shift. This will further enhance the accuracy of future prediction of EAM dynamics in connection to the present climate change.

We estimated δ18Osw using bi-weekly to monthly Sr/Ca and δ18O records of fossil corals (5.7, 4.9 (Kajita et.al. 2017) and 3.2 kyr BP) from Kikai Island, Japan. Sea surface temperature was reconstructed from Sr/Ca ratio measured from these fossil corals. Reconstructed SST and SSS were compared to instrumental and modern coral records. Mean Sr/Ca values show cooler SST at 5.7 kyr BP (24.5 °C), warmer SST at 4.9 kyr BP (26.7°C) and cooler SST at 3.2 kyr BP (24.1 °C) relative to the modern SST record (25.4°C). Enhanced winter-summer SST difference at 5.7 kyr (9.5°C) and 4.9 kyr (10.2°C) and reduced seasonality at 3.2 kyr (7.8°C) were observed relative to modern coral SST record (8.1°C). δ18Osw and SSS difference between winter (DJF) and late spring to summer (JJASO) were estimated. 5.7 kyr BP shows increased δ18Osw by +0.11‰ (decreased SSS (-0.5 psu)) from winter to late spring-summer. A similar pattern is observed at 4.9 kyr BP with increased δ18Osw by +0.13‰ (decreased SSS (-0.6 psu)) from winter to late spring-summer. However, 3.2 kyr BP recorded a decreased δ18Osw by -0.2‰ (increased SSS (+1.0 psu)) from winter to late spring-summer.

The decrease (increase) of salinity in ECS during late spring-summer months is associated with the increase (decrease) of rainfall brought about by strong (weak) EA summer monsoon. The increase (decrease) of salinity in ECS during winter months is associated to decrease (increase) of rainfall brought about by strong (weak) EA winter monsoon. 5.7 and 4.9 kyr BP recorded stronger EA summer and winter monsoon while 3.2 kyr BP recorded weaker EA summer and winter monsoon. Comparing to the coral records from 7.0 and 6.1 kyr BP reported by Morimoto et.al. 2007, EAM during Mid-Holocene was stronger than the present. Our data further suggest that EAM was stronger from 7.0 – 4.9 kyr BP, followed by weakening trend until 3.2 kyr BP and slightly intensified towards the present-day. Together with other datasets, solar insolation (higher in summer and lower in winter) in Northern Hemisphere during Mid-Holocene resulted to intensified EAM. Our coral data further refined the summer-winter SST and SSS difference using seasonal-resolved climate reconstruction.