**A comparative study of various sea surface temperature reconstruction methods – A case study from East China Sea**

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**Abstract**

Sea surface temperature (SST) reconstruction has been extensively studied to assess the past chemical and physical properties of water masses and climate change. Some of the most useful proxies for SST reconstruction are trace element (Mg/Ca) and stable isotope (δ18O isotope) measurements in the planktic foraminiferal test. Apart from this, there are several statistical methods that are not dependent on chemical signals but on the modern and paleo distribution of planktic foraminifera in the surface sediments. The modern observation of planktic foraminifera distribution with measured SST and salinity helps in constructing the foraminiferal transfer functions for paleo SST estimate. There are various statistical transfer function methods like Modern Analog Technique, CABFAC factor analysis, WA-PLS etc., which are able to estimate SST. This study employed the above-mentioned methods along with foraminiferal Mg/Ca on the planktic species *Globigerinoides* *ruber* to reconstruct the summer SST at the East China Sea (ECS) for the last 400 kyr. Mg/Ca measurements on the foraminiferal test require a thorough cleaning of the samples, using either reductive or non-reductive treatment, and this study utilized the latter. For the statistical methods, published datasets containing modern locations with summer SST and planktic foraminifera distribution are refined based on whether or not they are influenced by the warm Kuroshio Current. The generated transfer functions were applied on the planktic foraminiferal distribution at IODP Site U1429 at the ECS, covering the last 400 kyr. The result suggests that Modern Analog Technique is giving the best result with RMSEP = 0.2. The integration of published Mg/Ca data (Clemens et al., 2018) that used reductive cleaning treatment for the same species at the same site (ECS) allowed us to estimate the correction factor that is to be used if a non-reductive cleaning technique is employed. As a whole, our study focuses on the comparative assessment of various SST reconstruction methods, including statistical and foraminiferal Mg/Ca in the East China Sea (ECS).

**Key words:** SST reconstruction, Foraminifera, Elemental analysis, Transfer function

**References:**

i) Barker, S., Greaves, M., & Elderfield, H. (2003). A study of cleaning procedures used for foraminiferal Mg/Ca paleothermometry. *Geochemistry, Geophysics, Geosystems*, 4(9).

ii) Clemens, S. C., Holbourn, A., Kubota, Y., Lee, K. E., Liu, Z., Chen, G., ... & Fox-Kemper, B. (2018). Precession-band variance missing from East Asian monsoon runoff. *Nature communications*, 9(1), 3364.

iii) Siccha, M., Trommer, G., Schulz, H., Hemleben, C., & Kucera, M. (2009). Factors controlling the distribution of planktonic foraminifera in the Red Sea and implications for the development of transfer functions. *Marine Micropaleontology*, *72*(3-4), 146-156.