Geophysical Research Abstracts
Vol. 16, EGU2014-4968, 2014
EGU General Assembly 2014

Late Holocene SST and primary productivity variations in the northeastern Arabian Sea as a recorder for winter monsoon variability

Anna Böll (1), Birgit Gaye (1), and Andreas Lückge (2)

(1) Institute of Biogeochemistry and Marine Chemistry, University of Hamburg, Hamburg, Germany, (2) Bundesanstalt für Geowissenschaften und Rohstoffe, Hannover, Germany

Variability in the oceanic environment of the Arabian Sea region is strongly influenced by the seasonal monsoon cycle of alternating wind directions. Strong south-westerly winds during the summer monsoon induce upwelling of nutrient rich waters along the coast off Somalia, Oman and southwest India, which result in high rates of primary production. In the northeastern Arabian Sea off Pakistan on the other hand, primary production and sea surface temperatures are linked to northeast monsoonal winds that cool the sea surface and drive convective mixing and high surface ocean productivity during the winter season. In this study, we analyzed alkenone-derived sea surface temperature (SST) variations and proxies of primary productivity (organic carbon and δ15N) in a well-laminated sediment core from the Pakistan continental margin to establish the first high-resolution record of winter monsoon variability for the late Holocene.

Over the last 2400 years reconstructed SST in the northeastern Arabian Sea decreased whereas productivity increased, imaging a long-term trend of northeast monsoon strengthening in response to insolation-induced southward migration of the Intertropical Convergence Zone. The comparison of our winter monsoon record with records of summer monsoon intensity suggests that summer and winter monsoon strength was essentially anti-correlated over the late Holocene throughout the Asian monsoon system. In addition, SST variations recorded off Pakistan match very well with Northern Hemisphere temperature records supporting the growing body of evidence that Asian climate is linked to Northern Hemisphere climate change. It reveals a consistent pattern of increased summer monsoon activity in the northeastern Arabian Sea during northern hemispheric warm periods (Medieval Warm Period, Roman Warm Period) and strengthened winter monsoon activity during hemispheric colder periods (Little Ice Age).