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Past Temperature and Salinity of the Eastern Arabian Sea: Implications to Sun-Monsoon Precipitation Relationship over Past Couple of Millennia

Manish Tiwari (1), Siddhesh Nagoji (1), and Raja Ganeshram (2)

(1) National Centre for Antarctic & Ocean Research, Vasco-da-Gama 403804, Goa, India (manish@ncaor.gov.in), (2) School of GeoSciences, Grant Institute, University of Edinburgh, Edinburgh EH9 3JW, UK (r.ganeshram@ed.ac.uk)

Eastern Arabian Sea is one of the few regions from where not many high-resolution records of sea surface temperature (SST) and salinity exist despite its hydrological importance vis-à-vis South Asian summer monsoon precipitation. During this period, significant changes in salinity occur in the eastern Arabian Sea due to orographic precipitation and runoff. Additionally, minimal bioturbation occurs in coastal sediments accumulating rapidly due to the presence of an oxygen minima zone (OMZ) in the Arabian Sea. The sediment core used in this study was collected offshore Mangalore from the middle of the OMZ from a water depth of 589 m. The core spans a period of 154 to 4772 yr BP. The average sedimentation rate is 8.96 cm/Kyr while the average resolution is $\sim$112 yrs/cm. The stable oxygen isotope content ($\delta^{18}O_c$) was determined on the planktic foraminifera *Globigerinoides ruber* while the past SST variations were determined using an independent parameter - Mg/Ca - in the same species. The salinity was obtained by delineating SST from the $\delta^{18}O_c$ using empirical equations. The salinity varies from a maximum of 35.5 (arid) to a minimum of 32.4 (wet) while the SST varies from varies from a maximum of 29.9˚C to a minimum of 27.5˚C - a variability of 2.4˚C. Such high variability could be during to its coastal location, which is affected by moderate upwelling during monsoon season. The long-term trend determined through linear regression shows that the salinity has been increasing since mid-Holocene implying increasing aridity. We identify periods of aridity during the Little Ice Age (and a few centuries prior to it) and at 1300 yr BP, 2000 yr BP, and 4600 yr BP. A few paleomonsoon records also exhibit prominent correspondence with solar activity during early Holocene and beyond. But despite the strong recent solar minima (e.g. Maunder, Spörer, Oort, Wolf), their correlation with monsoon precipitation is weak and inconclusive. Additionally, those from the western Arabian Sea provide records of monsoon wind intensity and not the monsoon precipitation. We show that the monsoon precipitation declined in phase with the solar activity during the recent periods of major solar minima. Interestingly, this relationship changes beyond 1300 yr BP where precipitation lagged the solar activity by a couple of hundred years. This is confirmed through spectral analysis (Continuous Wavelet Transform and the Squared Wavelet Coherence) and also through comparison with earlier marine and terrestrial studies.