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Last Glacial Maximum to Holocene Monsoon Records in the Eastern Arabian Sea Continental Shelf Sediment

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A 390 cm long sediment core collected from 225 m water-depth in the Eastern Arabian Sea (EAS) off Goa, India, contains the proxy records for past-monsoon climate in the region. The AMS 14C and oxygen-isotope chronology have yielded a maximum age of 21.3 ky. B. P. for the core that exhibits an order of magnitude variation in sedimentation rates between Holocene and LGM (4.5 cm/ky and 42 cm/ky respectively). The LGM section (21.3 ky B. P. to 13 ky B. P.) records distinctly lower ratios of 100m: 10m and 100m: 2m grains in the silicate-fraction of the sediment, higher sedimentation rate, and ∼0.5 ‰ heavier residual-d18O in planktonic calcite. The residual-d18OG. sacculifer was translated into sea surface salinity (salinity) utilizing published past-SSTs for the region (Cayre and Bard, 1999). Thus generated salinity record indicates several events of significantly increased (>1.5 psu) salinity during the early Holocene (10 ky B. P. to 9 ky B. P.), deglaciation (15 ky B. P. to 11.5 ky B. P), and LGM (21.3 ky B. P. to 16.5 ky B. P.). Further, distinctly lower salinity event occurs only once between 8 ky B. P. and 7 ky B. P. These events suggest that the Indian summer monsoons were rarely intense than today in the past 21.3 ky period. However, the negligible variation in the salinity since ∼6.6 ky B. P. may suggest stabilization of the summer monsoons around modern conditions only during the later part of the Holocene. In general the salinity events show correspondence with grain-size pattern, where lower salinity during the Holocene and higher salinity during the LGM nearly overlap with dominant supply of coarse- and fine-grain material respectively. These observations along with residual-d18O indicate that, the Holocene period witnessed increased supply of fluvial material due to more turbulent rivers resulting from stronger summer monsoon rains, while the LGM period witnessed increased supply of fine grained eolian material due to stronger winter winds blowing from Indian sub-continent towards the EAS. The glacial weakening of freshwater input to the EAS region is consistent with a) Larger salinity gradient between northern- and southern-end of the characteristic low-salinity tongue in the EAS (Chodankar et al., 2005), and b) Higher salinity during LGM in the EAS (Banakar et al., 2005). More intense freshwater input to the EAS-region than modern input, indicating intense summer monsoons is evident only during the MIS5 (Chodankar et al., 2005). The dominant fine-grain fraction during the LGM period interpreted in terms of increased sub-continental dust input can be supported by higher productivity during that period, apparently caused by intensified winter-wind forced nutrient injection into the photic layer (Banakar et al. 2005).