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Monsoon variability and oxygen minimum zone intensity in the northern Arabian Sea - Status of the IODP drilling proposal

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Understanding the mechanisms and causes of rapid climate change is one of the major challenges in global climate research and constitutes a vital initiative of the Initial Science Plan of IODP. The Arabian Sea is a key area for addressing these questions on the longer-term evolution and variability of the Indian summer and winter monsoons. The western Arabian Sea (off Oman) has been extensively drilled in 1987, but the region off Pakistan has not yet been explored. The northeastern Arabian Sea, where a stable oxygen minumum zone and high winter productivity favors the deposition of organic-rich laminated or even varved sediments provides an important climate archive to study the response of the seasonal components of the Indian monsoon to orbital and suborbital forcing during the Pleistocene ice house at extremely high temporal resolution. High-resolution piston cores of Holocene to late Pleistocene age show monsoon variability on centennial to millennial time scales with a high degree of correspondence in both, event timing and structure with records from the North Atlantic, central Greenland, as well as with records from the South China Sea and the Bay of Bengal. The primary mechanisms responsible for the coupling between the monsoons, other tropical climate features and the North Atlantic climate regime remain, however, still poorly understood. Drilling the Holocene to lower Pliocene and upper Miocene sedimentary record off Pakistan and on the Murray Ridge will allow us to study the annual to millennial-scale monsoonal changes of critical climatic intervals, thereby enhancing our understanding of the role of the monsoon on rapid climate change in a global

perspective. Ultra-high resolution studies on specific early-middle Pliocene time intervals will allow a detailed comparison between the monsoonal climate in the pre-modern icehouse world and modern icehouse climate. It will also show whether the observed centennial to millennial scale variability in the Indian monsoon dates back to the onset of large-scale northern glaciations around 3 Ma or if it is an intrinsic component of the monsoon system. The portrayal of sub-orbital variability over longer time intervals may validate suggestions that the high frequency climate fluctuations result from combination tones of primary orbital frequencies and if these tropical sub-Milankovitch cycles propagated to higher latitudes around 1.5 Ma to cause the gradual change from the dominantly 41-kyr to the dominantly 100-kyr glacial cyclicity.