4 Multiproxy (Calcareous Nannofossil, Benthic Foraminiferal, and Total Organic Carbon) Records from the Eastern Arabian Sea

Implications for Monsoon-Induced Nutrients and Primary Productivity Changes during the Holocene

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4.1 INTRODUCTION

The Arabian Sea (AS) is one of the most productive oceans in the world (Bauer et al., 1991). The biological productivity is strongly governed by the nutrient input in the Arabian Sea, which shows spatial and temporal heterogeny. Two major processes that enhance nutrient availability in the AS are upwelling, which occurs in the western and southeastern regions during summers, and vertical mixing, which occurs in the northeastern region during the winters. In the eastern Arabian Sea, although runoff may benefit the productivity locally, the lack of intense upwelling and stratification due to high precipitation and runoff produces little productivity during the summers (Cabarcos et al., 2014). The sporadic moderate upwelling/mixing during the northeast (NE) monsoon promotes biological productivity in the eastern Arabian Sea.

The biological productivity has been shown to vary on temporal scales in the Arabian Sea. Several studies reported strong contrasts in productivity between the western, northern, and eastern regions during glacial–interglacial periods of the last glacial cycle. During the glacial period, the western and northern regions experienced diminished biotic productivity due to decreased summer monsoon strength. On the other hand, the eastern Arabian Sea experienced enhanced biotic productivity attributed to upwelling and/or vertical mixing in the water column due to the cold and strong NE monsoon (Singh et al., 2011, 2018; Cabarcos et al., 2014; López-Otálvaro et al., 2008). However, most of the studies are based on planktic foraminifera, % Total Organic Carbon (TOC), and other geochemical proxies, with less emphasis on other biotic organisms such as coccolithophores (Agnihotri et al., 2003; Bassinot et al., 2011).

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