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Forcing factors behind primary productivity variabilities in Western Arabian Sea since the Last Glacial Maximum: an important role of mineral dust supplies

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Located in the Northwestern part of the Indian Ocean, the Arabian Sea (AS) is surrounded by vast arid regions (e.g. Arabian Peninsula, Pakistan, Iran), regularly swept by regional winds, that supply important amounts of mineral dust to the sea. This oceanic area is also under the influence of Indian monsoon surface winds that create a coastal upwelling off Somalia and Oman during summer and a convective mixing north of 15°N during winter. Consequently, mineral dust, coastal upwelling and convective mixing bring important amounts of nutrients to the euphotic zone, making the AS one of the most productive oceanic regions in the world. Although older studies usually highlight the coastal upwelling as a major factor behind primary productivity (PP) patterns in the AS, more recent studies have demonstrated that mineral dust inputs and convective mixing could have a significant influence on PP as well, at least since the Last Glacial Maximum (LGM). This time interval encompasses a glacial-interglacial transition with rapid fluctuations of ice sheet volume and atmospheric CO_2 concentration, and represents therefore, a perfect case study to explore the impact of key Earth's climate forcing mechanisms on the PP for both, past and future climate conditions. Yet, mineral dust component is still poorly documented by proxy data in the AS and direct reconstruction of PP are rare, which limit our understanding of how fertilization of the euphotic zone either by dust, coastal upwelling and/or convective mixing, impacts PP in the past. In this study, we combine high resolution bulk geochemical composition, detrital fraction grain-size distribution and clay mineralogy composition, together with coccoliths counting and carbon organic analyses from sediment cores MD00-2354 and MD00-2355, both retrieved on the Owen ridge. The aim is to reconstruct high-resolution mineral dust and PP patterns over the western part of the AS since the LGM. Both sites are located under the direct influence of dust plumes and among the seasonal latitudinal shift of monsoonal winds. They are therefore willing to register nutrient inputs from mineral dusts, winter convective mixing and/or summer coastal upwelling.

Combined with previous paleoclimate records from the area, they will provide for the first time, an unprecedented overview of the forcing factors behind PP distribution in the past. Preliminary results show decreasing PP at both sites through the last 20 ka, suggesting a regional pattern of nutrient distribution in the western AS. Particularly, a strong correlation between PP and mineral dust signals reinforces the hypothesis of a key role of mineral dust on PP in the area.