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Multi-decadal to centennial climate variability in the Mid-Holocene and the 4.2 ka event as recorded in Shaban Deep brine sediments, northern Red Sea

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As a desert-surrounded, semi-enclosed marine environment, the northern Red Sea suffered extreme oceanographic changes in the past resulting in an amplification of paleoclimate signals in the marine records (e.g., Arz et al., 2003a, 2003b). Since paleoenvironmental data from this region are still rare, high-resolution Red Sea paleorecords provide an important link to, e.g., climate reconstructions from northeast Africa, the Eastern Mediterranean, and the Middle East. Very special paleoclimate archives in the northern Red Sea are the anoxic sediments from the brine-filled Shaban Deep. The Shaban Deep is a small-scale basin at ~1500 m water depth presently filled with ~200 m of oxygen-depleted, highly saline (~260 psu) brine. Gravity cores retrieved from this basin comprise of partly laminated olive gray to black sediments. Individual layers vary in their composition depending on the carbonate, clay, and biogenic silica (mainly diatoms) content and most probably document annual deposition cycles (Seeberg-Elverfeldt et al, 2004). Between about 6,400 and 4,200 years BP one such laminated interval documents distinct multi-decadal to centennial changes in the carbonaceous (coccoliths) versus siliceous (diatoms) sedimentation. At about 4.2 ka the lamination in the sediment disappears and the anoxic facies turns into a low oxygen environment were endobenthic foraminifera could survive. This strongly suggests the episodically absence of the brine. At the same time stable oxygen isotopes determined on surface dwelling foraminifera show a sharp increase (within less than 100 years) pointing to a strong positive salinity anomaly at the sea surface. As atmospheric processes notably control deep-water formation in the northern Red Sea, this major "evaporation event" significantly enhanced the renewal of deep-water and ventilation of the

small Shaban Deep basin. Especially the timing and strengths of the environmental changes around 4.2 ka, makes us believe that this event is the regional expression of the major drought event at 4.2 ka BP, which is widely observed in the neighbouring regions, and which strongly affected Middle East agricultural civilisations.