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New insights on the Holocene humid period in the Middle East : Evidence from a sedimentary record in Dhofar, Oman

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Through the Quaternary, orbitally induced variations in insolation at low latitudes governed monsoon dynamics in these regions, leading to recurrent periods of intense precipitation. Over the African continent and the Middle Eastthese humid phases were marked by major transformations of the hydrological cycle, fostering the development of extensive fluvial networks, lakes, and tropical flora and fauna in areas that are among the driest today (Sahara, Arabian Peninsula). In the current context of global warming, understanding the mechanisms and environmental responses associated with these humid periods, as well as their transitions toward states of extreme aridity, is crucial for improving climate projections. However, although these humid periods have been widely studied and discussed in Africa, they remain relatively poorly documented in the Middle East. This is most likely due to the difficulty of finding climate archives that allow continuous and high-resolution reconstructions of past hydrological changes in regions that are today climatically hostile. In this study, we analyzed a 4-meter-thick sedimentary sequence from the Dhofar region in Oman, which spans the Holocene climatic optimum - the last humid period experienced by this now hyper-arid region. Sedimentological analyses (sediment color, grain size and mineralogy of the inorganic fraction), total organic carbon and carbonate contents, as well as geochemical analyses of the organic fraction (leaf-wax *n*-alkane $\delta^{13}C$ and δD) were conducted. This multi-proxy approach enables the reconstruction of the paleoenvironmental history of the area (e.g., vegetation, precipitation). The study reveals drastic changes in the hydrological cycle during this period, shifting to a highly dynamic fluvial environment (active wadis) before returning to the desert landscape known today. Connections with human presence during this period are further examined by comparing climatic and environmental proxies with archaeological evidence. This comparison confirms the influence of climatic forcings and associated landscape transformations on human populations in regions that are particularly vulnerable to rapid climate change.