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Holocene Paleoenvironments in the Western Mediterranean Sea: palynological evidences on the Algerian coast and climatic reconstructions

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Environmental conditions along the Algerian margin (AM) involve complex atmosphere-hydrosphere-biosphere interactions with superimposed anthropogenic activities on adjacent watersheds across the Holocene. Surface waters of the Atlantic Ocean entering the western Mediterranean Sea become the Algerian Current (AC) flowing along the North African coast and generating anticyclonic eddies. Upwelled waters are other recurring hydrological feature reflecting the instability of the AC. In this area, Holocene vegetation and paleohydrological dynamics have not yet been described. The marine core MD04-2801 (2,067 m water depth) has been analyzed to assess environmental and climatic conditions over the last 14 kyrs BP at a secular-scale resolution to fill this gap. A multi-proxy approach including terrestrial (pollen grains and continental non-pollen palynomorphs such as Glomus spores and freshwater microalgae) and marine (dinoflagellate cysts or dinocysts) palynological data as well as sedimentological data (grain-size analysis and clay mineral assemblages) and biomarkers (alkenones and n-alkanes) have been used to investigate the links between past sea surface hydrological conditions characterized by the over-representation of heterotrophic dinocyst taxa (especially *Brigantedinium* spp.) and regional environmental changes on nearby watersheds. Quantifications of hydrological and climate parameters are also estimated using the Modern Analogue Technique applied to dinocyst and pollen assemblages. Our data evidence linkages between continental dryness or moisture and surface ocean conditions. High productivity is recorded during the cold and arid climate conditions of the Younger Dryas (12.7 to 11.7 ka BP). During the Early-Middle Holocene (11.7 to 8.2 and 8.2 to 4.2 ka BP), fluvial discharges increase concomitantly with the colonization of coastlands by the Mediterranean forest and oligotrophic conditions in the AM. In contrast, aridification characterizes the Late Holocene with the notable 4.2 ka BP megadrought between 4.3 and 3.9 ka BP. Comparison between with other paleoenvironmental records from the Gulf of Cadiz to the Siculo-Tunisian strait underlines a west to east climatic gradient at orbital and infra-orbital timescales, with marked cold-dry events at 9, 8.1, 7.3 and 6.5 ka BP. This zonal gradient is discussed to explain

contradictory results from the Alboran Sea to Tunisia. Finally, the last 3 kyrs BP highlight the establishment of modern ocean production conditions reflecting both vertical mixing in the AM (wind-driven eddies of the AC) and nutrient-enriched fluvial discharges intensified by human land-use.