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Magnetic Characteristics of Marine Sediments from the Upwelling Region Off NW Africa

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Rock magnetic investigations performed at low, high and room temperature are presented for marine sediments spanning the last 110 kyr from the lower Moroccan continental slope off Cape Ghir. The region is characterized by upwelling and high rates of marine organic productivity. Lowest magnetizations are observed during glacial times with dry conditions in northern Africa and a predominant eolian transport of terrigenous material. Higher magnetizations are observed during interglacial periods, when more humid conditions prevailed in northwest Africa with enhanced river discharge to the Atlantic Ocean. The primary detrital magnetic mineralogy is dominated by ferrimagnetic magnetite with variable degrees of oxidation as indicated by Curie temperatures of $\sim 580^{\circ}$C and broad Verwey transitions from 95 to 120 K. ARM/IRM ratios hint at high amounts of fine-grained particles. Field cooling (FC) and zero field cooling (ZFC) warming curves also suggest a goethite component. The sediments confined to $\sim$18 to $\sim$59 kyr have been affected strongly by diagenetic alteration. They are characterized by a reduction in magnetic mineral content, grain-size coarsening and lower coercivities. Particularly the goethite and fine-grained ferrimagnetic fraction is almost completely removed. Close to stoichiometric PSD to MD magnetite remains the predominant carrier of the magnetic signal as demonstrated by a Verwey transition at 120 K and similar ZFC and FC warming curves. This preservation of stoichiometric magnetite in reduced sediments is clearly inconsistent with typical findings in environments of diagenetic alteration. Changes in terrigenous influx, transport mechanism and/or hinterland climates could be of critical importance, in particular the fluvial input originating from the Atlas Mountains. Oceanic processes such as changes in oxygen content of the bottom water may also control the sedimentary magnetic characteristics, since the diagenetic layer is regionally confined to a specific age period.