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Changes in Magnetic Mineral Input Across the Subequatorial Atlantic during The Last Glacial Cycle

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A b s t r a c t

The North Atlantic Ocean has been an area of intensive research on the causes and effects of climate change on different time scales. This location bias is based on the high sensitivity of this region to changes in continental ice volume, given the high ratio of continental to oceanic surface, and in the vigour of the Meridional Overturning Circulation, whose engine is deep-water mass production in these regions. On the contrary, research in equatorial and tropical latitudes is scarce, despite their high potential of preserving atmospheric signals due to their high sensitivity to meridional shifts in the Inter Tropical Convergence Zone (ITCZ). Dust production and transport from the African Sahel and Sahara Desert is strongly dependent on the position and strength of the ITCZ, with large implications for lithogenic inputs in remote areas of the ocean, cloud formation, as well as albedo and radiative effects.

In this contribution, we address this relative lack of studies by presenting new results from a longitudinal transect across the subequatorial Atlantic ocean. We have analyzed the magnetic properties from 7 Megacores dating back to the early deglacial/last glacial maximum (LGM). We observe a decrease in magnetic susceptibility from South to North, and from East to West (Fig. 1), in both the Holocene and the LGM, with larger differences in the latter period. Water depth also shows a strong linear relationship with magnetic susceptibility, especially in the Holocene. This interglacial/glacial trend is also shown in the coercivity of remanenence, increasing the magnetic hardness in the glacial. Our results agree with an African origin of the magnetic minerals, transported from East to West due to the Easterly winds of the ITCZ. These results also agree with a more arid and dust-rich glacial period, displaced further south due to the cooling of the Northern hemisphere, as shown by higher magnetic susceptibilities during the LGM, especially in the low latitudes. More striking is the liner trend observed with water depth. We hypothesize that this trend is due to the presence at these latitudes of oxygen-rich Antarctic bottom water, which may promote the preservation of magnetic minerals, and to $CaCO_3$ dissolution at these depths, which will increase the proportion of detrital minerals, and thus their magnetic signal.

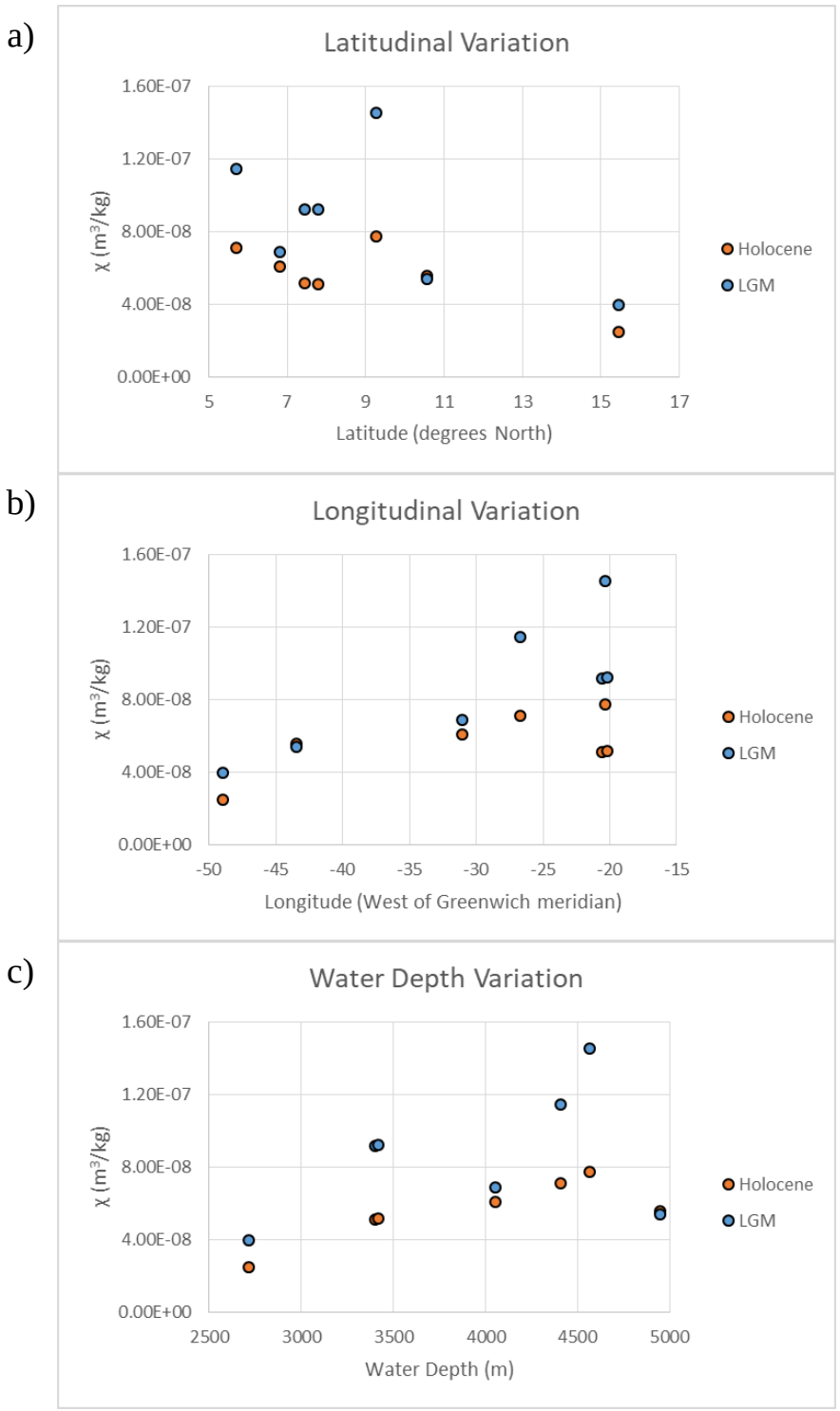

Fig. 1. Variation of magnetic susceptibility across the subequatorial Atlantic in the recent Holocene and LGM as a function of: a) aatitude, b) longitude, c) water depth.

Keywords: environmental magnetism, African dust, equatorial Atlantic.

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