# New sedimentary $^{231}Pa/^{230}Th$ records from the northern Brazilian margin over MIS3

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The region of the North Eastern Brazilian margin is of major interest in the study of the variability of the oceanic circulation because of the large part of the Atlantic Meridonal Overturning Circulation passing through it. Moreover this region has been extensively studied leading to a good chronostratigraphical framework of its marine sediment cores [1, 2, 3]

In order to better understand the changes in the AMOC during Heinrich events, we chose to study two sediment cores at different water depths so that we may observe not only changes in the intensity of circulation of the water masses influencing the cores, but as well changes in the vertical extent of these water masses.

Due to the difference in particle reactivity of $^{231}Pa$ and $^{230}Th$ in the water column sedimentary $^{231}Pa/^{230}Th$ (Pa/Th) may be used to record changes in AMOC [4, 5], although particle scavenging may bias the signal in certain cases. In the case of the western equatorial Atlantic region, the sedimentary Pa/Th vertical profile measured on recent sediment is consistent with a dominant role of the AMOC, rather than particle scavenging, thereby demonstrating that Pa/Th can indeed be used to monitor changes in water mass overturning rates in that region [6].

We present new Pa/Th records from the last glacial and in particular from periods of rapid circulation changes associated with Heinrich events. Our results show that the Pa/Th ratio changed along with other proxies such as the benthic foraminifer carbon isotopic ratio.

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# Halogen abundances of the martian mantle

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The surface of Mars is relatively halogen-rich, with a mean Cl concentration of 0.49wt% [1]. In contrast, little is known about the martian interior halogen composition, nor how it compares with the Earth's mantle, where subduction recycling of halogens occurs. Insights into the halogen composition of the martian interior can be gained from shergottite meteorites, whose parental magmas were formed by partial melting of the martian mantle. North West Africa (NWA) 6234 is an olivine phyric shergottite [2], it is unweathered [2] and relatively undegassed, having likely crystallised at depth within the martian upper crust [3]. We analysed bulk and mineral separates of NWA6234 to determine Cl, Br and I by extension of the $^{40}Ar$-$^{39}Ar$ technique. *In-vacuo* crushing experiments released only 2-10% of total halogens indicating that the major fraction is located within solid phases (melt inclusions or phosphate minerals). Stepped heating yielded constant molar $Br/Cl = 0.0040 \pm 0.0004$ and $I/Cl = 0.000358 \pm 0.000046$ throughout the release, indicative of a single halogen-bearing component. With the total Cl released (59 ppm), and assuming the basalt formed by 10-20% partial melting of the source, this implies a martian mantle Cl composition that is very similar to the terrestrial MORB source (4 ppm Cl [4]) and in agreement with a recent finding based on apatite chemistry [3]. However, NWA 6234 Br (560 ppb) and I (110 ppb) concentrations indicate a mantle enrichment of between 4-8 times and 30-70 times respectively relative to MORB. Thus, the martian interior is either less degassed of its heavy halogens compared to the Earth, or it formed with higher abundances.

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