Glacial Atlantic Circulation - Insights from combined sedimentary ε_{Nd} and $^{231}Pa/^{230}Th$ records

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In contrast to the modern situation, several proxies point to a very different structure of water mass distribution in the Atlantic Ocean during the Last Glacial. However, there is still no consensus about variations of the circulation strength and timing or causation of such changes.

Seawater-derived ^{231}Pa, ^{230}Th, and neodymium isotopes, extracted from marine sediments, are promising inorganic proxies to reconstruct the past deep Ocean hydrography and water mass export. $^{231}Pa/^{230}Th$ yield information about the rate of overturning circulation, whereas ε_{Nd} derived from ferromanganese coatings carries a water mass provenance signal.

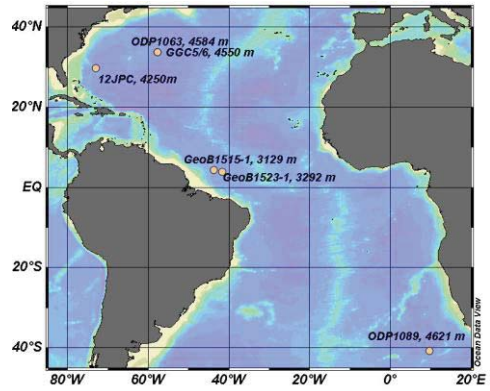

Fig.1: Locations of combined $^{231}Pa/^{230}Th$ and ε_{Nd} measurements.

First combined records of these tracers on the same sediment samples from the NW Atlantic (Bermuda Rise, ODP1063 and GGC5/6) vitally improved our knowledge about the timing of changes in past Ocean Circulation particularly with respect to centennial- to millennial-scale water column reorganisations [1,2]. We compare these earlier records to new North and South Atlantic core sites to better resolve basin-wide water column variations back to 30,000 years.

Our results show a general high level of concordance of both proxies. This is in agreement to former studies applying different circulation proxies [3,4,5], implying that both tracers indeed recorded invasion of Southern Source Water (high ε_{Nd}) during times of a weakened influence of North Atlantic Deep Water formation (high $^{231}Pa/^{230}Th$) in the Deep Atlantic Ocean.

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Highly Siderophile and Chalcophile element systematics in Mid-Ocean Ridge Basalts

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Highly Siderophile Elements (HSE: Os, Ir, Ru, Pt, Pd, Re) as well as chalcophile elements (S, Se, Te) are potential key tracers of large-scale planetary processes such as core formation and late veneer addition. Therefore their signatures and concentrations in the primitive upper mantle (PUM) should be estimated based on our understanding of their behaviour and signatures in the mantle rocks and in partial melts at both the whole-rock and host-minerals' scales.

While a relatively large database is available for HSE, data for S, Se and Te are scarce for MORBs and peridotites. Recent preliminary investigations in depleted peridotites [1] support an incompatible behaviour of both Se and Te during mantle melting, with Te being more incompatible. This is in agreement with experimental data on sulfides [2] but is not supported by the few MORB data available, which show similar Te concentration range than peridotites [3, 4]. Additionally, an increase of Se/Te ratios for decreasing Te concentrations is observed for a suite of peridotites as well as within replicate analyses on a single sample [1], revealing the strong control of heterogeneously-distributed micrometric Te-rich phases on the Se-Te systematics in mantle residues. Strikingly, similar Se/Te fractionations are also observed in available MORB data [3].

We will present a comprehensive HSE and S-Se-Te dataset for a large suite of MORB samples, in order to provide, in the light of S and HSE, further constrains on the behaviour of Se and Te during partial mantle melting. This dataset will contribute to the characterisation of the coupled chalcophile-highly siderophile elements signatures in the terrestrial silicate reservoirs.

[1] König et al. (2012) *GCA* **in press**. [2] Helmy et al. (2011) *GCA* **74**, 6174-6179. [3] Hertogen et al. (1980) *GCA* **44**, 2125-2143. [4] Yi et al. (2000) *JGR* **105 (B08)**, 18927-18948.