Display sedimentary $^{231}Pa/^{230}Th$ ratios the strength of Atlantic deep water circulation? – An approach for the past 30,000 years

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The applicability of $^{231}Pa/^{230}Th$ as a tracer for the Atlantic Meridional Overturning Circulation (AMOC) is still a great matter of discussion. Recently published results from the Bermuda Rise [1] challenged the idea of interpreting high $^{231}Pa/^{230}Th$ ratios as reduced AMOC during cold events like Younger Dryas or Heinrich-1 [2].

Although the effect of particle flux and particle composition has been studied and modelled in detail [3][4], there are still significant gaps in both our understanding of this proxy and in the spatial coverage of downcore $^{231}Pa/^{230}Th$ data.

Applying ICP-MS and (newly) low energy AMS [5], we measured $^{231}Pa/^{230}Th$ profiles along a transect from the North-(ODP 983), to the West- (ODP 1063) and South-(ODP 1089) Atlantic Ocean covering the past 30,000 yr.

During Heinrich-Events 1 and 2, ODP 1063 reveals high $^{231}Pa/^{230}Th$, but also high diatom abundances. ODP 983 displays extreme holocene $^{231}Pa/^{230}Th$ values during times of vigorous AMOC accompanied by increased diatom appearance, too. This qualitative concordance of $^{231}Pa/^{230}Th$ and diatom abundance may point to the conclusion that high $^{231}Pa/^{230}Th$ are not solely caused by diminished AMOC but also may be influenced by a change of the prevailing water mass (e. g. the injection of southern and silicate rich waters to the North-Atlantic). The Southern Atlantic Site (ODP 1089), in contrast, remained under the influence of ^{231}Pa-depleted Antarctic Bottom Waters reflected by constantly low $^{231}Pa/^{230}Th$ ratios below the production ratio of 0.093.

[1] Keigwin & Boyle (2008) *Paleoceanography* **23**, PA1101. [2] McManus *et al.* (2004) *Nature* **428**, 834-837. [3] Scholten *et al.* (2005) *EPSL* **230**, 319-337. [4] Sidall *et al.* (2007) *Paleoceanography* **22**, PA2214. [5] Christl *et al.* (2007) *NIM-B* **262**, 379-384.

Tectonic significance of Ca-rich plagioclase in refractory peridotites from Yungbwa ophiolite, Tibet Plateau

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Plagioclases have been widely reported in peridotites from different tectonic settings, and two mechanisms have been proposed for their formations: melt impregnation and decompressional break-down of spinel. Both fresh spinel peridotites and plagioclase peridotites from Yungbwa ophiolite, which crops out about 20 km south of Indus-Tsangbo Suture Zone, have been systematically measured for their mineral compositions. Plagioclases, with unusual high An (=Ca/Ca+Na) up to 99, have been discovered in three samples. In plagioclase-free samples, residual spinels are relatively homogeneous, with TiO_2 content generally less than 0.08% and Cr# ranging from 0.3 to 0.56, which corresponds to 13-20% partial melting. On the other hand, spinels in the plagioclase-bearing samples have variable Cr#, but still with quite low TiO_2 content (<0.15%). For compositions of olivine, clinopyroxenes and orthopyroxenes, no big difference exists between plagioclase-bearing and plagioclase-free harzburgites. Olivine shows a limited range of Fo (=Mg/Mg+Fe) of 88-91, with high NiO content (0.375-0.426%). Clinopyroxenes have CaO content of 20.91-23.42% and Al_2O_3 of 2.12-4.53%, with strong depletions of TiO_2 (<0.1%) and Na_2O (0.06-0.25%). Contents of CaO and Al_2O_3 of orthopyroxenes range from 0.86 to 2.09% and from 1.86 to 3.66%, respectively. Absence of reaction or symplectite textures around plagioclases indicates they are not likely formed by break-down of spinels in refractory harzburgites. Therefore, Ca-rich plagioclase is more likely to be formed by reaction of the impregnated melts, which are extremely poor in both Na and Ti, with the refractory harzburgites. Such depleted melts could be derived by hydrous partial melting of refractory harzburgites under supra-subduction zone setting. Based on the mineral data, we suggest a supra-subduction affinity of Yungbwa ophiolite.