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How well is the deep Tore seamount basin ventilated?

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The Last Glacial Maximum (LGM) was characterized by increased carbon storage in the deep ocean, as well as extremely poorly ventilated southern-sourced deep water (AABW) compared to northern-sourced deep water (NADW).

Here we analyse benthic (Cibicidoides wellerstorfi) $d^{13}C$, and compare 3 sites sitting on the deep floor at 5 km water depth: MD13-3473 in the Tore inside basin; MD03-2698 in the Iberian margin; and TN057-21 in the South Atlantic. The Tore Seamount is a geological structure 300 km off the West Iberian margin at 40°N latitude. It has a crater-like morphology with a 5500 m deep basin in its middle, where calypso core MD13-3473 was collected, confined from the open ocean by a summit rim at 2200 m water depth (wd). The only connection between the deepest Tore Seamount basin and the Atlantic circulation is a NE gateway down to 4300 mwd.

The results for the LGM show similar values around -1.0 ‰ for the South Atlantic and the Iberian margin, in other words these sites were both bathed by AABW. However, the Tore basin record exhibits values around 0 ‰, similarly to open sites in the Iberian margin at 3.5 km depth. This seems to indicate a remarkable isolation of the Tore inside basin from the Atlantic deep bottom waters influence.

Among other things, we plan to examine the residence time of the Tore basin bottom water by measuring the radiocarbon age difference between benthic and planktonic foraminifera.

Our results confer to this enclosed environment the status of an in-situ deep ocean laboratory where to test hypotheses of past ocean circulation changes like the role of deep waters in sequestering glacial CO_2. Core MD13-3473 covers 430 thousands of years, therefore 5 deglacial cycles (Spanish project “TORE5deglaciations”, CTM2017-84113-R, 2018-2020).