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Pliocene changes in the Mediterranean Outflow (3.6 – 2.5 Ma)

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East Atlantic DSDP Site 548 lies within the depth range of modern Mediterranean Outflow Water (MOW; 1251 m w.d.), here providing a largely continuous benthic record of bottom water variability with millennial-scale resolution from 3.6 Ma (MIS Gi01) to 2.5 Ma (MIS 99; tuned to age scale LR04). We assume that MOW spilled Site 548 almost continuously over the whole interval studied, since Nd isotopes remained constant at ε = -10.3$\pm$0.3 to -9.5$\pm$0.3, a range characteristic of Mediterranean waters. Mg/Ca-based bottom water temperatures show a major increase from an average of 6˚-8˚C up to a plateau of 8˚-11.5˚C near 3.46 to 3.38 Ma – for reasons yet unknown –, which lasted until 2.95 Ma (MIS G17). Subsequently, bottom water temperatures displayed a unique short-lasting drop down to 3˚C at MIS G10 (2.82 Ma), a drop coeval with the final closure of Central American Seaways and the onset of major Northern Hemisphere Glaciation (NHG; Bartoli et al., 2005). After MIS G10 bottom water temperatures returned to 6˚-8˚C, a level characteristic of modern MOW and being traced until 2.5 Ma (MIS 99). Since ice volume-corrected benthic δ^{18}O values do not reflect any of these immense changes, the long-term temperature rise of 3˚-4˚ C near 3.45 Ma also implies a major increase in bottom water salinity by some 1.5 to 2.0 p.s.u. Accordingly, the temperature plateau reflects intensified advection of MOW and salt discharge to the northern North Atlantic at intermediate water depths, that may have strengthened North Atlantic THC and thus preconditioned the onset of

NHG. Only after 2.95 Ma, during the final closure of the Central American Seaways, the high Mediterranean salt input was replaced by enhanced salt discharge from the Caribbean.

References:

Bartoli, G., Sarnthein, M., Weinelt, M., Erlenkeuser, H., Garbe-Schönberg, D., Lea, D.W., 2005. Final closure of Panama and the onset of northern hemisphere glaciation. Earth and Planetary Science Letters 237, 33-44.