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When did Mediterranean Outflow Water begin to circulate into the North Atlantic?

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The southwestern Iberian margin records critical evidence of Mediterranean Outflow Water (MOW) following its exit through the Strait of Gibraltar. Data collected during Integrated Ocean Drilling Program (IODP) Expedition 339 provide new constraints on MOW circulation patterns from Pliocene to present time, which indicate an alternative sequence of events in the establishment of global ocean circulation patterns. Following the opening of the Strait of Gibraltar (5.46 Ma), a limited volume of weak MOW entered the Atlantic at about 4.5- 4.2 Ma. Two depositional hiatuses evident at 3.2-3.0 Ma and 2.4-2.1 Ma indicate that significant MOW circulation into the North Atlantic did not occur until the Late Pliocene and early Pleistocene. These hiatuses accompany other changes in sedimentary processes. A younger event at 0.9-0.7 Ma suggests additional Pleistocene phase of MOW intensification. These events are coeval with global changes in deep-water sedimentation associated with shifts in global thermohaline circulation (THC). The events evident from sediment cores and seismic records interpreted here suggest that MOW provided an important, additional component of warm, saline waters to northern latitudes, thus enhancing Atlantic Meridional Overturning Circulation (AMOC). Similar changes have been globally described, suggesting a link between climatic shifts, THC and plate tectonic events.