Calcareous nannoplankton response to an AMOC shift during the last 200 kyr in the western South Atlantic

Juliana P. Quadros, Edmundo Camillo, Jr., Karen B. Costa, Felipe Toledo

Oceanographic Institute of the University of São Paulo, São Paulo, Brazil; jquadros@ufsb.edu.br, edmundo@usp.br, karen.costa@usp.br, ftoledo@usp.br

Palaeoceanographic changes during the last 200,000 years in the western South Atlantic were studied by means of calcareous nannoplankton from three sediment cores drilled in the Santos Basin (Brazilian margin) between 1900 and 2200 m water depth. Modern surface-water circulation is controlled by the oligotrophic Brazil Current (BC) that flows southwards, transporting tropical water and meandering to form mesoscale eddies and upwelling near the cities of Cabo Frio and Arraial do Cabo (Silveira et al., 2000). These processes are responsible for bringing colder, nutrient-rich South Atlantic Central Water to the surface. Deep circulation is controlled by the deep western boundary current (DWBC) that is bathed by North Atlantic deep water (NAWD) along the continental slope (Stramma & England, 1999). The NADW provides good preservation conditions for calcite, while the deeper Upper Circumpolar Deep Water (UCDW) is undersaturated in carbonate, resulting in the poor preservation of carbonate sediments. Estimates of primary palaeoproductivity were obtained from calcareous nannoplankton abundance and accumulation rates, and palaeoproductivity proxies, calcium carbonate content and complementary geochemical data analyses were performed. The results demonstrate that the palaeoproductivity record and calcareous nannoplankton accumulation were related to changes in ocean dynamics at the surface and in the deep ocean. Well-preserved coccoliths were recorded during episodes of strengthened Atlantic meridional overturning circulation (AMOC), which is similar to modern conditions. During these episodes, nannoplankton assemblages recorded higher productivity and diversity (Quadros, 2017), which was associated with prolonged sea-surface warming in the western South Atlantic (Santos et al., 2017). However, we also recorded poor preservation conditions and lower coccolith accumulation rates, diversity and productivity, which were interpreted as a northward advance of southern-sourced deep waters (UCDW) due to the AMOC weakening and the BC strengthening. Changes in calcareous nannoplankton primary palaeoproductivity during the last 200,000 years were separated into seven intervals.

References

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