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Carbon isotopic composition of C37 alkenones and Sr/Ca-ratio in sediments of the South Atlantic Ocean

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Atmospheric CO2 levels depend on the balance of CO2 between the world's oceans and terrestrial ecosystem. To a first approximation, equatorial regions of the modern ocean are supersaturated in CO_2 with respect to the atmosphere while sub-polar regions approach air-sea equilibrium and polar regions are undersaturated. In order to recognize better the mechanisms controlling atmospheric and oceanic levels of CO2 over geological time scales paleoceanic sinks and sources of CO2 must be defined. This requires reliable paleo-indicators (proxies) for past CO2 concentrations in the surface oceans.

Stoll and Schrag (2000) suggested using the carbon isotopic composition of alkenones in combination with the Sr/Ca-ratio of coccolith carbonate as a reliable proxy for surface water CO2 levels. The use of these parameters as paleoceanographic proxies in marine sediments requires a sediment-based calibration. Therefore we determined in a suite of core-top sediments from different oceanic regimes of the South Atlantic the delta 13C-value of the C37:2-alkenone and the Sr/Ca-ratio in the size fraction $<10\mu$m, respectively. Since the Sr/Ca-ratio is related to surface water phosphate concentration it is used to correct the isotopic fractionation (epsilon p) of C37-alkenones for the known influence of growth rate. The corrected epsilon p-values are calibrated against the surface water carbon dioxide concentration ([CO2(aq)]). Following this approach we determine CO2(aq) levels for the South Atlantic during the last glacial maximum and the marine isotopic stage 5.5.