Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.12733

Changes in Atlantic deep-water current ventilation during the last glacial interval recorded in Cape Basin sediments

NATASCHA RIEDINGER[1], MICHELLE L. ABSHIRE[2], FLORIAN SCHOLZ[3] AND MATTHIAS ZABEL[4]

[1]Oklahoma State University

[2]Valley City State University

[3]GEOMAR Helmholtz Centre for Ocean Research Kiel

[4]MARUM – Center for Marine Environmental Sciences, University of Bremen

Presenting Author: natascha.riedinger@okstate.edu

Changes in ocean current flow velocities and ventilation can significantly impact the ocean's capacity to sequester CO_2 from the atmosphere which, subsequentially, impacts climate. Paleoceanographic ventilation patterns can be reconstructed using redox-sensitive trace metals in the sediments. Here we present data from sediments collected along a transect at the continental margin off Namibia in the South Atlantic. The margin is characterized by an upwelling system and very high primary productivity. Furthermore, lateral transport of material from the shelf to the upper slope via particle-rich nepheloid layers has been reported [1]. Our data from shallow cores indicate that trace metal signatures are not preserved during down-slope transport. Our results from long cores show reduced contents of productivity-sensitive metals (avg. Ni 30.5 mg/kg and avg. Cd 0.31 mg/kg) during the Holocene at the lower slope compared to the glacial interval (avg. Ni 83.4 mg/kg and avg. Cd 0.99 mg/kg). Additionally, a close association of high concentrations of redox-sensitive metals (including Mo up to 72 mg/kg and U up to 30 mg/kg) with high accumulation rates of organic carbon (up to 4.7 $gC/m^2/yr$) during the glacial interval of the last 46 kyr occur at the deepest site (2470 m water depth). While increased trace metal and organic matter deposition can be observed on the upper slope during the last glacial maximum related to shelf erosion, our data indicate that organic matter deposited on the lower slope is mainly related to increased seaward-shifted productivity. Our finding indicates that the increased organic matter deposition alone cannot account for the anoxic (oxygen-free) deep waters of the Eastern Cape Basin during the Last Glacial Period. Only pronounced changes in ocean circulation, that is, a slow-down of the Atlantic meridional overturning circulation and associated deep-water ventilation, can ultimately explain such a scenario.

[1] Inthorn et al. (2006) Deep Sea Research Part I: Oceanographic Research Papers 53, 1423-1438.