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Department of Marine Sciences
Presents a Seminar by

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The role of the Southern Ocean in glacial/interglacial CO₂ change

In the effort to identify the cause of the lower atmospheric concentration of CO₂ during ice ages, the potential impact of the Southern Ocean, the circumpolar ocean around Antarctica, has long been recognized. I will describe an increasing body of nitrogen isotope evidence – from the organic matter bound within sedimentary microfossils – that both the (higher latitude) Antarctic and (lower latitude) Subantarctic Zones of the Southern Ocean played roles in lowering the atmospheric concentration of CO₂ during the ice ages. In the Subantarctic, the data indicate dust-driven iron fertilization of phytoplankton during the peak ice age conditions, which enhanced the flux of organic carbon out of the surface ocean. In the ice age Antarctic, the exchange of water between the surface and subsurface was apparently reduced, a state that I summarize here as “isolation” of the Antarctic surface; this could have stanching the leak of biologically derived, deeply stored CO₂ that occurs there today. As to the physical cause, a range of observations point to weakening of westerly wind-driven Antarctic upwelling. Moreover, new high-resolution nitrogen isotope records suggest orbital controls on the upwelling that can explain important aspects of glacial/interglacial CO₂ change, such as the lag of CO₂ behind climate at the initiation of the last ice age and the gradual rise in CO₂ over the Holocene. If time allows, a data-based hypothesis will be put forward for the physical and biogeochemical structure of the Southern Ocean’s upper water column under ice age conditions.

Host: Dave Lund

Time & Date: 11:00 am, Friday, November 19, 2021

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