

Raffaele Ferrari

Breene M. Kerr Professor of Oceanography
Department of Earth, Atmospheric, and Planetary Sciences
Massachusetts Institute of Technology

“An Ocean Tale of Two Climates: Modern and Last Glacial Maximum”

Abstract: In the present climate, the ocean below 2 km is mainly filled by waters sinking into the abyss around Antarctica and in the North Atlantic. Paleo proxies indicate that waters of North Atlantic origin were instead absent below 2 km at the Last Glacial Maximum (LGM), resulting in an expansion of the volume occupied by Antarctic origin waters. I will argue that this rearrangement of deep water masses is dynamically connected to the expansion of summer sea ice around Antarctica. A simple theory will be introduced to suggest that these deep waters only came to the surface under summer sea ice, which insulated them from atmospheric forcing, and were weakly mixed with overlying waters, thus being able to store carbon for long times. I will show that this unappreciated link between the expansion of sea ice and the appearance of a voluminous and insulated water mass appear to be crucial in explaining the ocean's role in regulating atmospheric carbon dioxide on glacial-interglacial timescales.