Deglacial water mass mixing in the Drake Passage on millennial to centennial timescales

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Deep-sea corals have emerged as a valuable archive for tracer reconstructions of the Late Pleistocene oceans. Unlike many paleoceanographic archives, they record conditions on (sub-)centennial timescales, can be absolutely dated using uranium series, and are relatively abundant at mid-depths of the Southern Ocean. These properties lead to the opportunity for a direct comparison between interior ocean changes and high-resolution globally-distributed climate records such as those from speleothems and ice cores.

Here we address the sequence and timing of changes in the intermediate to mid-depth Southern Ocean during the millennial climate events of the last deglaciation. In particular, by combining new neodymium (Nd) isotope data with existing radiocarbon evidence on deep-sea corals collected from the Drake Passage [1, 2], we focus on water mass variability and its role in deglacial carbon cycling.

Despite in some cases only modest glacial-interglacial changes in Nd isotopes, there is striking variability on millennial to centennial timescales. In addition, and in contrast to the modern Southern Ocean water column, latitude and water depth were significant factors in the deglacial evolution of Nd isotopes recorded by deep-sea corals. Comparing the records from different seamounts and water depths therefore provides additional insight into the rapidly changing ocean structure.

A further intriguing feature of some of the records is a correspondence between Nd isotope variability and rapid jumps in atmospheric carbon dioxide [3]. By considering the detailed pattern and timing of these changes, we attempt to determine the possible atmospheric or oceanic mechanisms operating, and to distinguish the importance of northern versus southern hemisphere forcing.

[1] Burke and Robinson (2012) *Science* **335**, 557-561.
[2] Chen et al. (2015) *Science* **349**, 1537-1541.
[3] Marcott et al. (2014) *Nature* **514**, 616-619.