Constraints on Deglacial Southern Ocean Circulation and Carbon Cycling from Deep-Sea Corals

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Changes in the circulation of the Southern Ocean are thought to be important for glacial-interglacial atmospheric CO_2 variations because the Southern Ocean is a region of intense upwelling and deep water formation. These dynamical characteristics provide a connection between deep, carbon-rich waters and the surface ocean, and thus changes in the circulation in this region can exert a strong influence on atmospheric CO_2. Radiocarbon is a sensitive tracer of past circulation and carbon cycle dynamics because it is produced in the atmosphere, enters the ocean through air-sea gas exchange at the surface, and then decays away as it is isolated from the atmosphere. We present new radiocarbon measurements of U-Th dated deep-sea corals from the Drake Passage to supplement previously published data from this region [*1,2*], and we combine these higher-resolution radiocarbon records with both biogeographical data, estimates of dissolved seawater Ba concentration, and boron isotope measurements to reconstruct the history of intermediate water circulation and carbon cycling from the last glacial period to the Holocene. The corals have ages ranging between 9.9 and 27.2 thousand years ago, and were dredged from water depths ranging from 328 to 1710 m. The increased temporal resolution provided from these newly dated corals is used to pinpoint the timing and examine the potential causes of millennial scale variations in Southern Ocean circulation and carbon cycling during the last glacial and deglacial periods.

[1] Burke, A., & Robinson, L. F. (2012). *Science*, *335*(6068), 557–561. [2] Chen, T., Robinson, L. F., Burke, A., Southon, J., Spooner, P., Morris, P. J., & Ng, H. C. (2015). *Science*, *349*(6255), 1537–1541.