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Drake Passage deep-sea coral records of Southern Ocean ventilation during the last deglaciation

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Changes of circulation pattern in the Southern Ocean have been invoked to explain a significant portion of the increase in the atmospheric carbon dioxide during the last deglaciation. However the accurate timing and thus underlying mechanisms of these changes are still controversial, requiring knowledge of different water masses movements with absolute age constraints. Aragonitic scleractinian deep-sea corals, recovered from a broad range of depths in the Drake Passage, provide a unique opportunity to investigate Southern Ocean ventilation with precise U-Th age control. A rapid age-screening technique achieved by coupling a laser system to MC-ICPMS enables us to get an approximate age distribution of the coral samples in order to select appropriate specimens for more accurate isotope-dilution age and radiocarbon age determination. Thus far more than 1500 deep-sea corals from the Drake Passage have been dated using this and other techniques. The reconnaissance age results show that deep-sea corals can be found across nearly the whole of the last deglaciation. With known radiocarbon contents and U-Th ages of the deep-sea corals, the ventilation state of different water masses in the past can be assessed based on their decay-corrected ^{14}C activities. We are building on previous work to provide high-resolution ^{14}C records covering the last 20,000 years from multiple locations including Cape Horn at a depth of 1000m, which is today bathed by Antarctic Intermediate Water (AAIW). With U-Th age control this high-resolution record is directly comparable to the Antarctic ice-core records, and can be used to help us better understand the Southern Ocean's role in global climate and carbon cycle during the last deglaciation.