Meteoric ^{10}Be and Compound Specifc ^{14}C revealed timing of colossal Antarctic ice-shelf collapse

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Ice shelves are among the most rapidly changing elements of the modern cryosphere, due to their sensitivity to atmospheric warming and to melting from beneath by warm ocean currents. The marine-based West Antarctic Ice Sheet (WAIS) is vulnerable to future climate change, but the degree to which is not well constrained. Obtaining a better understanding requires geological evidence of retreat history, which is complicated by the lack of proximal marine calcareous sediment, largely preventing construction of a precise chronology. Here we reconstruct the history of Ross Ice Shelf retreat based on compound specific (CS) ^{14}C dating and meteoric ^{10}Be measurement [1]. Taken together with land-based grounding line reconstructions, our results provide strong constraints on numerical glacial models. Dynamic retreat of the ice shelf edge, by as much as 400 km occurred between ~5,000 and ~1,500 years ago, resulting in a maritime climate for inland Antarctica as recorded in ice cores from Siple Dome and Byrd. Modeling results indicate that retreat of the ice shelf resulted from combined atmospheric warming and warm ocean currents impinging onto the continental shelf.

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