Constraints on the Holocene extents of the southwestern margin of the Greenland Ice Sheet, Kangerlussuaq, Greenland

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Borehole records from atop the Greenland Ice Sheet (GrIS) indicate muted temperature fluctuations during the Holocene compared to those of the last glacial period. During this time, however, the sensitive, margins of the GrIS experienced major fluctuations. Determining the extent and timing of these changes is important for understanding the response of the GrIS to warmer and colder climate conditions and for calibrating ice sheet models.

The Kangerlussuaq region (67.0°N, 50.7°W), southwestern Greenland hosts an excellent geomorphic record of Holocene deglaciation of the GrIS. Moraines marking past ice extents exist between Kangerlussuaq and the modern ice margin. They are, from oldest to youngest, the Keglen, the Ørkendalen and the late Holocene moraines. Moraine ages have been previously constrained using bracketing radiocarbon ages. However, prior to this study, they have not been directly dated.

We present ^{10}Be ages from boulders on the Keglen, Ørkendalen and historical moraines as well as from atop bedrock highs in the region. We present ages for the Keglen moraines of 7.2 ± 0.1 ka and 6.8 ± 0.3 ka for the Ørkendalen moraines, which are identical to those of van Tatenhove et al. (1996). The Ørkendalen moraines, just outboard of the late Holocene moraines (dated at ~180-60 yrs ago using ^{10}Be), indicate that the GrIS was smaller than present between 6.8 ka and the late 19th century. These ^{10}Be age constrain the extent and thickness of the southwestern margin of the GrIS during the Holocene and provide the first direct ages for deglaciation in the region.