Geophysical Research Abstracts
Vol. 18, EGU2016-8825-1, 2016
EGU General Assembly 2016

Mid-Holocene pulse of thinning in the Weddell Sea sector of the West Antarctic Ice Sheet

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The trajectory of thinning of the West Antarctic Ice Sheet during the Holocene is important for questions concerning ice-sheet (in)stability and changes in global sea level. Here we present detailed geomorphological and cosmogenic nuclide data from the southern Ellsworth Mountains that suggest a mid-Holocene phase of marine instability in this little known sector of Antarctica. The ice sheet, in the heart of the Weddell Sea embayment, was nourished by increased snowfall until the early Holocene and remained near its Last Glacial Maximum thickness from 49-10 ka. A pulse of rapid thinning at 6.5-3.5 ka, triggered by grounding-line retreat, caused the ice elevation to fall by ~400 m at rates of 29 cm per year or higher and may have contributed 1.4-2 m to global sea level. Ice elevation today is the same as at 3.5 ka and the ice has either stabilised or thickened in recent millennia. These results constrain ice-sheet models in the Weddell Sea sector of the West Antarctic Ice Sheet. Moreover, they imply that the West Antarctic Ice Sheet contributed little to late-glacial sea-level rise but was involved in mid-Holocene rises.