

## **Insights into the evolution of the Antarctic Ice Sheet from cosmogenic nuclide analysis in the Ellsworth Mountains.**

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### **Abstract**

The Ellsworth Mountains stand above the West Antarctic Ice Sheet close to its centre and inland of the floating Filchner-Ronne Ice Shelf. The mountains act as a dipstick for the half of the Antarctic Ice Sheet that flows into the Weddell Sea. Our field campaign in the southernmost mountains and subsequent analysis suggests the following. The earliest ice sheets were warm based and eroded a trimline that now stands 600-1900 m above the present ice surface. This erosion predates the Quaternary and is best explained by the Mid-Miocene ice sheets that extended offshore at a time preceding the erosion of large glacial troughs. Blue-ice moraines have been forming in the mountains for at least 1.4 million years. This and the lack of evidence of deglaciation during interglacials confirms models of interglacial regional ice sheets based on uplands such as the Ellsworth-Whitworth massif. Ice thickness varied with Quaternary glacial cycles, probably in response to sea level fluctuations causing migration of the grounding line of the Filchner-Ronne Ice Shelf. Ice remained near its Last Glacial Maximum thickness until 10 ka. An episode of marine instability saw the ice surface drop suddenly by 400 m in the mid-Holocene around 6.5 ka.