



Ice elevation changes in the Shackleton Range, Antarctica.

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The Shackleton Range lies at the junction of the East Antarctic Ice Sheet (EAIS) and the Filchner Ice Shelf, and records changes in the evolution and dynamics of the Antarctic Ice Sheet that are relevant to two debates. The first concerns the Miocene–Pleistocene evolution of the East Antarctic Ice Sheet. The second concerns the movement of the grounding line of the Filchner Ice Shelf during the late Quaternary, which is at present poorly constrained, impeding our understanding of how the West Antarctic Ice Sheet responds to sea-level change and contributes to eustatic sea level.

We present the results of combined geomorphological mapping and cosmogenic isotope analysis that provides evidence of limited subglacial and sub-aerial erosion of the higher parts of the Shackleton Range over millions of years (3.4 ± 0.3 to 1.0 ± 0.1 Ma.). This evidence of an old or relict landscape together with the presence of an *in situ* meteorite at 350 m above modern ice at 415 ka, suggests that moraines found 200–350 m above the modern ice surface are likely to represent the maximum thickening of the Filchner–Ronnie Ice Shelf during the Late Quaternary. If so, then ice thickening during glacial maxima was much less than commonly modelled. This evidence of relict landscapes and limited Quaternary thickening points to long-term stability of the East Antarctic Ice Sheet and limited thickening of the West Antarctic Ice Sheet in the past as it flowed into the Filchner Ice Shelf.