

Glacial history of the Ellsworth Mountains, Weddell Sea embayment, West Antarctica

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We report here the results from a programme of geomorphological mapping and sampling for cosmogenic isotope analysis in the Ellsworth Mountains. The overall aim of the project is to establish the timing and rate of thinning of the West Antarctic Ice Sheet (WAIS) from its maximum extent in an area inland of the Weddell Sea embayment. We have data from along a 350 km-long transect, stretching from Pirrit Hills (81° 06' S, 85° 31' W) in the south to the ridge between Mt Bentley and Mt Hubley in the north (78° 09' S, 86° 41' W). Most sites are on the western (WAIS) side of the range but we also have data from the Flowers Hills (78° 24' S, 84° 31' W) on the east side of the range, adjacent to the Rutford Ice Stream. We studied the geomorphology of 11 field locations in detail, including studies of drift sheets, weathering of sediments and bedrock, plus closely-spaced sampling of erratics and bedrock along altitudinal transects at each site. Our geomorphological mapping has allowed us to determine a series of ice sheet advances and we discuss a preliminary landscape and glacial history of the Ellsworth Mountains extending from the pre-Quaternary to the present-day, including a record of Holocene thinning. Our cosmogenic ¹⁰Be and ²⁶Al chronology for the mapped glacial fluctuations suggests that (i) Alpine glaciation of the Ellsworths probably occurred prior to the Quaternary, (ii) a high, previously-mapped trimline records WAIS expansion > 700 ka, and that there may have been multiple expansions to this level; (iii) a lower, less distinct trimline records WAIS expansion at the Last Glacial Maximum, and implies a thinner WAIS in the Weddell Sea embayment than has been previously supposed; (iv) thinning from the maximum occurred from ~ 15 ka to the Late Holocene. These data are being used to constrain an ice sheet model of the Weddell Sea embayment.