

Surface-exposure ages from Reedy Glacier, Antarctica

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Glacial deposits from the most recent advances of Reedy Glacier, Antarctica, are 50 – 250 m above the modern glacier surface. We measured cosmogenic Be-10 in glacial erratics collected from these deposits in order to determine the timing of surface elevation changes along Reedy Glacier during the last glacial period. Surface exposure ages calculated from Be-10 concentrations provide evidence of differential and asynchronous thickening along Reedy Glacier.

At the mouth of Reedy Glacier, where the glacier flows into the southern Ross Sea Embayment, surface-exposure ages of erratics collected from the summits of nunataks indicate that the ice surface was ~ 110 m higher than the present ice surface ~ 7 kyr before present (B.P.). Surface-exposure ages of erratics collected from the flanks of these nunataks show that ice at the mouth of Reedy Glacier thinned from ~ 7 kyr B.P. through the late Holocene. Surface-exposure age results from a large deposit located at the middle of the glacier length show that the glacier surface was ~ 250 m higher than the present glacier surface from ~17 kyr to ~ 14 kyr B.P. Surface-exposure ages from the head of Reedy Glacier show that maximum ice surface elevations occurred there during the early Holocene.

Our results show that the most recent maximum ice surface elevations at Reedy Glacier post-date the age of the last glacial maximum in the Northern Hemisphere, and occur at different times at different locations along the glacier length. Surface-exposure ages suggest that maximum ice thickness occurred at the lower half of Reedy Glacier before ice-sheet retreat occurred in the western Ross Sea Embayment. In contrast, maximum ice thickness at the head of Reedy Glacier occurred during the early Holocene, when ice-sheet retreat was underway in the western Ross Sea Embayment and when ice was thinning at the mouth of Reedy Glacier. These results suggest (1) that Reedy Glacier was still responding to post-glacial mass balance changes through the mid-Holocene, (2) that the relative influence of the East Antarctic Ice Sheet and the West Antarctic Ice Sheet on ice surface elevations at Reedy Glacier has varied during the late Quaternary, and (3) that post-glacial changes in East Antarctic accumulation have affected ice surface elevations at Reedy Glacier.