

Long-term Glacial History of the Southern Ross Sea Embayment

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We measured cosmogenic Al-26 (half-life = 0.7 Myr) and Be-10 (half-life = 1.4 Myr) concentrations in bedrock samples from elevation transects on mountains alongside the outlets of Scott and Reedy Glaciers. Concentrations of these nuclides build up during interglacial periods and decrease via different decay rates during periods of ice cover. Therefore, high nuclide concentrations and high Al-26/Be-10 ratios indicate prolonged exposure throughout the past few million years, whereas low concentrations and ratios indicate longer periods of ice cover. Erosive removal of surface rock by warm-based glaciers can also reduce nuclide concentrations.

At Scott Glacier, Mt Rigby summit bedrock has high nuclide concentrations, corresponding to a minimum cumulative exposure history of ~ 2 Myr. Although this peak was overrun during the LGM, this minimum exposure age demonstrates that prior ice cover has been limited. On Reedy Glacier, comparable mountain summits have shorter cumulative exposure histories and lower Al-26/Be-10 ratios, indicating that they may have been ice-covered for as much as half of the Pleistocene. Bedrock samples from 500-800 m elevations on both transects show similar contrasts—limited Pleistocene ice cover at Scott Glacier and prolonged ice cover at Reedy Glacier. We conclude that the Siple Coast grounding line, which currently lies between these two glaciers, has returned to this interglacial position throughout much of the Pleistocene, maintaining thick ice in Reedy Glacier and thin ice in Scott Glacier.

A strong increase in nuclide concentrations with altitude over the full elevation transect at Mt Rigby is due to small but significant differences in subglacial erosion. We are investigating this by measuring the ratio of neutron capture-produced Cl-36 to spallogenic Cl-36, using biotite and K-feldspar, respectively. The production ratio by these processes is strongly depth-dependent, hence their ratio in surface samples will provide information about long-term erosion.

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