

Late Quaternary fluctuation of Scott Glacier in response to grounding-line retreat in the Ross Sea Embayment

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Thickening of the WAIS during the last glacial maximum (LGM) dramatically influenced the flow of East Antarctic outlet glaciers draining through the Transantarctic Mountains into the Ross Sea Embayment, instigating significant changes in both surface elevation and profile. Subsequent recession of the Ross Sea grounding line removed this effect, causing outlet glaciers to thin and steepen. Today, only Reedy Glacier (86°S) remains connected to the WAIS. Dating of glacial deposits adjacent to the outlet glaciers has enabled researchers to reconstruct the broad pattern of Ross Sea deglaciation during the Holocene. This is an important step in identifying the mechanism that triggered ice recession in this sector of the WAIS and has implications for the future stability of the ice sheet. However, the most recent behaviour of the WAIS grounding line in the Ross Sea, since the isolation of Hatherton Glacier at ~7 Ka BP, remains poorly understood and prevents us from determining whether the grounding line has stabilised on the Siple Coast or whether the WAIS continues to retreat.

During the 2003-4 and 2004-5 field seasons, we mapped glacial deposits alongside Reedy Glacier and sampled former ice limits for surface-exposure dating. Exposure ages from nunataks at the confluence with Mercer Ice Stream show that the bulk of post-LGM thinning at Reedy Glacier was complete by 3.8 Ka BP. Only minor thinning (<30 m) has occurred over the last two millennia, but whether this marks the end of deglaciation or localised reorganisation of glacier flow is unclear. To further constrain the most recent behaviour of the Ross Sea grounding line, we are continuing our glacial geologic investigation at neighbouring Scott Glacier.

Scott Glacier is the last major outlet glacier of the EAIS draining into the Ross Sea north of the grounding line. Large nunataks (the Karo Hills) are located above the shear margin of Scott Glacier at its confluence with the Ross Ice Shelf. We are mapping and sampling glacial deposits at the Karo Hills and elsewhere at Scott Glacier in order to accurately constrain the timing of the LGM and Holocene deglaciation. Coupled with the Reedy Glacier record, we anticipate that these data will provide strong constraints on the past few thousand years of Ross Sea grounding-line retreat. In particular, the Scott Glacier record will help establish whether grounding-line recession in the southern Ross Sea has ended or whether it is ongoing. Additionally, unlike at Reedy Glacier, the Karo Hills nunataks are high enough for their summits to have remained ice-free during the LGM. Therefore, the distribution of glacial deposits at the mouth of Scott Glacier will provide valuable geologic constraint of the surface elevation of the WAIS during the LGM.