INTEGRATING TERRESTRIAL AND MARINE RECORDS OF THE LAST GLACIAL MAXIMUM IN MCMURDO SOUND, ANTARCTICA: IMPLICATIONS FOR GROUNDED ICE EXPANSION, ICE FLOW, AND DEGLACIATION OF THE ROSS SEA EMBAYMENT

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Session S3 Empirically testing paleoglaciological hypotheses and models

Oral Presentation

During the Last Glacial Maximum (LGM), grounded glacier ice filled the Ross Embayment in Antarctica and deposited glacial drift on volcanic islands and peninsulas in McMurdo Sound and coastal regions of the Transantarctic Mountains (TAM), including the McMurdo Dry Valleys and Royal Society Range. The flow geometry and retreat history of this ice are still debated, with contrasting views yielding divergent implications for the stability of and interaction between ice derived from East and West Antarctica during late Quaternary time. Here, we present terrestrial geomorphologic evidence and use it to reconstruct former ice sheet elevations, ice-flow directions, and ice-marginal environments in McMurdo Sound. Radiocarbon dates of fossil algae in ice-marginal sediments provide a coherent timeline for local ice retreat. These data are integrated with marine-sediment records and multi-beam data to reconstruct grounded ice dynamics in McMurdo Sound and the western Ross Sea. The combined dataset suggests ice flow toward the TAM in McMurdo Sound during all phases of glaciation, with thick, grounded ice at or near its maximum extent between 19.6 and 12.3 calibrated thousands of years before present (cal. ka). The persistence of grounded ice in McMurdo Sound and across the western Ross Sea after the Meltwater Pulse 1a event (14.0-14.5 ka) suggests that this sector of Antarctica did not significantly contribute to rapid sea level rise at that time. Our data show no significant advance of locally derived ice from the TAM into McMurdo Sound. This suggests that grounded ice in McMurdo Sound and the wider Ross Embayment expands in response to reduced oceanic heat flux and lower eustatic sea level and the resulting advance of marine-based ice, rather than local increases in precipitation and ice accumulation.