



Early mountain glaciation and build-up of the last Patagonian Ice Sheet

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Resolving the timing and structure of glacial advances throughout the last glacial cycle is essential for understanding the underlying drivers of climate changes in the southern hemisphere. Our knowledge of glacial activity in the early stages of the last glacial cycle, however, is limited owing to the inherently incomplete preservation of the moraine record. Here, we present a ^{10}Be -dated glacial chronology from Lago Belgrano (47.9°S) in central Patagonia that extends to the early last glacial. Our data reveal a major advance at the end of Marine Isotope Stage 5. A second, less-extensive advance occurred during the global Last Glacial Maximum at 25 ka. We suggest the pattern of ice advances reflects ice-divide migration during the build-up of the Patagonian Ice Sheet, which caused ice-flow re-routing, snow starvation, and less extensive glaciers at the site during peak glacial conditions. The timing of the early maximum coincides with cooling evident in Antarctic ice cores and marine proxies from the southern mid-latitudes. The early maximum at Lago Belgrano is likely an expression of hemisphere-wide oceanic and atmospheric cooling.