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^{10}Be / ^{26}Al exposure age chronologies from mid-latitude Southern Hemisphere glacial sequences in the Southern Alps, New Zealand

H. Rother (1), David Fink (1), James Shulmeister (2), Evans, Mike (2), Charles Mifsud (1)

(1) Institute for Environmental Research, Australian Nuclear Science and Technology Organisation (ANSTO), PMB 1, Menai, NSW 2234, Australia (henrik.rother@ansto.gov.au)(2) Department of Geological Sciences, University of Canterbury, 4800 Private Bag, Christchurch, New Zealand.

Obtaining reliable absolute geochronologies for former glacial fluctuations in the mid—latitude Southern Hemisphere is critical for understanding past and present global climate dynamics and the mechanisms of interhemispheric climate links. Standard models suggest that major Quaternary ice advances in New Zealand (NZ) were forced by Milankovitch style cooling transmitted from the Northern Hemisphere (NH) either via oceanic or atmospheric pathways. More recently, however, emphasis has shifted to the role of synoptic climate processes, and it has been suggested that changes in regional insolation and variations in the zonal westerly air flow can provide a better explanation for some glacial advances in NZ, particularly during the last glacial transition. If the later model is appropriate the pattern of NZ's sub-orbital glacial chronology is likely to differ more substantially from that of the NH, while a closer NH – NZ link would be expected if direct NH forcing is the exclusive glacial driver in the NZ region.

To address this question we collected a large set of rock samples from moraine sequences and kame terraces of the Rangitata Valley and Lake Te Anau in the Southern Alps for in-situ ^{10}Be and ^{26}Al exposure age dating. All samples were prepared and measured at the ANTARES accelerator facility of the Australian Nuclear Science and Technology Organisation (ANSTO) in Sydney. Results show that the most extensive

LGM ice advances occurred between 24,000 – 27,000 a BP consistent with other records from the region but somewhat earlier than in the NH. Detailed deglaciation data show that recession from LGM positions commenced close to 20,000 – 19,000 a BP followed by an ice still-stand at $\sim$18,000 a BP. Very extensive valley glaciers persisted until 16,000 a BP after which ice retreat accelerated markedly leading to near complete glacial collapse in the Southern Alps within $\sim$1,000 a. On sub-orbital time scales, the results indicate some important differences between NZ and NH glacial chronologies. In particular, some major NZ ice advances (i.e. early LGM) appear to pre-date similar signals in the NH, which would rule out direct forcing from the NH. Although this does not preclude general Milankovitch forcing of glaciation in NZ, our results highlight that NH forcing is not the exclusive glacial driver in NZ and that synoptic style climate variations are the more likely cause for at least some of the major Quaternary ice advances in the Southern Alps.