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## A new Last Glacial-Interglacial Transition varve record from Chilean Patagonia

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High-resolution sedimentary archives, such as glaciolacustrine varve sequences formed in proglacial lakes, can enable detailed reconstructions of past glacier dynamics, assess regional to global climate (a)synchronicity and disentangle oceanic and atmospheric climatic forcing mechanisms. Specifically, glaciolacustrine varved sequences can be utilised to investigate, at an annual resolution, the rates and/or duration of change during deglaciation of a former glacial basin, significantly refining models of ice-sheet deglaciation. Additionally, the identification of tephra layers deposited within varved sequences offer the potential to provide isochronous marker layers, enabling high-precision correlations between sites and palaeoenvironmental archives, and an independent means of generating an absolute age for the varve chronology.

We present new varve data obtained from sediment sections in Chile Chico (-46.53°S, -71.73°W) in the Lago General Carrera (Chile)/Buenos Aires (Argentina) basin in central Patagonia. Here, an ice-contact, proglacial lake formed during the recession of an ice lobe of the former Patagonian Ice Sheet from its local Last Glacial Maximum position ( $18,778 \pm 615$  to  $18,086 \pm 214^1$ ). Sequences of laminated glaciolacustrine sediment accumulated in the palaeolake and have subsequently been exposed following lake drainage. We report on the detailed macro- and micro-facies of the Chile Chico sediments as well as an updated tephrostratigraphy for the region. In particular we (1) develop a process model for the formation of melt season and non-melt season components that suggest a varved origin; (2) present a ~3.5 kyr varve thickness record for Chile Chico that post-dates (<17 ka BP) the Fenix Chico Master Varve Chronology, and (3) detail pilot tephrochronological assessment of the sequences. Consideration is also given to the challenges associated with developing both the varve chronology, where detection of varves is variable and hiatuses and deformation exist within the sequences, and tephrochronology, where distinguishing between eruptive events with this level of stratigraphic resolution is unparalleled in the region.

<sup>1</sup>Bendle, J.M., Palmer, A.P., Thorndycraft, V.R., Matthews, I. P. (2019) Phased Patagonian Ice Sheet response to Southern Hemisphere atmospheric and oceanic warming between 18 and 17 ka. *Sci Rep* 9, 4133