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Using cosmogenic depth-profiles to establish the timing of glaciations in southernmost South America

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Ice sheets in southernmost South America (52 to 54°S) are likely to have been sensitive to oceanic and atmospheric forcing, but the timing of glaciations is poorly constrained. This uncertainty represents a significant gap in our understanding of the southern hemisphere terrestrial-climatic record and stems from two unresolved issues. First, the nature of advance(s) and retreat(s) of the southernmost ice lobes is relatively unknown. Secondly, there is a difficulty in establishing age constraints beyond the Last Glacial Maximum (LGM), with previous cosmogenic nuclide exposure data from boulders yielding ages that are significantly younger (ca. LGM) than the previously hypothesised ages of the ice limits (ca. MIS 8 to 12). This discrepancy was ascribed to post-depositional processes (exhumation and erosion) acting on the boulders. This paper presents the preliminary results of an on-going investigation into the timing of glaciations for these ice lobes, focussing on glacial geomorphological mapping, ice lobe reconstruction and an alternative cosmogenic nuclide depth-profile approach to dating former ice limits. The glacial geomorphological mapping allows ice-sheet reconstruction and highlights locations where there are clear relationships between glaciofluvial outwash and corresponding ice limits. These are the target locations for cosmogenic outwash depth-profiles, which are being used to date the surface of outwash (rather than moraine boulders) whilst accounting for issues of erosion, exhumation and inheritance. The aim is to produce robust ages for the pre-'LGM' limits of the southernmost ice lobes in order to show when ice advances occurred and how this relates to wider Southern Hemispheric climatic change.