

An ~500,000 yr record of tropical glaciation recovered during the Lake Junin (Peru) Drilling Project

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Lake Junín (11.0°S, 76.2°W) is a shallow ($z_{\max} \sim 12$ m), intermontane, high-elevation (4080 masl) lake in the inner-tropics of the Southern Hemisphere that spans ~ 300 km². It is dammed by coalescing alluvial fans that are >250 ka that emanate from glacial valleys. Lake Junín has not been overrun by glacial ice in several hundred thousand years and is ideally located to receive glacial sediment. The Junín basin is underlain by carbonate rocks that have provided a source of Ca and HCO₃ ions; during the present interglacial period precipitation of CaCO₃ in the western margin of the lake has occurred at ~ 1 mm yr⁻¹. An airgun seismic survey reveals a strong reflector at ~ 105 meters depth, which marks the base of the lacustrine section. Drilling focused on three sites. Site 1, located near the depocenter and most distal to glacial sources, yielded a composite sediment thickness of ~ 95 m; Site 2, proximal to glacial outwash fans, yielded a composite thickness of 28 m; Site 3, located at an intermediate distance yielded a sediment thickness of 55 m. The stratigraphy of Site 1 is marked by 8 interstadial units that are characterized by low bulk density and magnetic susceptibility (MS) and high CaCO₃. These units are intercalated with glacial sediment that has high density and MS, and low CaCO₃. The age model for Site 1 is based on numerous AMS radiocarbon dates on terrestrial macrofossils and dozens of U/Th ages on authigenic CaCO₃. Comparison of the MS record of glaciation in Junín over the past 700 ka with the global ice volume record reveals many common features and several prominent differences. The high resolution signal of the last 50 ka suggests that glacial pulses are correlative with increases in tropical moisture and steep meridional sea surface temperature gradients in the North Atlantic.