

Glacier history of the low-mid latitudes of South America and paleoclimate forcings

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Earth's natural changes in and out of ice age conditions represent the largest differences the Earth's climate system has experienced during the last 2.5 million years. These climatic swings comprise a background setting against which human-induced climate change will occur. Researchers are debating the causes of such past climate changes in the low to middle latitudes of the Southern Hemisphere. A school of thought is that at the lowest latitudes energy received from the sun and ocean-atmospheric dynamics (e.g., ENSO) dominate climate change at different time scales. Recent hypotheses, on the other hand, including by LDEO researchers, focus on the importance of the North Atlantic sector and its impact on tropical climate. The idea is that when the North Atlantic sector experiences frigid ice age climate conditions, its extensive sea ice and cold temperatures have a major influence even on the climate of the tropics and low latitudes of the Southern Hemisphere. The problem is that we do not yet know what causes major climate changes on land at different time scales in the low to mid latitudes of the Southern Hemisphere. Basic observations are still needed to define the timing of past climate change on land and evaluate the above potential climate drivers, including those recently put forth. Our aim is to reconstruct the behavior of past glaciers in northwest Argentina, ~24°S, around the Tropic of Capricorn. Small alpine glaciers respond sensitively and rapidly to temperature and precipitation changes. Their history is thus a direct proxy for what atmospheric conditions were over central South America in the past. Our study area is unique because it contains one of the few and best preserved glacial geologic records at these latitudes, ~23 to 26°S. The high elevations of the field sites (4300 to 6000 m) supported some of the only glaciers in this part of the Andes. This award helps jump start this project with our Argentine collaborators.