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# Past glaciation in the Sierra Aconquija, NW Argentina

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The subtropical Andes has been glaciated multiple times in the late Pleistocene, leaving behind extensive moraines in areas that are today arid and unglaciated. Unfortunately, we have a poor understanding of the timings and causes of these advances, despite their importance as terrestrial palaeoclimate archives. Here, we present an analysis of glaciation in the Sierra Aconquija (27°S), NW Argentina. This range has peaks >5000 m and occupies a climatically-sensitive location, receiving precipitation rates of >1500 mm/yr on its eastern side from the South American Monsoon, while also casting a powerful rain shadow on its western side (∼250 mm/yr). The range has no glaciers today, but we characterise three distinct past glacial advances that each terminate at different elevations between 3500 and 4400 m. We map their spatial extents in detail and explore the sensitivity of glaciation to the strong orographic gradient in climate across the Sierra Aconquija. We use a numerical glacier model to simulate the deviations in climate that are needed to explain past glacial episodes in this area. In our initial simulation we prescribe the net mass balance as a linear function of elevation, with an accumulation threshold that depends on mean annual precipitation. Our results show that under the assumption of present-day precipitation, the oldest and most extensive advance would require a temperature decrease of 2.5 °C. On the other hand, imposing the modern temperature field would require an increase in precipitation of >600% to achieve known past glacier extents. As such, we use glacier modelling to constrain the palaeoclimatic conditions in this part of the southern Central Andes during late Pleistocene glacial advances