



GMPE-4: Ciencias de la Criósfera

Rock glaciers as a water resource in the semiarid Chilean Andes in a changing climate

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Rock glaciers likely play an important hydrological role in the semiarid Andes (SA; 27°S-35°S). They supplement streamflow when water is needed most, especially during dry years in the late summer months. Despite their assumed importance, there are no publications that quantify their hydrological contribution to streamflow in the SA, based on measurements of rock glacier ice loss or discharge. In this study we assess the available information on the hydrological importance of rock glaciers in the SA and provide suggestions for future research to address knowledge gaps. We conclude that there is insufficient data available to adequately quantify their hydrological contribution in the SA. Measurements of glacier discharge are limited to unpublished data sets from which only very limited conclusions can be drawn. There are no rock glacier ice volume change measurements or proxies available. Approximations of rock glacier ice volume, calculated from aerial extent, thickness, and percentage of ice content are available and these data provide an initial baseline for calculating ice volume change in the future. While these baseline data are very valuable, they represent rough estimates due to a scarcity of studies, especially on glacier thickness and ice content percent. Using a combination of the minimal glacier discharge data available (all from unpublished data sets) and published discharge values measured at rock glaciers outside of the SA, we estimated the rock glacier contributions to streamflow for the La Laguna Basin (~30.2°N; contains ~15 km² of rock glaciers). At the end of summer (Jan/Feb 2014-2016) the likely range of rock glacier discharge for the entire basin was 0.3-0.5 m³ s⁻¹, with an estimated contribution to streamflow of 18-34%. With increased temperatures and a decrease in precipitation expected in the future, rock glaciers could become an increasingly critical water resource in this region, especially in the Elqui and Juncal catchments. Improved estimates of rock glacier discharge, water content, processes, and hydrology are required to model their future evolution and evaluate their contribution to water resources.