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Glacialmorphological reconstruction of glacier advances and glacial lake outburst floods at the Cachapoal glacier in the Dry Central Andes of Chile (34°S)

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Throughout the Andes Mountain range of South America a general trend of glacier shrinkage has taken place in the last century. Only a few glaciers have shown a rather non-continuous trend of glacier retreat and temporally advanced or even surged during the mid-19th to 20th century. One of the earliest assumed glacier surges has occurred in the upper Cachapoal catchment area at the homonymous glacier. In climatic respect the Cachapoal glacier is located in the transition zone from the most southern part of the Dry Central Andes of Chile to the more humid zone of the Wet Andes. The region is affected mainly by winter precipitation deriving from the Westerlies. The debris-covered, 12 km-long Cachapoal glacier represents one of the largest valley glaciers in the Central Andes. It is an avalanche-fed glacier with an almost 1500 m-high head wall in its upper catchment area flowing down from Picos del Barroso (5180 m) and terminates at an elevation of 2630 m a.s.l. with a bifurcated glacier tongue. A large moraine complex, almost 2 km in length and 500 m in width, separates the two glacier lobes. During times of advanced glacier tongue positions the Ríos Molina and Cachapoal may be have blocked independently at two distinct localities which are situated about 2300 m apart from each other. A blockage with temporal lake formation has occurred at least in the years 1848, 1955 and 1981 (cf. Plagemann 1887, Peña 1981), from which the rupture of the earliest glacier barrier has been the most devastating. This event is locally reminded as „la gran avenida en seco“ in the historical record. Geomorphological evidence of the past historical and modern glacier expansions is given in the proglacial area by a fresh dead-ice hummocky topography and glacial trimlines at the valley flanks. More down valley broad outwash plains and boulder clusters indicate past high energy floods produced by glacier lake outbursts. Regarding the small size of the catchment area of the Río Molina, which has been the main source of the former impounded glacial lakes, the present risk of potential glacier lake outbursts might be considered as comparatively low. The project is financed by the Universidad de Andrés Bello (Santiago de Chile) as well as by the Alexander von Humboldt Foundation.