

EGU2020-11808

<https://doi.org/10.5194/egusphere-egu2020-11808>

EGU General Assembly 2020

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Geophysical characterization of inactive/active rock glaciers in the semi-arid Andes using seismic, geoelectrics and GPR

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Rock glaciers play an important hydrological role in the semiarid Andes (SA; 27°-35°S). They cover about three times the area of uncovered glaciers and they are an important contribution to streamflow when water is needed most, especially during dry years and in the late summer months. Their characteristics such as their extension in depth and their ice content is poorly known. Here, we present a case study of one active rock glacier and periglacial inactive geoform in Estero Derecho (~30°S), in the upper Elqui River catchment, Chile. Three geophysical methods (ground-penetrating radar and electrical resistivity and seismic refraction tomography) were combined to detect the presence of ice and understand the internal structure of the landform. The results suggest that the combination of electrical resistivity and seismic velocity provide relevant information on ice presence and their geometry. Radargrams shows diffraction linked to boulders presence but some information regarding electromagnetic velocity could be extracted. These results strongly suggest that such landforms contain ice, are therefore important to include in future inventories and should be considered when evaluating the hydrological importance of a particular region.