



Potential water storage of rock glacier permafrost derived from geophysical modeling (Central Andes of Argentina)

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Active rock glaciers potentially constitute significant reservoirs and sources of water in the dry Central Andes. However, volumetric ice and water contents of Andean rock glaciers are largely unknown. In this study, we apply the so-called four-phase model (4PM) to quantify the material composition of the talus-derived rock glacier Dos Lenguas and the large rock glacier complex Morenas Coloradas in the Central Andes of Argentina. The 4PM is based on different porosity models for ice-rich permafrost bodies and on geoelectric and refraction seismic tomography that were conducted in the root zone, middle part and on the tongues of both rock glaciers. The spatial distributions of ice and water contents show a heterogeneous pattern. Ice-oversaturated permafrost and massive ground ice with ice contents of 50 up to 90 vol% are two to three times higher in root zones of both rock glaciers compared to lower lying rock glacier tongues containing 20 to 30 vol%. High water contents and saturated subsurface conditions are identified underneath surface depression and furrows indicating effective water pathways. Furthermore increased active layer depths, dissected permafrost bodies, and thermokarst show the influence of thermal erosion on the internal hydrologic structure of both rock glaciers.