



## GMPE-4: Ciencias de la Criósfera

**What is the influence of penitentes on the winter mass balance measurements? A case study on Tapado Glacier (30°S, Chile).**

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In the semi-arid Andes of Chile (26°S–32°S), snow and ice melt are thought to be the primary contributor to stream flow, buffering drought conditions especially in the spring and summer seasons. Therefore, determining snow accumulation and ablation is necessary for the evaluation of water resources. While most studies focus on snow and ice ablation, summer mass balance can only be simulated correctly when the winter mass balance is well documented. Despite its importance winter mass balance measurements are scarce, primarily due to challenges associated with accessing glaciers during the winter period. At Tapado glacier, located in La Laguna catchment in the fourth region of Chile (~30°S), there are large penitentes (> 3 m tall). These not only significantly inhibit access to the glacier, but also complicate snow distribution. While penitentes properties have been investigated over the ablation season, there are, to date, no published studies evaluating their influence on the winter mass balance. In this study, we designed a field campaign in April 2018 to measure the influence of penitentes on snow depth evolution on the glacier over the entire winter period. Two snow depth sensors, as well as temperature and wind sensors were set up in strategic locations recording the snow depth at an hourly time steps. One within a penitente field and a second at the same elevation without penitentes. A classical snow depth sensor can induce large uncertainties in the snow depth measurements due to the large spread of the beam and the low space between the penitentes. Therefore a specific sensor has been made, based on a laser with a beam lower than few centimeters. Indoors and outdoors analysis have been performed to evaluate the precision of the sensor, in comparison to a classical SR50. Results indicate an uncertainty of 3 cm of the sensor, making us confident to install this sensor in real conditions. The experimental protocol and records from the two weather stations are presented in this study.