We present the application of a distributed snow evolution model (Snowmodel) to the Pascua-Lama area in the semi-arid Andes of north-central Chile (29°S). In this area, the seasonal snowpack is the main contributor to the hydrological balance and thus is a critical water resource for downstream areas. Yet, the snow cover dynamics remain poorly understood. This is partly due to the lack of data, which restricts quantitative studies, as well as to the singularity of the key hydrological processes at play, such as snowdrift and sublimation.

In the study area, a high concentration of hydrometeorological data allows the evaluation of Snowmodel for the first time in the Andes. The model was forced by meteorological data from 11 meteorological stations. We assess the model ability to represent i) the effect of wind on snow distribution using remote sensing data, ii) the contribution of sublimation to snow ablation using lysimeter experiments, iii) the snow height evolution using the data of six ultrasonic gauges distributed within the study area and iv) the snow water equivalence using snow courses data.

The results demonstrate the importance of accounting of the effect of wind on snow redistribution in this area, in particular as a possible factor to explain the preferential accumulation of snow onto the glaciers.