



## High Resolution Modeling of a Mountain Glacier in the Chilean Patagonia

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Changes in climate are dramatically shaping the planet, imposing new conditions, and constraints on water systems that are not easy to foresee. The need for an integrated application of methodologies that links advances in climatology with hydrology and water management is now undeniably necessary. Given the latitude of the Chilean Patagonia, the effects of climate change are beginning to show more dramatically. However, there are analogous examples of glaciated systems in other parts of the world that can offer valuable insight into the effects that increases in temperature would have on the evolution of river flows in Patagonia. Where glaciers are present, stream flows are positively/negatively correlated with temperature/precipitation. In equilibrium, glaciers regulate river flows by smoothing the annual streamflow variations. In the Chilean Patagonia, significant attention has been given to the evaluation of lake formation and the impacts of potential Glacier Lakes Outburst Floods, and studies of glacier melting contribution to sea-level rise. In this study, we will use the Weather Research Forecast Hydro (WRF-Hydro) with the Crocus snow/glacier module to model the Paulina glacier hydrology and to estimate the streamflow in the NEF river basin. We use a nested watershed to study and parameterize the models in high resolution. We carried fieldwork to collect streamflow and climate data to calibrate and correct the model results. We used an Unmanned Aerial Vehicle (UAV) to generate a high-resolution elevation model of the glacier terminal, as well as the use of Landsat imagery to determine changes in the glacier area, snow line, and ASTER imagery to determine changes in thickness.

Our expected result is the quantification of the volume contribution of freshwater from a small mountain glacier. Further, we will use this parameterization at a regional setting to evaluate the potential of transferring parameters from a small glacier watershed to a broader context in the Baker River Basin in the Chilean Patagonia.