



## **Parsimonious hydroglaciological modeling for understanding the hydrological role of rock glaciers in the Andes of Central Chile**

Luis Javier Marcoleta Romero (1) and James Peter McPhee Torres (1,2)

(1) Universidad de Chile, Department of Civil Engineering, Maipú, Chile, (2) Advanced Mining Technology Center (AMTC), Universidad de Chile, Santiago, Chile

Glaciers are purported to play a key role in the hydrology of the semi-arid Andes of Central Chile and Argentina (representing almost the entire contribution during late summer), where the presence of debris-covered glaciers (DCG) and rock glaciers (RG) has been largely documented and in some cases surpasses the extent of clean glaciers. However, studies quantifying their hydrological contribution are still few. In this work, we build a hydrological model for the Yerba Loca Creek basin, located close to Santiago de Chile (110 km<sup>2</sup>, 1300 to 5500 meters above sea level) which hosts glaciers of different types (DFG, DCG and RG). We use the Cold Regions Hydrological Model (CRHM), with modifications including: (i) an offline process to calculate the melting from DCG, (ii) annual ice mass redistribution from upper to lower Hydrologic Response Units (HRUs) based on the ice flow equations, focused on DFG. The results of this study have wide implications to the estimation of water resources for mountain, glaciated river basins, improving the ice mass change estimation for glaciers in the area and allowing the projection of future contributions from parsimonious, physically-based equations. The preliminary results show that the contribution of covered glaciers is around 10% to 20% of total glacier contribution; and an improve in the ice mass balance and distribution.