Percolation Flux of Meltwater and Snowpack Density in Mass Balance Measurements on the Juneau Icefield, Alaska and British Columbia, Canada.

Emily Evans, Willamette University
Alec Getraer, Princeton University
Clem Taylor-Roth, Juneau Douglas High School
Mia Vanderwilt, Georgetown University
Andrew Opila, Juneau Icefield Research Program
Zak Horine, University of North Carolina

One sixth of the world’s population relies on glacial runoff or snow melt for drinking water. As global climates warm, changing snowmelt patterns will affect meltwater availability and could contribute to flooding and droughts. Temperate Alaskan glaciers are highly sensitive to climate warming, and through rapid ablation levels have become a primary contributor to modern sea level rise. Understanding the surface meltwater hydrology in these glaciers is critical to projecting the effects of warming climates on global water supplies and sea level rise. The surficial snowpack of temperate glaciers is an important reservoir of meltwater, and contributes a lag between surface melt and mass loss. However, the percolation flux of meltwater through the surficial snowpack is poorly understood. Using liquid water content and self-potential measurements, we quantified the flux of meltwater through the snowpack on the Taku and Llewellyn glaciers on the Juneau Icefield. These measurements may greatly increase the accuracy of both geodetic and glaciological mass balance measurements by constraining local snowpack density estimates. Relating local meteorological patterns to our in-situ measurements of snowpack water content, we tested a method for more accurately predicting snowpack density directly from weather data. This study enhances our understanding of local glacial ablation and may provide a template for studying changes in meltwater hydrology for temperate glaciers around the world.