Microstructural Characterization of Mid-Latitude Snowpack through Micro-Computed Tomography

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ABSTRACT

Understanding the physical and mechanical properties of snow is essential to determining the vulnerabilities of mid-latitude snowpack to climatic shifts. By improving our measurements of snow microstructure, we can refine our understanding of structural, thermal, and optical properties of snow. Micro-computed tomography is a non-destructive imaging technique that produces high-resolution images. We use a Bruker Skyscan 1173 micro-CT scanner housed in a -10 ºC cold room to produce high-resolution (20 μm), two-dimensional, cross-sectional slices that are compiled and segmented to create three-dimensional visualizations of a snow. With these output files, we can calculate snow microstructural parameters such as: total porosity, mean grain size per sample volume, anisotropy, and surface-to-volume ratio with which we calculate specific surface area. These parameterizations can inform our understanding of the radiative properties of snow. These analyzed snow samples were collected in 2020 as a part of the SnowEx Intensive Observation Period in Grand Mesa, Colorado. In concert with the collection of these micro-CT samples, scores of snow measurements were taken, to which we will compare our microstructural parameterizations. Preliminary results show good agreement between ground penetrating radar, snow micropenetrometer, and optically-based microstructural data.

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