Comparing Roughness Metrics with Geometric-based Roughness Lengths for a Snowpack Surface

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Abstract. The snow surface is the interface between the atmosphere and the earth. It is very dynamic, and varies spatially and temporally. Its roughness influences turbulence and is used to estimate the sensible and latent heat fluxes to and/or from the snow surface to the atmosphere. We use airborne lidar-derived snow surface measurements from the NASA Cold Land Process Experiment (CLPX) Fraser Alpine (FA) intensive study area (ISA) collected in late March 2003. A meteorological tower was centered in the middle of the 1 km^2 ISA and meteorological data were used to determine the dominant wind direction. The raw surface elevation data were rotated to yield a 100 by 100m area about the tower, that was square (parallel/perpendicular) to the wind. The data were interpolated to a 1-m resolution. Roughness metrics, including the random roughness, autocorrelation, and fractal dimension were computed, and compared to the geometric-based roughness (z_0). The latter was used to model sublimation.