Geometry Methods to Evaluate Snow Surface Roughness

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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 used different metrics, including the random roughness, autocorrelation, and fractal dimension, geometric roughness length, curvature, and power spectrum density to characterize the roughness of a typical snow surface. The data for the surface come from airborne lidar measurements taken during from the NASA Cold Land Process Experiment in late March 2003 at the Fraser Alpine intensive study area. The surface elevation data were rotated to be parallel to the dominant wind direction and were interpolated to a 1-m resolution. We provide a comparison of methods and present their possible applicability for other datasets.