Assessing the Spatial and Temporal Surface Roughness Using Digital Imagery

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Abstract. Numerical estimation of sublimation relies on quantifying the aerodynamic roughness parameter (z_o). Traditionally, the values of z_o are assumed to be constant, due to the difficulty in measuring aerodynamic roughness variations near the snow surface. Snow surface characteristics, vegetation cover, topography, and solar radiation, among other variables, all affect z_o, causing variations over space and time.

An investigation of the spatial and temporal variations in snow surface characteristics will assist in understanding changes in the aerodynamic roughness, and would provide more accurate predictions of snowpack sublimation and therefore water yield.

Quasi three-dimensional snow surface sampling was undertaken using digital photography for an open site near Cameron Pass along Highway 14 in northern Colorado (at the border between Larimer and Jackson Counties). This paper presents the image analysis procedures and examines the feasibility of using the method for identifying spatial and temporal variability in the snow surface roughness.