Topographic Controls on Depletion Curves Observed from Airborne LiDAR Snow Depth Data

Dominik Schneider (1) and Noah Molotch (1,2)

(1) Institute of Arctic and Alpine Research, University of Colorado, Boulder, United States, (2) Dept. of Geography, University of Colorado, Boulder, United States

The repetition of the spatial pattern of snow cover from year to year are well established and form the basis of depletion curves. In this study, we used the high resolution spatio-temporal dataset from the NASA Airborne Snow Observatory (ASO) to model the snow depth as a function of fractional snow covered area (fSCA) for 1 km grid cells through time. We utilize a bilinear regression to estimate the fSCA breakpoint, the point at which the depletion slope changes. A regression tree analysis with topographic variables of different scales explains 39% of the variance in the fSCA breakpoint. Vegetation height, elevation, and terrain roughness are the main controls. This study provides an observation based evaluation of the shape of the depletion curve, and has implications for improving our understanding of snow distribution and improving the parameterization of depletion curves in hydrologic models.