Local Scale Soil-Snow Interaction and the Impacts of Soil on Snow

MAHSA MORADI[1], JENNIFER JACOBS[1], AND ADAM HUNSAKER[2]

ABSTRACT

The complex interaction between soil and snowpack via energy and mass exchange processes is a critical component of winter at cold regions and has significant consequences for hydrological and ecological cycles. While the impacts of snowpack on the underlying soil and its thermodynamic processes have been widely studied, there are limited studies on soil contributions to the temporal evolution and spatial distribution of snowpack characteristics. The goal of this study is to understand if and how soil exerts controls on snowpack evolution over the course of winter at local scale. The hypothesis is that the soil layers with different physical properties have different thermal and hydrological regimes which impact some characteristics of their overlying snowpack such as its temperature profile. Using observational data at three sites, this study investigates a) if observed depth, temperature, and albedo of snowpacks over different soil layers evolve differently during accumulation and ablation periods and b) how soil physical properties contribute to the temporal evolution of the snowpack characteristics. The study sites, located at the University of New Hampshire Thompson Farm Research Station, Durham, New Hampshire, USA, are selected to represent spatial variability of soil properties and snow depth over the study region. Detailed and continuous observations of meteorological variables, ground heat flux, soil states and snow characteristics including temperature, depth and albedo are collected at these sites to investigate the role of soil layer on snowpack development.

[1] College of Engineering and Physical Sciences, University of New Hampshire, Durham, HN, USA

2 Institute for the Study of Earth, Oceans, and Space, University of New Hampshire, Durham, NH, USA