Poster #11

Modeling Hydrothermal Interaction Within 2D Hillslope

Elchin Jafarov[1], Ethan Coon[1], and Cathy Wilson[1]

[1] Los Alamos National Laboratory, Los Alamos, NM, United States

Contact: Elchin Jafarov [elchin@lanl.gov]

Arctic hydrological processes impose an important feedback on permafrost thermal conditions. Changes in permafrost hydrology could accelerate its thawing, resulting in a positive effect on permafrost carbon decomposition rates. Therefore, it is important to understand how geomorphic and other landscape processes control permafrost distribution and its properties such as soil saturation, ice content, active layer thickness (ALT) and temperature. The Advanced Terrestrial Simulator (ATS) is a collection of hydro-thermal processes designed to work within a flexibly configured modeling framework. ATS includes the soil physics needed to capture permafrost dynamics, including ice, gas, and liquid water content, multi-layered soil physics, and flow of unfrozen water in the presence of phase change. In this study, we directly address one of the tasks of the NGEE-Arctic project by modeling the effect of climate and environmental drivers on ALT and permafrost thickness and its distribution along the subarctic hillslope. Hillslope flowpaths along with vegetation and soil organic matter distribution, variation in soil depth and mineralogy are important components of the subgrid spatial extent of permafrost. This study explores the ways to improve the quality of the permafrost predictions at the subgrid scale and contribute to the better modeling of the permafrost related processes at the pan-Arctic scale.