

Understanding Snow Patterns for Improved Earth System Modeling in the Arctic

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In the Arctic, changes to snow patterns are resulting in shifts to eco- and hydro- system functioning. In this region of the world, shifts in snow properties have reverberating effects on permafrost, ecology, and biology, with notable feedbacks between atmospheric moisture, sea ice, and albedo. While in the lower latitudes, shifts in high elevation snow is largely owing to changes in temperature, the Arctic cryosphere exhibits strong coupling between changes in snow, atmospheric moisture transport, and soil and air temperatures. The Next Generation Ecosystem Experiment (NGEE)-Arctic has been working to understand how changing snow patterns affect evolving permafrost and vegetation on the Seward Peninsula, Alaska. Recent work (2016-2019) has uncovered the tight coupling between climate, vegetation, and snow patterns, with important ramifications for permafrost condition. In the coming phase of the project, intensive field sites will be expanded to a broader region and will integrate with SnowEx and ABoVE studies to relate ground-based field data and remotely sensed information on snow and vegetation. The intensive field campaign and resulting analysis and modeling will inform improvement of the snow component of the Exascale Earth System Model Land Surface Model (E3SM-ELM) in Arctic regions.