Poster #1-26

Integrated Modeling for NGEE-Arctic Phase 3: New Modules of Predictive Capability for E3SM

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Phase 3 of the NGEE-Arctic project will have as a primary modeling goal the integration of multiple modules of new predictive Arctic tundra capability within the E3SM Land Model (ELM). This goal builds on extensive fine-scale and intermediate-scale modeling capabilities already developed by NGEE-Arctic, and provides a direct pathway for climate-scale integration of new observational and experimental knowledge gained within the question-based NGEE- Arctic research areas. Six specific areas are being targeted for new predictive modeling capabilities within ELM: 1) representation of sub-grid inundation fraction, and the influence of inundation on other thermal, hydrologic, and biogeochemical processes; 2) Improved parameterization of sub-grid hillslope processes to capture variation in atmospheric forcing as well as hillslope process connectivity; 3) interactions of snowpack with surface weather, terrain position, and vegetation structure, and the influence of varying snowpack on thermal, hydrologic, and biological processes; 4) representation of alder as a unique component of the Arctic shrub tundra community, including its roles in nutrient cycling; 5) improved predictions of pan-Arctic dynamic biogeography to represent future distributions of vegetation types and traits; and 6) improved representation of the oxic/anoxic transitions in Arctic tundra soils and the influence of these on other biogeochemical processes. Examples of foundational work in each of these areas is presented, along with forward-looking descriptions of how these new modules will be incorporated in ELM, and the expected outcomes for regional, pan-Arctic, and global climate system predictions.