GC33F-02 The Influences of Land Surface Properties on Soil Thermal Regimes in the Low Arctic of Northwestern Siberia

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Understanding the feedbacks among climate, permafrost, and vegetation is crucial for assessments of arctic ecosystem vulnerability and response to climate change, and for development of sustainable engineering and management methods associated with infrastructure. Vegetation, snow cover, and near-surface soil organic layers are key determinants in regulating the energy exchange between the atmosphere and the deeper soils. Here we present high-temporal resolution soil thermal regime data over annual time extents for multiple sites at two locations in the Low Arctic of northwestern Siberia. At a location near Nadym, Russia, we measured soil temperatures at various depths in the soil profile (down to 60 cm) at three sites: 1) a boreal forest stand with lichen understory and a shallow organic layer (8 cm), 2) a young, cryoturbated *Sphagnum* peatland with soil organic layers to 40 cm depth, and 3) an old *Sphagnum* peatland with deep organic soil horizons (58+ cm). At a location near Kharp, Russia, we measured soil temperatures at 5 and 20 cm depth for sites along a chronosequence of tall alder shrub expansion, from short-statured tundra to mature and old alder stands, with deeper organic layers. The deeper snow accumulation at the Nadym forest site kept winter soil temperatures dramatically warmer than the peatland soils, up to 8 °C difference, but the shading of the forest tended to cool the surface during the summer. The overall effect of the forest was cooler summer soils in the near-surface layers, yet warmer summer soils at the deeper layers (20-60 cm). The forest location had substantially greater thawing degree days at depth (20-60 cm), compared to the *Sphagnum* peatlands. At the Kharp site, mature alder shrub stands cooled summer soil temperatures relative to shorter tundra by up to 8 °C (at 20 cm depth), yet warmed winter soils by greater than 10 °C. Mature and old shrubland locations had reduced thawing degree days at 20 cm depth relative to short-statured vegetation. Both datasets suggest that the surface and soil organic layers play a key role in buffering active layer deepening in the summer, potentially preventing permafrost from degradation with warming temperatures; therefore, land management efforts that support and maintain thick organic layers are essential for permafrost stability.

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