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Soil temperature response to climate change along a gradient of Swedish boreal forest

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Complex non-linear relationships exist between air and soil temperature responses to climate change. Despite its influence on hydrological and biogeochemical processes, soil temperature has received less attention in climate impact studies. Here we present and apply an empirical soil temperature model to four forest sites along a climatic gradient of Sweden. Future air and soil temperature were projected using an ensemble of regional climate models. Both air and soil annual average temperatures were projected to increase, but complex dynamics were projected on a seasonal scale. Future changes in winter soil temperature were strongly dependent on projected snow cover. At northern site, winter soil temperatures changed very little due to possible insulation of snow cover but southern sites showed the largest projected winter soil temperature warming. Projected soil warming was greatest in the spring (up to 4oC) in the north, suggesting early snowmelt regimes, extension of growing season length and possible shift in the northern boreal biome. This showed that the projected effects of climate change on soil temperature in snow dominated regions is complex and general assumptions of future soil temperature responses to climate change based on air temperature alone are inadequate and should be avoided in boreal regions.