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Snow-vegetation interactions across the tundra-taiga interface: stabilising feedbacks or drivers of rapid environmental change?

R. Holden
United Kingdom (r.d.holden@durham.ac.uk)

Mountain Birch, *Betula pubescens ssp. czerepanovii*, forest in the Abisko area, Swedish Lapland, becomes increasingly patchy towards the tree limit. Where these patches occur mature individuals give way to dwarf shrub tundra in the space of a few meters. Further north, or uphill, of this patchy region the landscape is void of mature trees. Whilst broadly accepted that treeline position is correlated with a particular air temperature, temperature alone cannot explain the observed patchiness of the forest, as it varies little on this scale. Winter snow regime is likely to be an important controlling factor of the position of forest-patch edges. Snow cover protects delicate seedlings from blowing snow and ice particles, as well as providing insulation from freeze-thaw cycles capable of damaging fine roots, however, too great a depth of snow is likely to shorten the growing season to a point where seedlings cannot maintain a positive carbon balance. An insulating layer of snow also ensures that soils stay warmer through the winter months, therefore soil processes continue for longer, resulting in enhanced nutrient availability during the spring, compared to soils experiencing a thin layer of snow cover. Soil moisture, soil disturbance and vegetation cover may also be important controlling factors and these may depend to some extent upon winter snow regimen. Trees are able to trap wind-blown snow by decreasing local wind speed. Presence of trees will result in areas experiencing greater snow cover than a tree-free landscape. Once trees establish they may be able to modify the local environment, in terms of snow depth, creating further areas suitable for forest establishment. This is likely to be particularly true of areas downwind of existing tree patches. Where a sudden change is observed it is likely that a 'switch' is operating, allowing a sudden future change to occur if the system is perturbed. Investigating processes that control the switch between forest and tundra will provide insight into how this important area may respond to the changing climate. This is particularly important to understand as changes on this landscape are likely to have significant impacts on the climate, due to tundra having a much higher albedo than forest during the snow-covered period.