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INFLUENCE OF SITE- SPECIFIC FACTORS ON TEMPERATURES OF THE ACTIVE LAYER AND SEASONALLY FROZEN GROUND, MONGOLIA

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Factors that contribute on permafrost degradation are anthropogenic disturbances, including overgrazing, forest clear-cutting and forest fires. The forests are distributed in a mosaic pattern and overlap considerably the permafrost regions in central Mongolia; river discharges originate entirely from the high mountains and northern territory where permafrost occurs extensively (Dashtseren et al. 2014; Ishikawa et al, in press). Permafrost underlying forested north-facing slopes and seasonally frozen ground underlying mountain steppes on south-facing slopes co-exist within a small mountain basin that represents the most general landscape type in northern Central Mongolia, where we have been continuously measuring the micro climate components at two sites since 2003 and surface temperatures at 100 sites since 2015. The purpose of the article is to describe records of comparable hydro-meteorological parameters on these slopes, with a special focus on the site-specific factors controlling ground temperatures regime on these slopes with different exposition.

The result shows that the ground surface temperature (GST) in summer is exceeded air temperature at mountain steppe slopes, contrary to forested slopes. In contrast, GSTs in winter were lower at the mountain steppe slopes than at the forested north slopes. The mean annual ground surface temperature ranged from 0^{o} C to -2.4^{o} C at forested slopes and from 0^{o} C to +7.0^{o} C at steppe slopes. These differences in GST between the south and north exposed slopes could be mostly explained by solar radiation (R) allocation and variations in snow covers on the slopes. Despite of different topographical conditions, the amounts of solar radiation over the slopes were similar in summer, but not in winter. Furthermore, the forest canopy prevents 33–86 % of the total annual amount of solar radiation reaching the forest ground (Dashtseren et al. 2014). It suggests that the GST is usually related to forest cover and not to the site exposition. Soils at steppe slopes are characterized by low moisture. In contrast, soils in forested slopes contain abundant water and covered by thick organic layer. The thermal conductivities (k) at steppe slopes were less variable with values ranging 0.92W/mK (winter mean) and 1.04 W/mK (summer mean). However, the forested slopes have high variability of k, ranging from 0.57W/mK (summer mean) to 1.14W/mK (winter mean) due to a combined effect of thick organic layer and soil moisture. It is therefore likely that the higher R and k at steppe slopes contribute to a warm soil layer during summer compared to soil layer at forested slopes. There is a less snow cover in winter and a similar amount of k during summer time in the steppe slopes, releasing more heat from ground to the atmosphere, enabling deep seasonal freezing at the steppe slopes. In winter, due to the higher value of k and low R, the ground temperature fell rapidly, which leads to quick refreezing of the active layer at forested slopes. This result may confirm that the forest occurrence and thick organic layer are the most important key factors controlling the existence of permafrost and seasonally frozen ground in this area.

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