P1. The Influence of Forest Clear-cutting on the Thermal and Hydrological Regime of the Active Layer near Yakutsk, Eastern Siberia

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Abstract

Thermal and hydrological conditions in the active layer were investigated at a mature larch forest and an experimental cutover, to clarify the characteristics of heat and water budget in the active layer and to assess the influence of clear-cutting on permafrost and active layer conditions. Clear-cutting enhanced ground thawing and the difference in the active layer thickness between the forest and the cutover after 1 year was 14 cm. The soil water content drastically decreased at the forest, while that at the cutover was retained during the first thaw season after clear-cutting. Although the ground heat flux continued to increase at the cutover (the difference in the total amounts between sites from May to August were 44 and 69 MJ/m^2 in 1-year and 2-year after the clear-cutting, respectively) marked changes in the active layer conditions were limited only to the first thaw season. The correspondent differences in the active layer thickness between the sites were 16 and 14 cm in 2-year and 3-year, respectively. Thermal and hydrological analyses of the active layer revealed that the storage of latent heat was a predominant component in the energy balance in the active layer. Thus, the soil moisture condition, especially spring ice content in the active layer, plays an important role in controlling the energy balance of the active layer. Further increases in the maximum thaw depth at the cutover site were inhibited by the thermal inertial effect of the larger amount of ice in the second spring after disturbance. This suggests a self-retention mechanism of the active layer thickness after forest disturbance in this continuous permafrost zone.