# Effect of precipitation on interannual variability of permafrost active layer thickness at larch forests in eastern Siberia

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Seasonal freeze and thaw cycle of permafrost active layer in terrestrial ecosystem depends on both climate and physical characteristics of the vegetation cover and active layer soils. This study investigated interannual variability of active layer thickness with focus on effect of precipitation and accordingly soil water in the active layer. We analyzed two field data obtained at two larch-dominated forests mixed with birch and willow, in the southern and middle parts of the Lena basin. One is the Spasskaya Pad station (SP) on alluvial terrace near Yakutsk (62° 15´N, 129° 14´E). The other is Elgeeii (EG) station (60° 0´N, 133° 49´E) located at erosional plain, 300 km southeast of Yakutsk. Reflecting different geographical location. Sensitivity of active layer thickness was tested with the land surface model.

Based on continuous measurement of soil temperature and water, we found difference of temperature and its seasonal pattern is larger in freezing period than thawing period. Soils at EG freeze slower with longer zero curtain period, especially in the deeper layer. Length of the zero curtain period depends on soil water. Therefore, the minimum temperature was higher and recorded in one month later at EG, compared to SP site. As a result, the difference in soil temperature just before thawing is higher at EG. Deeper snow accumulation at EG also could act as insulation to impede decreasing temperature. In contrast, the difference in temperature during thawing period was small. In spite of the lower temperature before thawing at SP, higher penetrating solar radiation to the forest floor and thinner organic accumulation layer could promote energy input into the active layer. Dependency of seasonal thawing speed on the soil water was complicated, compared to the freezing period. Although the wetter soil condition promoted thawing because of high thermal conductivity, these relationships was unclear close to the ground surface, in which the air and surface temperature dominates thawing speed in the drier soil condition.

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