24. Epigenetic Salt Accumulation and Water Movement in the Active Layer of Central Yakutia in Eastern Siberia

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Abstract

Observations of soil moisture and salt content were conducted from May to August at Neleger station in Eastern Siberia. Seasonal changes of salt and soil moisture distribution in the active layer of larch forest (undisturbed) and a thermokarst depression known as alas (disturbed) were studied. Electric conductivity (EC_e) of the intact forest revealed higher concentrations that increased with depth from the soil surface into the active layer and the underlying permafrost, 1 mS cm^{-1} at 1.1m to 2.6 mS cm^{-1} at 160 cm depth in the permafrost. However, maximum value of 5.4 mS cm^{-1} at 0.6 m depth was found in the dry area of alas. The concentration of ions, especially Na^+, Mg^{2+}, Ca^{2+}, SO_4^{2-}as well as HCO_3^- in the upper layers of this long-term disturbed site indicates the upward movement of ions together with water. Higher concentration of solutes was found in profiles with deeper seasonal thawing. The accumulation of salts in alas occurs from spring through the growing season. The low concentration of salt in the surface soil layers appears to be linked to leaching of salts by rainfall. There are substantial differences between water content and electric conductivity of soil in forest and alas. Modern salinization of the active layer in alas is epigenetic, and it happens in summer as a result of spring water collection and high summer evaporation; the gradual salt accumulation in alas in comparison to forest is controlled by annual balance of water and salts in the active layer. Present climatic trends point to continuous permafrost degradation in Eastern Siberia increasing the risk of surface salinization which has already contributed to change the landscape by hindering the growth of forest.