# 22. Thermokarst transformation of soil cover on cryolithozone flat territories

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## Abstract

The large territory of land surface of the Earth is occupied by permafrost zone. The area of cryolithozone on the Northern hemisphere takes 22,35 million sq. km, including continuous permafrost on the 7,64 million sq. km. and discontinious on the 14,71 million sq. km. On the plains of cryolithozone the ice complex is widely developed. For example, in the Central Yakutia the depth of ices of ice complex amounts 40-60 m, they occupy up to 40-50 % of the ground's volume. On the lowlands of northern latitudes the Arctic type of ice complex (edoma) is distributed. The volumetric content of ice there takes up to 90 %. The fluctuations of thermal conditions during Holocene have led to the partial degradation of underground ice and have caused thermokarst transformation of relief with alas formation and have led to the changes of soil cover of initial plains.

At present time on the Central Yakutia alases occupy about 20 - 30 % of whole area. On circumpolar regions of Eurasia and Northern America the thermokarst occupies the huge area within the limits of the northern taiga zone, forest-tundras and tundras. On the Yana-Indigirka and the Kolyma lowlands only about 25 % of territory represents plain with an ice complex, other part of lowlands is changed by thermokarst and activity of big and small rivers. Thermokarst is a long-term process, and its initiators are primary and residual lakes which accumulate solar energy and lead to the gradual degradation of the ice complex.

Thermokarst formation of alases, its functioning and dynamics in the aggregate promote the evolution of cryolithozone's natural look and aspect, and it is considered as an unique **alas process** (Desyatkin, 1991, 1993). Alas process leads to the degradation of soil cover on primary plains and promotes the formation of other soil forming beds, different from soil forming beds on the plains with an ice complex. During alas procces occures the repeated cyclic change of hydromorphous and xeromorphous stages, and in alases happens the formation of layered soil-forming beds with water-marsh origin. Heterogeneous lamination of alas deposits promotes the disturbance of classical structure of soil profile (_-B-_), formed on these layers and leads to the occurrence in a structure of alas soils not only surface, but also buried organogeneous horizons of the lake and marsh genesis. Such horizons are designated by LD index (*Lakustrine deposits*). The horizon is frequently represented by turfed sapropelic deposits, less often, by carbonaceous layers with heavy granulometric structure. The amount of LD horizons shows how many cycles of metamorphical developments there have been passed. The thickness of LD horizons gives the representation about duration of lake and marsh development phases.

In conditions of global climate changes grows the probability of thermokarst transformations of zonal soils into the intrazonal (alas soils).