



## Climate-related changes in thermokarst terrain in Russian Altay Mountains

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The Altay Mountains is the largest area of widespread mountain permafrost in Siberia. In Russia it occupies approximately 92,000 km<sup>2</sup>. The climatic variations during the 20th century and especially during the last three decades have impacted on current permafrost temperatures. Observations over the last 40 years show that permafrost warmed by 0.3° - 0.4°C, and average active-layer thickness increased by 20 - 25 per cent in comparison with the 1960s.

Thermal degradation of ice-rich permafrost with coincident subsidence of the ground surface has recently resulted in extensive thermokarst and creation of new lakes on the Eshtikol Plateau (EP) and Dzhulukul District (DD) in South-East of Russian Altay.

Thermokarst is a type of pseudokarst. This term is the abbreviation of the phrase “the thermal karst”. It was introduced by Ermolaev in 1932 and has been used in Russia and in other countries for describing subsided landforms generated due to the thawing of permanently frozen rocks with a very high content of the underground ice. The thermokarst is generated primarily by changes in the conditions of heat exchange between the frozen grounds and atmosphere, which results in an increase in the depth of the seasonal active layer.

GIS Analysis of aerial photography and satellite images indicated that widespread ice wedge degradation had not yet occurred before 1952. Our study documented a net increase in lake area and the number of lakes exceeding 0.2 - 2 ha in size in the continuous permafrost zone and suggests an increase of 52 % on a 3,000 km<sup>2</sup> territory (EP and DD) between 1952 and 2007, with the greatest increase between 1972 and 2000. Field observations indicate that in some locations thawing permafrost creates thermokarst lakes, while in other situations, thawing promotes talik development and draining of lake.

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