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Modern Dynamics of Permafrost Temperature at the Northern Yakutia.

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Northern Yakutia is characterized by a cold continental climate (mean annual air temperature is from -10.6 to -13.5°C). In terms of air temperature dynamics the period of the last 30 years can be divided into 2 stages: from 1980 to 1996-97 when the air temperature was relatively stable and from 1997 to the present time – the period of sustained warming. Permafrost is continuous here and has a thickness up to 700 m. It is the most ancient permafrost in the Northern hemisphere that had never been completely thawed during the Quaternary period.
The network of geothermal observations includes 10 boreholes located in different natural zones within the region. 5 boreholes are situated in the tundra, 3 in the boreal forest and 1 within the Kolyma river flood plain.
Mean annual ground temperature (MAGT) varies in the range from -12.3°C to -2.6°C depending on latitude and landscape.
Comparison of modern observations and published data shows that the most significant changes in permafrost temperatures took place on the Kolyma Lowland. Permafrost temperature increased here by 1.5-2°C since 1980.
Based on observation and published data analyses the following conclusions can be made.
Modern mean annual ground temperature in this region varies in a wide range from –12.3° to –2.6°.
Despite the absence of a latitudinal zonality in air temperature, the reduced warming influence of snow at the coastal sites in this region leads to a northward decrease in mean annual permafrost temperature (1°C by the 1o of latitude). It caused by the change of snow cover warming impact southward from the Arctic basin coast. From a rough estimate using the Kudryavtsev approach (Kudryavtsev, 1974) the warming influence of the snow is 0.5 to 1.5°C at the north-western part with a relatively maritime climate, while in the southern and eastern parts with more continental climate it is 3.5 to 4.5°C.
Permafrost temperatures in this region did not change significantly from 1980 up to the end of the 20th century. However, a permafrost warming trend is very noticeable over the entire region over the last several years, with a rate of increase of mean annual ground temperature up to 0.2ºC per year in boreal forest area and 0.1ºC in tundra.
Climate-affected local changes in ecosystems, especially vegetation and micro-topography, can reduce warming effect on permafrost temperature snow redistribution at the beginning of the winter season within some specific landscapes. This leads to the decreasing of the average winter ground temperature and reducing of the warming air impact.
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