Print Close Window

Proof

Print

CONTROL ID: 1491577

TITLE: Influence of ecosystem conditions on permafrost temperature dynamics of the lower Kolyma region.

ABSTRACT BODY: The region of the lower Kolyma river in northeast Russia is characterized by a broad variety of ecological and permafrost conditions. Geothermal measurements that have been done in the 5 boreholes in this region show that in the boreal forest natural zones recent permafrost temperature varies from -2.6 to -6.4°C and at the Kolyma-Panteleiha floodplane from -4.7 to -5.5°C. Such significant variations within the small area can only be explained by the different surface heat transfer conditions in the various ecosystems.

Terrestrial ecological surveys conducted in July 2012 around the boreholes allow us to estimate how differences in the soil organic layer, surface moisture, microtopography and vegetation can affect permafrost temperature.

Due to lower thermal conductivity (0.6 – 0.8 W/(m*°K)), existence of a thick organic layer (peat and fibrous) at the ground surface prevents propagation of summer heat into permafrost, while the sites with active layer mostly composed of mineral soil (thermal conductivity 1.2 – 1.5 W/(m*°K)) are characterized by higher permafrost temperature. Vegetation and landscape characteristics are also important regulators of permafrost temperature. Tussocky microtopography leads to snow redistribution at the beginning of the winter period, which results in lower permafrost temperature.

These observations of ecosystem conditions in concert with permafrost temperature monitoring will allow us to test the hypothesis that some ecosystem changes induced by climate warming can protect permafrost. For example, one of boreholes located in the Kolyma floodplane did not show any significant changes in permafrost temperature over the last 30 years, despite increases in mean annual air temperature across the region. The observed stability of permafrost temperature may have been due to rapid ecosystem changes (tussocks growing and willow shrubs spreading) that have occurred at this site.

This research highlights the importance of ecosystem characteristics in regulating permafrost temperatures and the potential for changing ecosystem dynamics to increase the resilience of permafrost to thawing as the climate warms.

CURRENT SECTION/FOCUS GROUP: Global Environmental Change

CURRENT SESSION: GC019. Environmental, Socio-economic and Climatic Change in Northern Eurasia and Their Feedbacks to the Global Earth System

INDEX TERMS: [0702] CRYOSPHERE / Permafrost, [1631] GLOBAL CHANGE / Land/atmosphere interactions.

AUTHORS/INSTITUTIONS: A. Kholodov, , Geophysical Institute UAF, Fairbanks, AK;
A. Kholodov, , Institute of Physical-Chemical and Biological Problems of Soil Science RAS, Pushchino, RUSSIAN FEDERATION;
V.V. Spektor, V. Andreeva, , Melnikov Permafrost Institute, Yakutsk, RUSSIAN FEDERATION;
S. Davydov, S.A. Zimov, , North-East Science Station, Chersky, RUSSIAN FEDERATION;
S. Natali, , University of Florida, Miami, FL;

SPONSOR NAME: Alexander Kholodov

CONTACT (E-MAIL ONLY): akholodov@gi.alaska.edu

TITLE OF TEAM:

Product version number 4.0.0 (Build 56)
Build date Aug 07, 2012 12:22:26. Server tss1be0013