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Activation of thermal denudation under recent climatic fluctuations, Central Yamal, Russia

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Climatic fluctuations over the past few years significantly affected the increase of cryogenic processes activity in the tundra zone of the Yamal Peninsula. On Central Yamal a large-scale cryogenic landsliding was observed in 1989, while cryogenic earth flows were actively developing since 2012 through tabular ground ice thawing. As a result, thermocirques form on lakeshores.
Key area (research station "Vaskiny Dachi" on the Se-Yakha and the Mordy-Yakha interfluve) during the period from 1989 to 2012 was characterized by a local occurrence of thermal denudation. By 2010, remote sensing data showed that this process in the study area was usually inactive and thermocirques looked stabilized, overgrown by vegetation.
Extremely warm summer of 2012 resulted in formation of new thermal denudation features, such as cryogenic translational landslides, cryogenic earth flows and furthermore, thermocirques, complex landforms resulting from ice wedges and tabular ground ice thaw. The 2012 warm season was characterized by a deeper active layer: at the end of the warm period deeper by 15% than the average for the 1993-2011. Observed were indications of a high pore pressure in the active layer: effuse of liquefied clay in the tension cracks on many slopes. By 2013, according to the field and remote sensing data, there were more than 90 active thermal denudation landforms from 66 to 25000 sq.m in size on the territory of 345 sq.km.
Thus, at the present in the tundra of the Yamal Peninsula the predominance of the processes associated with tabular ground ice thawing (cryogenic earth flows) over the processes associated with the ice formation at the bottom of the active layer (cryogenic translational landslides) is observed. It is caused by both a periodic deepening of the active layer, and consecutive increase of ground temperature.
Activation of thermal denudation observed on the Yamal Peninsula last years is associated with extremely warm spring and summer of 2012. By the end of the warm season thawing of the top of icy permafrost and tabular ground ice on some slopes resulted in cryogenic landsliding and further thermocirques development.
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