The specificity of thermal denudation feature distribution on Yamal and Gydan peninsulas, Russia

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Thermal denudation is a combination of the processes responsible for the formation of retrogressive thaw slumps (cryogenic earth flows) and thermocirques. Thermocirques are the depressions with a semi-circle shape resulting from tabular ground ice thaw. Environments characteristic of Central parts of Yamal and Gydan peninsulas forming the so called Kara sub-latitudinal transect, are favorable to activation of thermal denudation. The key factors are continuous permafrost distribution and shallow occurrence of tabular ground ice.

An increase in ground temperature and active layer thickness in 2012-2013 cause the intensification of thermal denudation along Kara sub-latitudinal transect. Field studies in the area of “Vaskiny Dachi” research station as well as remote sensing of 2018 data demonstrates the presence of both active and stabilized thermocirques during.

This research presents preliminary results of collecting and analyzing the distribution of more than 400 landforms caused by thermal denudation identified in central Yamal and central Gydan peninsulas. Coastal thermodenudation landforms were not taken into account to exclude the influence of wave erosion in this study. Such work became possible due to free of charge satellite images with a very high spatial resolution available at the service Yandex.Maps (https://yandex.ru/maps/).

In Yamal peninsula, we identified 63 active and 53 stabilized thermodenudation landforms, in Gydan peninsula, 169 active and 166 stabilized, respectively. Active thermodenudation features concentrate in the western and southern parts of central Yamal, while stabilized dominate in western and central parts. In central Gydan both active and stabilized features of thermal denudation are located at northwestern part and are distributed more evenly compared to Yamal.

Northern border of all identified thermodenudation features for both Yamal and Gydan peninsulas is located at 71 degrees North, and the southern border at 69 degrees North. Despite the difficulties of visual interpretation of thermal denudation features, we defined the majority of them as thermocirques, most of which are located along lake coastlines. Such indication was also confirmed by in-situ data collected during multiyear field campaigns in the study area. These results reveal a prevalence of thermal denudation features in the study area and the collected data gives us an opportunity for spatial analysis of their distribution.
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