

## **New Data on Thermal Denudation and Thermal Abrasion Rate on Western Kolguev Island Based on High Resolution Satellite Images**

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INTRODUCTION. Destruction mechanisms and dynamics of the Arctic coast, including the western sector of the Russian Arctic, where our observations took place, are studied in detail, including the use of remote sensing methods. However, data on thermal abrasion and thermo denudation of Kolguev Island is quite limited. Some estimates are presented in article M.A.Velikotsky (1998). Determination of a speed of thermo denudation breaks in the key area near the mouth of the river Sauchiha for the period 1948-2002 years was done by the authors earlier (Kizyakov& Perednya, 2003; Perednya et al., 2003).

To obtain data about the modern (after 2002) shoreline retreat rates and growth of thermal cirque a high resolution remote sensing data are involved in our research.

METHODS AND KEY-SITE. Part of the western coast of Kolguev Island was inspected in field work conducted on 2002 by ECI SB RAS, together with VNIIOkeangeologia. The object of research was the part of coast, including a group of three coastal thermal cirques. In 2012, within the project "Geoportal of MSU" operational satellite imaging was done by satellite FORMOSAT-2. High resolution satellite imagery provides

ample opportunities for visual interpretation of coastal landforms. Aerial photographs (1948, 1968), surveying materials (2002), satellite images (2009, 2012) became a basis to study the dynamics of the coast.

RESULTS. Calculations for key area:

retreat rates of the edge of the coastal terraces and thermal cirques for the periods 1948-1968, 1968-2002, 2002-2009, 2009-2012;

retreat rates of the foot of the coastal terrace for the periods 2002-2009, 2009-2012;

volume of the material enters the coastal zone by the thermal abrasion for one linear km of a coast.

Average long-term rates of retreat of the coastal terrace during: 1948-2012, 0.7-2.4 m/year; 2002-2012, 1.7-2.4 m/year. Identified rates are distinctive for the part of coast from the mouth of Krivaya River to the curve of coastline near the mouth of the Gusinaya River, a length is 60.5 km.

Averaged growth rates of the thermal cirques: 1948-2002, 2.4 m/year; 2002-2012, 2.6 m/year. The maximum growth rates on some sections in 2009-2012, 14.5-15.1 m/year. The cause of the abnormally high rates is an increase the annual amount of positive air temperatures, which in 2011-2012 were 1.4-1.5 times higher than the long-term average.

The determined rates of the development of thermal cirque can be extended to the north from the key area to the mouth of Gusinaya River a total length of 32.3 km.

#### CONCLUSIONS

1. Modern rates of thermo denudation and thermal abrasion were obtained by using very high resolution satellite imagery. Averaged growth rates of the thermal cirques: 1948-2002, 2.4 m/year; 2002-2012, 2.6 m/year.

2. The maximum growth rate: 2009-2012, 14.5-15.1 m/year. These rates are the highest for the previously recorded in the western sector of the Russian Arctic.

3. Average rates of retreat of the coast without thermal cirque: 2002-2012, 1.7-2.4 m/year. These rates are in 1.1-1.5 times lower than average rates of retreat of thermal cirque edges which are connected with melting of massive ice deposits.