

GIANT CURRENT RIPPLE MARKS: REMOTE SENSING OF NEW LOCATIONS ON THE EARTH. A.N. Rudoy¹ and S.S. Chernomorets², ¹Faculty of Geology and Geography, Tomsk State University, Russia, rudoy@tspu.edu.ru, ²Faculty of Geography, Lomonosov Moscow State University, Russia, devdorak@gmail.com.

Introduction: Giant current ripple marks usually emerge following rapid outbursts of large proglacial and rock-dammed lakes given extremely high intensity of flow. They represent morphological and genetic macro-analog of sand current ripples. We have produced analysis of known locations of giant current ripples and geographic conditions in which emergence of current ripples is possible at today's stage of active degradation of glaciers and mass formation of large proglacial lakes. Remote research was carried out – satellite image interpretation for various mountainous regions of the world – to discover other parts of the giant current ripples terrain [1].

Discussion: Emergence of the exotic relief of giant current ripples is connected with outburst of large lakes dammed by glacial or landslide dams. After the outburst, the river faces extremely high intensity of flow for some time, and a terrain in the form of diluvium or flood dunes with height of dozens of meters emerges [2]. Until recently, three areas of giant ripples were thoroughly examined: basin of Columbia River in the north-west of the USA, Altai and Tuva in Russia [2,4]. The age of the ripples in these areas goes back to the end of the late Pleistocene within the range of 7-22 thousand years ago [2]. As for other areas, giant ripples have not been examined, although they play a big role in paleo-hydraulic reconstruction.

Based on the ripples prior research, we have performed remote sensing and surface study in Altai ([5,6], Fig. 1) to find and examine ripples, learn about conditions of its emergence, and clarify its geographic distribution. We have used QuickBird highresolution images published in Google Earth as the main material for the remote study. We have identified search criteria for ripples based on which we have selected and interpreted considerable mountainous areas. High emphasis was placed upon relatively recent forms of ripples that are in better condition

than Pleistocene ones. Upon finding the forms of ripples, we have started searching for corresponding terrain forms, e.g. terraces marking the level of former lakes. That is, we have discovered diluvial morpholithologic complexes described in [2]. We have also analyzed publications describing events that may have led to emergence of the ripples on the areas discovered. While carrying out the remote study of the surface, the following circumstances were taken into consideration and the following areas were paid special attention to: -extensive highland valleys with the marks of their blocking; - diluvial dunes and anti-dunes in several terrains across the valley. If giant ripples are discovered in one place, they can usually be found in other places up or down the stream at the distance of several kilometers just like in the Altai and Tuva areas studied; – lake terraces and dropstones. Apart from the western part of the USA, Altai, and Tuva, giant ripples are located in: -the Alsek River valley (St. Elias Mountains, Canada) [4]; - the Yarlung Zangbo river valley (Tibet, China) [4]; -in the upper reach of the Hunza river and farther along the Indus river (north of Pakistan) at the 170-kilometer distance starting from Gilgit City; -in the Indus River valley near Skardu (north of Pakistan); -in the Nubra River valley (Kashmir, India).



Fig.1. The Great Field of Giant Current Ripples in Kuray Basin, Altai, Russia. Picture by A. Rudoy (August 19, 1991)



Fig.2. Giant ripples in the Alsek River valley, St. Elias Mountains, Canada. Picture by S.S. Chernomorets.

Apparently, diluvial dunes in the Alsek River valley are the youngest (Fig. 2). Emergence of these dunes dates to the end of XIX – beginning of XX centuries [3]. Glacial dams have emerged here at least four times due to the Alsek River ponding given surge of the Lowell Glacier. We made a survey of the valley from the helicopter and interpreted clearly defined forms of the relief of the current giant ripples [1]. In addition, we discovered marks of old levels of a dammed lake on the edges of the river valley. It was also established that dunes emerge both upstream of the dam, where still water of the lake starts moving, and downstream of the dam, where the in-rushing water comes to. Morphology of the dunes up and down the dike is somewhat different. We have identified peculiar features of valley in place blocked by the glacier, which can be used for analysis of similar objects in other areas in future. Areas that were interpreted as places of possible location of giant ripples were discovered in Tajikistan (two areas –the Murgab River valley (Fig 3) and the Alitchur River valley between the Sassyk-Kul and Yashil Kul lakes), Argentina (the Limay River basin to the south-east of San-Martin-de-los-Andes city, Neuken province, Patagonia), and China (the Dadu River outlet area, Sichuan Province). In

those places, there are forms resembling giant ripples that are located in geographic conditions suitable for emergence of ripples. Further interpretation is required, as well as mapping, search for publications on the ripples and interpretation thereof. When analyzing marks of any outburst, it is very important to search for a place of a former dammed dike.



Fig.3. Giant current ripples in Murgab River valley.

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