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Prospects of studying and possibilities of indication of catastrophic flood deposits by petromagnetic methods

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Traces of catastrophic floods have been recorded in different regions of Siberia. In Altai [1] and Tyva [2], these floods were associated with outbursts of glacier-dammed lakes, and in the Baikal region [3] with a catastrophic landslide in Lake Baikal and the subsequent tsunami. Research on catastrophic floods and associated sediments in Russia began in the 80s of the 20th century, but the most intensivity has been reached in the last two decades. In the USA they have been known since the first half of the last century [4]. In general, more significant experience has been accumulated abroad in the use of various methods to study the sediments in question. In particular, petromagnetic methods have been used quite widely in a variety of aspects. Below we will consider the main directions of studying catastrophic floods in which petromagnetic methods were used abroad. This experience may also prove valuable in studying the deposits of the corresponding formations in Siberia.

Studying the direction of magnetization in catastrophic flood deposits allows us to determine whether they were formed by one or many floods [5]. If the average direction changes greatly within the section of such deposits, this may indicate a multiplicity of flood events.

Sometimes a drastic change in a number of magnetic properties (natural remanent magnetization, magnetic susceptibility, magnetic saturation, etc.) along a section also makes it possible to determine the boundary more accurately in the case of relatively smooth transitions between deposits of outburst floods and glacial-dammed lakes [6].

Viscous remanent magnetization can be used to date catastrophic floods [7] due to the gradual and partial change in the direction of magnetization in boulders moved by the flow and the dependence of the degree of this change on time.

Analysis of magnetic susceptibility and isothermal remanence can show whether different units of catastrophic flood sediments have the same or different sources [8].

Thus, petromagnetic methods can be used to study a variety of aspects of the structure and formation of catastrophic flood deposits. Their application to the corresponding deposits in Siberia would significantly deepen the understanding of the general and individual features of their structure and conditions of formation.

References

[1] I.D. Zolnikov, A.A. Mistrukov, Quaternary deposits and the relief of the Chuya and Katun valleys, Parallel Pabl., Novosibirsk, 2008.

[2] G. Komatsu et al., Quaternary paleolake formation and cataclysmic flooding along the upper Yenisei River, 104 (2009), 143.

[3] A. Ivanov et al., Catastrophic outburst and tsunami flooding of Lake Baikal: U–Pb detrital zircon provenance study of the Palaeo-Manzurka megaflood sediments, International Geology Review, 58(14) (2015), 1.

[4] J.H. Bretz, Bars of the Channeled Scabland, Geological Society of America Bulletin, 39 (1928), 643.

[5] J.J. Clague et al., Paleomagnetic and tephra evidence for tens of Missoula floods in southern Washington, Geology, 31 (2003), 247.

[6] M.A. Hanson et al., Provenance and deposition of glacial Lake Missoula lacustrine and flood sediments from rock magnetic properties, Quaternary Research, 83(1) (2015), 166.

[7] T. Berndt, A.R. Muxworthy, Dating Icelandic glacial floods using a new viscous remanent magnetization protocol, Geology, 45(4) (2017), 339.

[8] P. Srivastava et al., Paleofloods records in Himalaya. Geomorphology, 284 (2017), 17.