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Changes in rock magnetic data in Late Pleistocene-Holocene sediments of the glacial lake Sosednee (Upper Kolyma region)

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Lake sediments are an important archive of data on changes in the natural environment of the past. Changes in the rock magnetic parameters in lake sediments are due to the quality and quantity of magnetic minerals. These characteristics depend on the conditions of sedimentation, catchment, post-sedimentation processes, and bioproductivity.

The results of a study of lake sediments of the mountain glacial lake Sosednee (62°03'29.62" N, 149°31'21.18" E) of the Yagodnoye district of the Magadan region are presented. It is located on the southern shore of the lake. Jack London, height 823 m above sea level, length 1.4 km, width 0.6 km, depth up to 13.4 m.

Drilling of Lake sediments was carried out using a Livingston sampler [3]. The sediments of 4 cores was studied: SD-1 (424 cm), SD-2 (64 cm), SD-3 (361 cm), SD-4 (190 cm).

The sediment of the cores has been studied by various methods, including optical, rock magnetic, geochemical, mineralogical, and palynological analyses.

According to the results of radiocarbon dating and age model, as well as palynological analysis, the age of the lake is 22570 cal. years. The sediments of this lake carry information about changes in the natural environment during the Holocene and Late Pleistocene

3 layers are distinguished, differing in lithology and rock magnetic properties (description according to core SD-1).

Layer 1 (0-246 cm) is represented by non-laminated organic silts. The layer was formed during the Holocene in the age range of 0-11 640 cal. years ago in a warm climate. The magnetic parameters of sediments are low, due to the dilution of terrigenous material with biogenic. The average values are: MS = 0.06 10^{-6} m^3/kg; Jrs = 0.0003 Am^2/kg; Js = 0.0012 Am^2/kg, Bc = 18.22 mT, Bcr = 52.32 mT. At a depth of 201-202 cm, a white, acidic tephra layer (SiO_2 – 77.4%) was observed. It is associated with the eruption of the Kuril Lake volcano in Kamchatka, which occurred 7600 A.D. [2].

Layer 2 (246-290 cm) is composed of silts. It is formed in the age range of 11,640 - 14,950 cal. years ago. The layer is transitional between the Pleistocene and Holocene. According to palynological data, the climatic conditions at that time were still warm. The pollen content of herbaceous plants increases from top to bottom along the layer, the role of detrital sedimentation and autigenic mineral formation increases, the amount of organic matter and paramagnetic components decreases directionally, the average values of MS (0.09 10^{-6} m^3/kg), Jrs (0.0009 Am^2/kg), Js (0.0015 Am^2/kg) increase.

Layer 3 (360-424 cm) covers the age range 14 950–22 570 cal. Years ago. The sediments are composed of laminated silts. According to palynological data, cold climatic conditions are reconstructed during this interval. There was no biogenic sedimentation in the lake. The layer is characterized by active autistic mineral formation. The average magnetic parameters are high – MS = 0.19 10^{-6} m^3/kg; Jrs = 0.0043 Am^2/kg; Js = 0.0081 Am^2/kg, Bc = 43.63 mT, Bcr = 75.05 mT, the contribution of the paramagnetic component is low.

In Late Pleistocene sediments (15,996-19,370 cal. years ago) are strongly magnetic samples (MS = 0.47-2.88 10^{-6} m^3/kg) with autigenic magnetic sulfides of greigite-pyrrhotite composition at several levels. At the Dey-Dunlop diagram [1], they lie in the area of single-domain particles. The values of Js/Jrs range from 0.48 to 0.56, Bcr/Bc – from 1.46 to 1.53. Detrital magnetic minerals are represented by titanomagnetites and magnetites.

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