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NEW DATA ON THE RESULTS OF THE MOLOGA-SHEKSNA LOWLAND LAKES RESEARCH (VOLOGDA REGION, RUSSIA)

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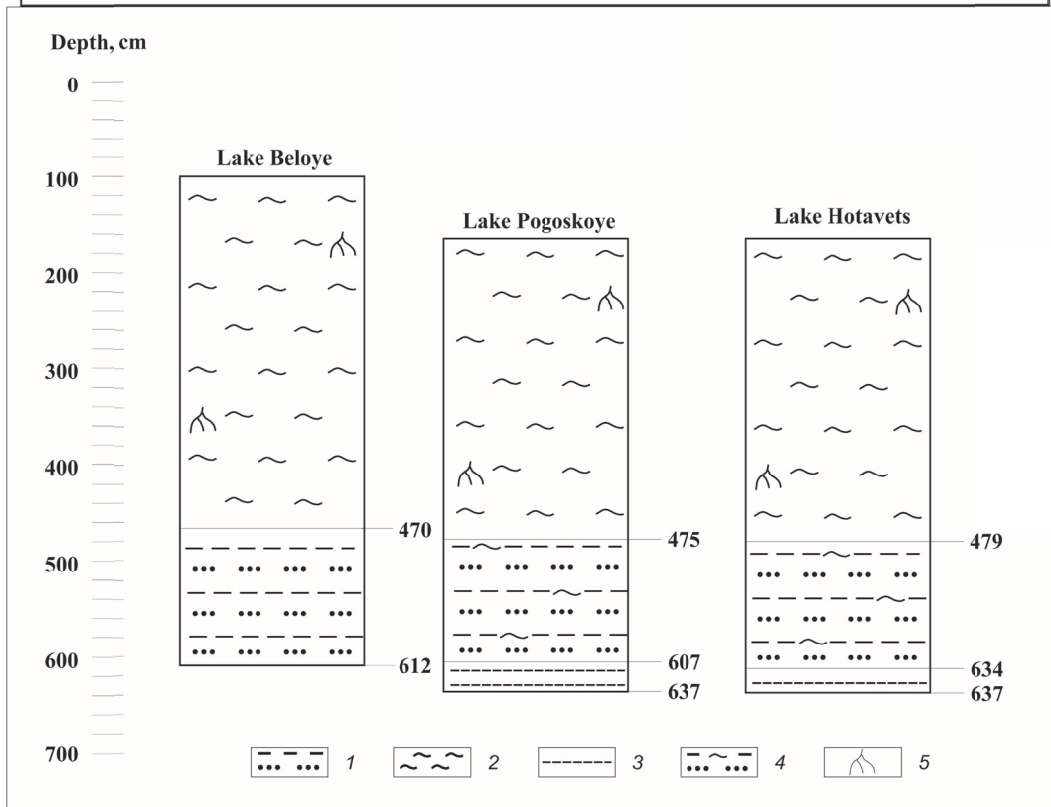
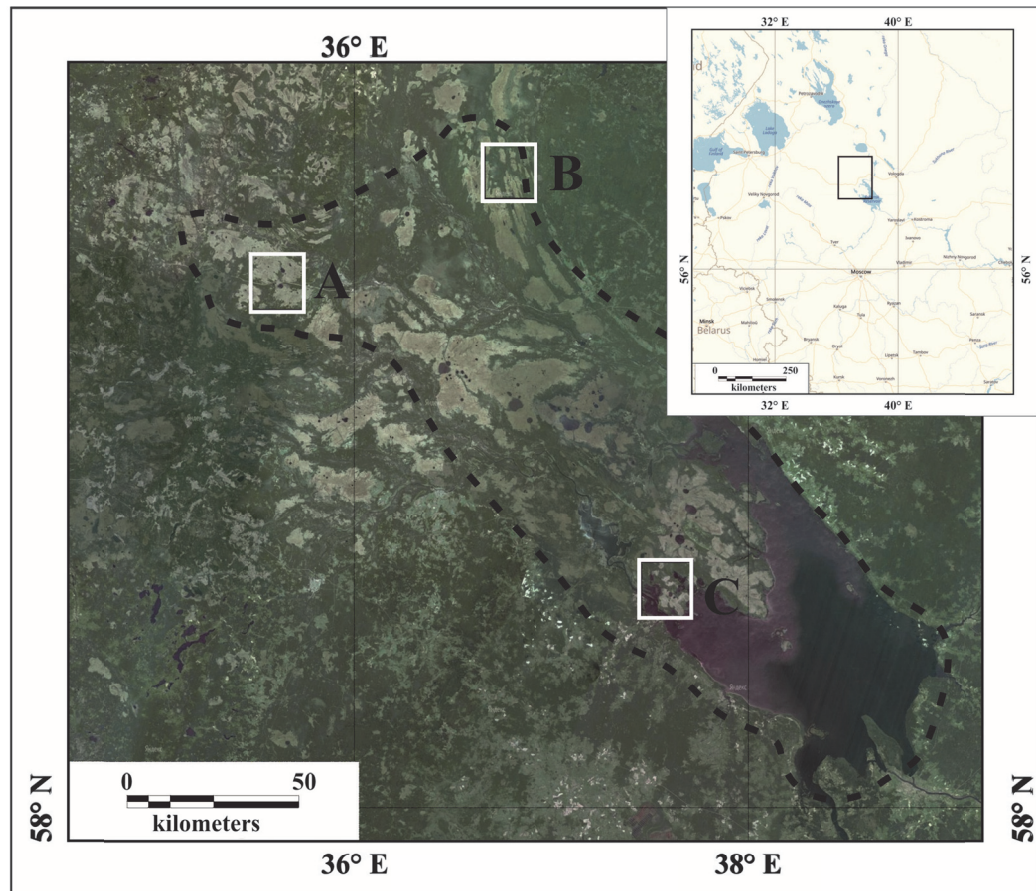
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Scandinavian ice sheet deglaciation is closely connected with forming and dynamics of the Glacial Lakes in Upper Valdai period. Mologa-Sheksna Lake was one of the Largest Glacial Lakes on the north-west of East-European Plane with an approximate area 23 282,84 km² (calculated by the altitude of the lacustrine terrace 140-152 m) (Anisimov et al., 2016). The Mologa-Sheksna Lowland was covered by an ice sheet during Late-Pleistocene period, which reached its maximal boundaries approximately 19-18 thousand years ago, according to a range of radiocarbon and OSL dates (Hughes et al., 2016).

Most of the ice-margin relief patterns are poorly developed or even absent in the region which makes it difficult to specify the ice sheet true boundaries during the Last Glacial Maximum (LGM). Glacial sediments and moraines are overlaid by lake and lake-glacial sediments, and the material could have been distributed by floating ice masses (Kvasov, 1975). According to most prominent reconstructions. A variety of glacial landforms are found on the north of the Mologa-Sheksna Lowland (including the Mologa-Suda Lowland), and here on this basis several zones can be distinguished: an interior (proximal) zone and also an exterior (distal) zone (Mokrienko et al., 1976), where the lakes Beloye and Pogoskoye are situated (Fig.1).

Lowland, according to the literature and geomorphological data and also on the open remote sensing materials. The main objective of the survey was to work out a characteristic of spatial and temporal margins of the Mologa-Sheksna Lake, especially about the time of its termination as a Glacial Lake. Another objective was to record the beginning of the Mologa-Sheksna Lake gradual regression. The locations of the sampling were chosen on the necessity to identify the Mologa-Sheksna lake's spatial boundaries, particularly in conditions of the glacial relief of the Lowland's north. Kvasov (1975) draws the Glacial Lake boundaries in its maximum by the isohypse 145 m; Anisimov et al. (2016) in this way take the isohypse 152 m, Lake Pogoskoye (Vologda region, Belozersk district, N 59,697° E 36,853°, alt. 146,3 m) and Lake Beloye (Vologda region, Babaevo district, N 59,379° E 35,626°, alt. 150,5 m) were studied in order to investigate the northern periphery of the lake (which probably was covered with floating ice here at certain time period). Also the Lake Hotavets (Vologda region, Cherepovets district, N 58,568° E 37,603°, alt. 102,4 m) was studied for interpolation the data from the central part of the Lowland and making a correct palaeogeographical reconstruction. All the three lakes are drainless mire relict lakes, and notable for their small depth (100-175 cm of water over the upper gyttja layer).

First stage of the research was profile georadar (GPR) survey of the lacustrine sediments which took place on early March, 2018. The survey was conducted using the "OKO-2" instrument with 150 MHz (shielded) and 50 MHz (unshielded) antennas. The profiles were laid evenly on the ice-snow cover of the lakes in order to detect most applicable positions for core sampling. The software Geoscan32 was used for processing and analyzing radargrams.



Field work based on the primary information about the assumed boundaries of the

Fig. 1. Location map of the research area (A – Lake Belye, B – lake Pogoskoye, C – Lake Hotavets).

Dashed line shows hypothetical boundaries of the Mologa-Sheksna Glacial Lake after LGM

Fig. 2. The lithology of the investigated lakes. Legend: 1 – clay, 2 – organic gyttja, 3 – sandy clay, 4 – clayey gyttja, 5 – macrofossils

Within the framework of the cooperation between the Institute of Limnology RAS and the Darwin State Nature Biosphere Reserve the lakes were cored from ice in March 2018 with a Russian corer (chamber length 1 m, inside diameter 5 cm), according with the initial results of GPR survey interpretation. The sequences were photographed and described visually after acquisition, and then packed into 50-mm PVC-pipes and rolled by sticky tape, and have been held in the refrigerator at the Institute of Limnology RAS (Saint-Petersburg). Approbation and brief lithological description of the lake sediments sequence were executed, which had been obtained as a result of deposits coring on the lakes at different locations of the Mologa-Sheksna Lowland (Fig.2).

Lake Belye (area 1,26 km²) located in a boggy depression between flat moraine ridges overlaid by the lake-glacial sediments. Flat and undulated moraine relief formed by the EarlyValday icesheet is spread to the north from the moraine ridges, and Lake Belye is located directly by the mapped boundary of the flat moraine relief extension (Mokrienko et al., 1976). The depth is 100 cm at the site of the coring.

Lake Pogoskoye (area 0,14 km²) is located within the Andoga drumlin field (north-east of the Mologa-Sheksna Lowland), where glacial accumulative relief is typical. The drumlins consist of till with depth 0,5-6 m, and linear depressions typically have lacustrine and peat sediments in upper layers (Mokrienko et al., 1976). Lake Pogoskoye is located within one of the depressions, with water depth near 175 cm.

Lake Hotavets (area 1,24 km²) is situated on the territory of Darwin Nature Reserve, on the surface of lake-delta flatland with distinctive landforms of abrasive-accumulative relief. The lake is surrounded by a plenty of semi-buried elongated spindle-shaped landforms on the flat boggy Glacial Lake terrace, and the 'spindles' indicate fluvioglacial streams directions. Surfaces of the 'spindles' are often complicated with dunes (Spiridonov, 1947).

Depth of Lake Hotavets at the place of coring is nearly 175 cm. Lake Hotavets is notable for its complicated bed morphology in profile revealed in GPR profile data, under muddy deposits, unlike lakes Pogoskoye and Belye. The sequences were sampled from one of the prominent depressions visible on the radargram. Lithostratigrafical analys showed similar transitional horizons which probably correspond to the Mologa-Sheksna Lake considerable water level oscillations as a result of fluvioglacial meltwater inflow from the descending ice-sheet, and due to gradual regression of the lake level which finally led to the complete drainage of the Glacial Lake.

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