

Paleomagnetic studies of marine sediments collected from the northern Barents Sea during the 2023 expedition

Tansylu I. Khosnullina^{1,2}, Alexey L. Piskarev^{1,2}, Daria V. Elkina², Evgeny A. Gusev²

¹ St Petersburg University

² All-Russian Research Institute of Geology and Mineral Resources of the World Ocean named after Academician I. S. Gramberg (VNIIOkeangeologia), Russia

st076570@student.spbu.ru

Geological and geophysical study of the Russian Arctic shelf and water areas is an urgent task, one of the most studied regions of the Arctic sedimentary Basin is the shelf of the Barents Sea. The use of paleomagnetic studies on sediment cores allows to dissect, correlate and obtain relative ages of sedimentary strata. In this paper, paleomagnetic studies were carried out on six sediment cores (IP23-29t, IP23-36t, IP23-26t, IP23-33t, IP23-62t, IP23-15t) obtained during the expedition of FSBI VNIIOkeangeologia in the northern part of the Barents Sea on RV Ivan Petrov in 2023. Expedition was performed within the framework of the "Program of State Geological Mapping of the Territory and Continental Shelf of the Russian Federation at a scale of 1:1 000 000" [1].

During the expedition, the magnetic susceptibility of the sediments was measured using a PIMV kappameter, manufactured by GEODEVICE. Samples for paleomagnetic studies were collected by the method of continuous sampling using glass cylinders with an internal volume of 8 cm³ according to the method of V.V. Kochegura [3]. Subsequent paleomagnetic measurements were carried out at the Geomodel resource center of the Science Park of St. Petersburg State University. Magnetic susceptibility and its anisotropy (AMS) were measured with the MFK1-FA device. A SRM-755 SQUID magnetometer by 2G Enterprise was used to determine the intensity and direction of the natural remanent magnetization (NRM). The alternating field demagnetization was carried out with a step of 5 mT in the range from 5 to 60 mT and with a step of 10 mT from 60 to 100 mT.

The values of magnetic susceptibility are on average in the range (15-55) 10⁻⁵ SI, which indicates that the distribution of magnetic minerals in the sediments is not quite uniform. In addition, peaks of magnetic susceptibility are noted in the cores at different depths; their values reach 100·10⁻⁵ SI and higher. The AMS data illustrate a calm sedimentation environment for core IP23-15t; for other cores the values of the minimum axis are concentrated outside the central part of the stereographic projection, that is characteristic of currents influence during sedimentation. For the IP23-36t core the NRM changes insignificantly in contrast to the inclination values, which varies from -61° to 88°.

Newly obtained paleomagnetic data for the northern Barents Sea are used to characterize the peculiarities of Quaternary sediments of this region. The negative inclinations can be related both to the fixation of excursions mentioned in the literature [2,4]. The direction of flows is demonstrated in the AMS results. The magnetic susceptibility curves can indirectly trace the change in sedimentation rate from northwest (IP23-36t) to southeast and from deeper parts of the section (IP23-29t) to the Perseus Rise (IP23-26t) by wedging the interval with higher magnetic susceptibility values relative to lower ones. The results will be used to correlate and stratify sediments in the northern part of the Barents Sea water area with sediments in other parts of the region.

References

- [1] Gusev E.A., Yarzhembovsky Ya.D., Elkina D.V., Ponimaskin P.I., Krylov A.V., Zykov E.A., Lodochnikova A.S., Kartashev A.O., Golosnoy A.S., Zakharov V.Yu., Brui E.V. Structure of the Perseus Rise eastern slopes (Barents Sea) // Relief and Quaternary deposits of the Arctic, Subarctic and North-West Russia. 2023. Issue 10. P. 67-77.
- [2] Guskova, E.G., Raspopov, O.M., Piskarev, A.L. et al. Manifestation of the Gothenburg geomagnetic field excursion in the Barents Sea bottom sediments. Geomagn. Aeron. 47, 781-786 (2007).
- [3] Kochegura V. V., Application of Paleomagnetic Methods during the Geological Survey of the Shelf. VSEGEI, St. Petersburg, 1992.

[4] Piskarev, A.L., Guskova, E.G. Primenenie paleomagnitnyh metodov pri izuchenii donnyh osadkov morej i okeanov. Materialy otcheta. St. Petersburg, 2010.