GC2024-PERM040

Record of climatic and paleomagnetic events of the late Holocene in takyr deposits of western Turkmenistan

Valeriy M. Trubikhin[1] , Hasmik A. Vardanyan[2] , Rita Y. Stakhovskaya[2]

[1] Geological Institute, Russian Academy of Sciences, Moscow, Russia
[2] Schmidt Institute of Physics of the Earth, Russian Academy of Sciences, Moscow, Russia

vmt1940@mail.ru

A study of the Holocene deposits of Western Turkmenistan was carried out. The thickness of the takyr deposits of the Donatinsky corridor - a clay desert between the Maly Balkhan and Kyurendag ridges - was studied.

Two times a year (Spring-Autumn) the plain is flooded with water, turning into a shallow lake. In summer the lake dries up. Thus, a layer of sediments with seasonal layering is formed, which makes it possible to apply varvochronology methods to dating these sediments. A similar process is typical for periods of climate aridization. During periods of climate humidification, the lake does not dry out, and layers of carbonate aurolites are deposited in the central part of the basin, and layers of silty sand are deposited in the periphery. This nature of the deposits makes it possible not only to record the history of climatic events in the region, but also to date them varvochronologically. By the nature of sedimentation, these deposits are extremely homogeneous and have magnetization of detrital origin.

Here, about a dozen pits were dug to a depth of 7 m across the entire area of takyrs from the deluvial train of the Small Balkhan to the deluvial train of the Kurendag ridge. Some of them were described in detail with the calculation of seasonal layers and selected by continuous sampling (pillars) for paleomagnetic analysis.

The magnitude and direction of natural remanent magnetization, magnetic susceptibility and a number of laboratory magnetic parameters were studied. As a result, it turned out that the studied sections are characterized by correct secular variations (SV) - declinations and inclinations with well-defined periods of about 1800 and 1200 years and a less expressive period of about 300 years.

In addition to intervals of calm behavior of the geomagnetic field, two sections of disturbed behavior of the natural remanent magnetization vector are distinguished in two parallel sections. One varvochronologically can be dated in the range of approximately 600 – 800 BC. This interval is known in the literature and is called the Etrurian excursion. The second interval is located at approximately 2000 – 2200 BC and we named Danat’s excursion after the name of the nearest village.

The reliability of the obtained paleomagnetic results can be verified by direct comparison with the observatory data available for the upper parts of the sections, since they accumulated immediately before our sampling. Data for a fairly long period (about 500 years) are available only for declination (D). A comparison of declination curves over approximately 500 years demonstrates a striking similarity for geophysical data between the obtained D curves and the curves of direct observation of variations in declination D for a given period (British Admiralty Data Bank)