

Mainland glaciation and conditions for formation of exaration relief in the territory of the Baltic shield

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Annotation. The hypothesis about the absence of a powerful multi-kilometer ice sheet on the territory of the Baltic Shield is discussed. It is believed that in the Quaternary period, the glacier plowed up powerful strata of crystalline rocks on the shield and spread their boulders thousands of kilometers. The article analyzes the arguments of supporters of the concept of continental glaciations. Modern studies have shown that the bottom layers of glaciers do not participate in the general movement of ice masses, and there are no moraine layers at their base. As for the exaration relief, "curly rocks", "sheep's foreheads", fiords, lake basins, finite moraine ridges, etc., their origin is associated with neotectonic processes, large vertical and horizontal movements of blocks of crystalline rocks, shallow and large scale scaly thrust faults.

Keywords. Baltic shield, glaciation, exaration relief, scaly thrust faults.

Introduction. In the middle of the XIX century, a group of naturalist scientists (J. Charpentier, L. Agassitz and others), in an attempt to substantiate the reasons for the accumulation of boulders of crystalline rocks on the plains of Europe, put forward a hypothesis about powerful continental glaciation in the Quaternary period in northern Europe, Asia and America. The works of the German geologists A. Penck and E. Brueckner on the Alpine cover glaciers and "moraine formations" of the r. Danube - formed the basis for the periodization of the Ice Ages: Günz, Almond, Riss, Würm.

Subsequently, the supporters of this hypothesis (O. Torrell, A. Geiki, and others) argued that the glaciers of Scandinavia actively formed the so-called exaration relief, plowing lake basins, deep fjords, furrowed and polished "sheep's foreheads", "curly rocks" and other "glacial" forms of relief. Since then, the number of publications based on the glacial hypothesis has amounted to many thousands.

However, in parallel, the greatest naturalists Ch. Darwin, Ch. Lyayel, R. Murchison, A. Keyserling put forward a drift theory of the formation of boulder accumulations in the Northern

Hemisphere due to the spread of boulders by floating ice during transgressions of sea basins. During the war, Professor I.G. Pidoplichko, as part of the active army, examined all the known "glacial" deposits in the Alps.

In his works, he argued that all these "glacial" constructions of German scientists and their followers are deeply mistaken and based on self-hypnosis and a kind of mass hypnosis. In the 50-60s of the XX century, many domestic geologists (A.I. Popov, I.D. Danilov, R.B. Krapivner, P.P. Generalov, etc.) came to the conclusion that the northern territories of Europe and Siberia were not subjected to continental glaciations, and thick strata of boulder loams accumulated as a result of transportation of boulder material by icebergs and fast ice floes. As a result, two points of view coexist in the scientific world on the issues of continental glaciation in Z. Siberia and the European North - "glacial" and "marine". However, the "exaration relief" of Scandinavia and Canada until recently was considered indisputable proof of the inviolability of the main prostates of the glacial theory.

Postulates of the "glacial" theory and the results of drilling out modern ice sheets.

University and academic scientists, united in scientific and "glacial" schools, constantly refer to the cover glaciers of Antarctica and Greenland, which, in their opinion, did a great job of transforming the ancient surface of platforms and crystalline shields. It is believed that the very existence of these mighty glaciers testifies to the inviolability and fidelity of the "glacial" doctrine, and that in the Quaternary period, such glaciers plowed up and carried away from the Baltic shield strata of crystalline rocks up to 200 m thick and smashed rocks and boulders of bedrock for thousands of kilometers, dragged hundreds of kilometers huge rejects.

However, to date, the dynamics and patterns of movement of cover glaciers throughout their section have been studied by the works of glaciologists, geologists, drillers and geophysicists. Of unique importance are the results of the through - to the basement, drilling out of the continental glaciers of Antarctica and Greenland, obtained under International projects. It turned out that instead of strata of moraine-containing ice, completely filled with huge blocks and boulders (which is usually depicted in diagrams and figures in textbooks on General and Quaternary geology), only inclusions of sandy-loamy are recorded in the continental ice. Even in the bottom parts of glaciers, where it is customary to place a powerful bottom moraine filled with huge blocks and boulders (for example, in the schemes of V.M. Kotlyakov and N.V. Koronovsky), only small lenses and clots of clay and sandy loam matter are recorded, yes rare sandy grains. These mineral inclusions are mainly represented by volcanic ash, aeolian dust of distant deserts, rare inclusions of fine terrigenous matter, as well as spores and plant pollen. Glaciologists have also established that the bottom layers of the cover glaciers (according to the canons of glacial theory and must perform all geological

work) do not participate in the general movement of ice masses, they lie in place as a dead weight for hundreds of thousands of years, protecting the underlying rocks from denudation. Moreover, the cover ice preserves large paleotectonic lakes, with their relict, very ancient water, and protects them from the notorious glacial plowing out.

Origin and mechanism of formation of textbook-exaration relief. Based on almost fifty years of geological work in the Kola-Karelian region, V.G. Chuvardinsky resolutely opposes the generally accepted doctrine of enormous Ice Ages, the cover glaciers of which, plowing the bedrock of the glacier bed, moved huge boulders and kilometer-long rock outcrops and moved southward, covering Europe and North America with the cover glaciers up to 3 km thick. In his works [3,4,5], he analyzes the arguments of supporters of the concept of continental glaciations, which ascribes the role of an active relief-forming factor to the powerful glaciers rapidly advancing on Europe.

Glaciological studies on the continental glaciers of Antarctica and Greenland have shown that the bottom layers of ice are practically motionless, and they do not produce any “plowing out” of the glacier bed - all movements in the glaciers occur higher as a result of viscous-fluid sliding of packets of ice plates along intraglacial cleavages. The bed of mountain-valley glaciers keeps the primary rock surface, soil layers and even the grass cover completely intact under the moving ice masses.

And the bed of the Greenland and Antarctic huge glaciers is generally mothballed for hundreds of thousands of years, and ice-kilometer thick ice calmly glides over this bed without affecting it. The modern researcher of the glaciers of Antarctica D.Yu. Bolshiyonov concludes: "... The glaciers of the cover type are not able to actively transform the continental bed" [1].



Fig. 1. Tectonic formation of "sheep's foreheads" in the Precambrian granodiorites, in the process of neotectonic growth of granite domes.

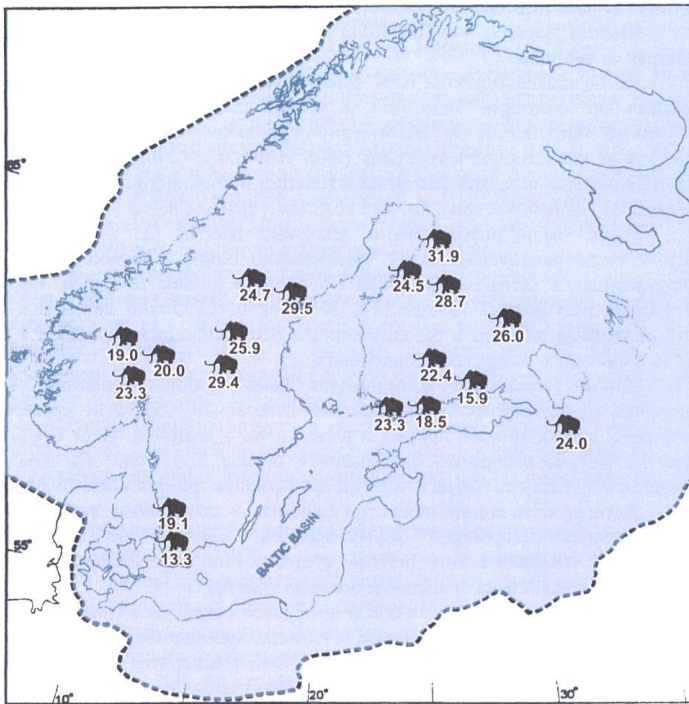


Fig. 2. Locations of fossil remains of mammoths in Fennoscandia during the last (Würm) ice sheet (age 26000-10000 years).

As for the exaration relief, "curly rocks", "sheep's foreheads", fiords, lake basins, finite moraine ridges, etc., V.G. Chuvardinsky connects all these formations with neotectonic processes, vertical and horizontal movements of rocks, small- and large-scale scaly thrust faults (Fig. 1).

The materials of the 2014 Geological Meeting in Lund (Sweden) devoted to the problem of glaciation in Scandinavia are presented in the last article by D.Yu. Bolshiyarov [2]. The final communiqué says: "... The latest geographic, geological and botanical studies indicate the absence of a continuous cover glacier on the Scandinavian Peninsula during the last glacial maximum. Instead of the cover glaciers, small ice domes developed in these territories, which could not actively mechanically influence the ice bed."

New literary data on paleontology, paleobotany and Quaternary climatology cast doubt on the presence of powerful continental glaciation even in the citadel of the adherents of the "glacial" theory - in Scandinavia. Numerous publications point to permanent finds of mammoth remains where, according to the "glacial" theory, the thickness of the ice in the Würm reached 4 km (Fig. 2). Numerous radiocarbon dates in the Würm of mammoth remains (26-11 thousand years old) indicate the comfortable living conditions of these voracious animals in the lush river valleys of Finland and Norway overgrown with lush vegetation. Modern researches shows that the climate of Scandinavia

in the Würm was colder and more continental than the modern one, but on the whole is close to the modern climate of Siberia, and forest-tundra steppes with permafrost in the basement and lush vegetation in river valleys occupied vast territories in Europe, including in Scandinavia.

References

1. Bolshiyarov D.Yu. Passive glaciation of the Arctic and Antarctica. SPb .: Publishing house of AANII, 2006.296 p.
2. Bolshiyarov D.Yu. Scandinavian Ice Cover - New Data and Suggestions. News of the Russian Geographical Society. Issue 6, 2015. S. 1-13.
3. Skuf'in P.K., Chuvardinskiy V.G. On the problem of the "Great Glaciation" on the Russian Plain. // East European Scientific Journal. Warsaw, Polska. No. 8. 2016. S. 157-164.
4. Chuvardinskiy V.G. On the question of continental glaciations in Fennoscandia. Natural setting and fauna of the past. Kiev. 1963. S. 66-96.
5. Chuvardinskiy V.G. About "glacial" theory. The origin of the formations of the glacial formation. Apatity. 1998.302 p.