A NEW ASTROBLEME IN THE POLAR URALS (RUSSIA). A.N.Danilin, Karpinsky Russian Geological Research Institute (VSEGEI), 199106 Saint Petersburg, Russia (anatol-48@mail.ru)

In all maps of geological content, the junction area of the Polar Urals and Pai Khoi strongly differs from other parts of the Urals by an unusual structure. In this territory (its central part is known as "Shchuchjinskaya area"), contours of the majority of geological bodies are isometric in plan view, while for the rest of the Urals, a linear elongated shape is characteristic.

In the magnetic anomaly field map, a concentric structure of the territory is shown. The central part is characterized by positive values of the magnetic field (up to 28 mOe); it is surrounded with a torus with negative (up to –8 mOe) field values. Further, they are positive again. A similar pattern is characteristic for gravity fields. Regional petromagnetic maps show the anomality of the Polar Urals structure against other, adjacent areas. Here, strong magnetic petrophysical rock associations with mantle, subcrustal thermodynamical regime of high temperature (t^0 > 1,000^{0}C) and pressure (P = 12-20 KBar) are outcropping. Mapped contours in the map are isometric, circular.

In the map of deep structure of the Earth's crust in the Urals at scale 1:1,000,000 within the structure, an outcrop of basaltic layer formations occurring autochthonously to the day surface is shown.

Morphostructural map of the Urals emphasizes the anomality of the Polar Urals structure against its framing with the same main features – rounded contours; the same is noted in the topographic maps.

Other examples could be given, however, all of them give evidence of the territory anomality, which does not fit into the general structural pattern of the Urals and adjacent areas.

Most of the faults distinguished in the territory have either radial or concentric orientation relative to the conventional center with coordinates: N67^{0}30^1, E67^{0}30^1. Concentric structures are most clearly observed in the uplifted northwestern, western and southwestern sectors. Radial-concentric structure of the territory is clearly seen in space images. Embedding of well-identified fragmentary circular structures with average diameters of 40 km, 80 km, 130 km, and 210 km is observed.

Pre-Late Ordovician formations of the Polar Urals structure territory are anomalously fractured in mega-, macro- and microforms. In space images at 100,000-500,000 scale, block, small-hilly territory character is observed. Brecciation is characteristic for many sites of the area, where rock blocks up to tens meters in size are arranged randomly. Often, brecciation is observed a lump.

We crossed the Polar Urals structure along a constructed railway line "Obskaya - Bovanenkovo" from Obskaya station (0 km). In the last rock open pit (159 km) on the line, rocks dated, according to different sources, from the Early to Late Silurian and represented by limestones, diabases, and tuffs, were discovered. All rocks are crushed; their brecciation degree in single open pit outcrops varies from fine detrital to large-blocked varieties. "Gris" textures are marked. Presumably, a megabreccia is exposed in the open pit, the cement of large blocks of which is a decreasing in size breccia of the same rocks. A similar pattern is observed in a vast territory near 14 km open pit (Kharbey area). Here, fields of formations development dated from the Late Ordovician to the Early Devonian occur. Diabases, basaltic, andesitic and dacitic porphyries, agglomeration tuffs of mixed composition, limestones constitute the formations. Rocks are intensively crushed and often mixed to polymictic breccias of various dimensions; "gris" textures occur. For the geologists carrying out different studies here, mapping of the occurrence fields of such structures is very difficult due to their fragmentary nature and considerable composition variability.

Based on the analysis of a set of large-scale maps of the Urals, space images of the territory and personal fragmentary observations, we made a presumption on the genetic similarity of the described Polar Urals territory with Vredefort structure (South Africa). The latter, according to the opinion of most specialists, is a typical example of a deeply eroded crater 190 km in diameter, formed by a huge meteoroid impact. First, we noted similarities visible in space images: a network of concentric and radial elements determining the appearance of structures.

Based on the suggested impact hypothesis of the Polar Urals circular structure origin, the available material allows assuming that an impact of a meteoroid with the Earth's surface took place in the Middle Ordovician – Early Silurian. A huge amount of energy released due to an almost vertical impact at a velocity of 20-50 km/s of a silicate striker approximately 10 km in diameter. The process specified and estimated in many scientific works, of which we refer to two the most fundamental ones in our opinion, develops further [1,3].

At the closing stages of crater formation, under conditions of relatively thin Earth's crust, a superpower impact from outside could activate trigger magmatism, when mantle magma, which produced thick ultrabasite and basite bodies observed in the Shchuchjinskaya area, as well as numerous dyke-like basite bodies within the Precambrian-Silurian development within the Polar Urals structure, could use fractures developing in the Earth's crust.

Shortly after the impact event, the territory returned to the evolutionary geological period of its

further development. However, impact from the space left an imprint on its entire further history.

Assuming that the erosional truncation over a period after the impact was considerable (to 5 - 10 km), at present we have only astrobleme “roots”, that is a deeply eroded socle complex, where fracture cones, rocks with “gris” structure, and pseudotachylites can occur. In the remainders of development fields of allogenic breccias (14 and 159 km open pits), poly- and monomineralic glasses, slags, massive and clastic impactites may occur.

The given paper is certainly only a hypothesis, because the above-mentioned facts are not enough for the categorical structure attribution to astroblemes. Petrographic, mineralogical diagnostic criteria of such formations are not discovered. Probably, intensive regional metamorphism, to which impactites and explosion breccias were subject during subsequent to their formation geological epochs, eliminated these traces. We hope that purposeful, comprehensive but expensive studies could have drawn a line in the resolving of this problem.

References: [1] V.L.Masaitis et al. (1980) The geology of astroblemes. Leningrad, Nedra Publ., 231 p. [2] H.J. Melosh (1989) Impact cratering: a geologic process. N.Y., Oxford University Press, 245 p.