Role of tectonic stresses in formation of protrusion

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From gravimetric data studying of the geological structure of Tagil-Kushvinsky iron-ore region it has been shown that its basic density heterogeneity can be identified with protrusion of hyperbasits, which had been implanted in a zone of the Main Ural fault. That fault it is possible to treat as listric (Vandysheva, 2010) tectonic structure. To the east that exocontact of the protrusion contain all deposits from the iron-ore deposits region. That defines the geological prospecting interest. And consequently the question: what are the reasons of the matter moving from which lead to a natural protrusion.

Movement of mantle matter can occur by breaking of hydrostatic stress condition (Phylatov, 1990) in the bottom part of earth's crust. One of the major factors for such breaking are large density heterogeneities in the form of positive and negative forms of a relief inside boundaries of the crust, at transition through which there is a spasmodic change of density.

According to deep seismic sounding data for the region of Tagil-Kushvinsky region two density boundaries had been established: the Moho boundary and the roof of the granulate-basalt layer. The two boundaries are heterogeneous: the Moho boundary by immersion, the basalt-granulate layer by convex roof. The jump of the density by passing over the Moho boundary is equal to 0,40 g/sm3, over the roof of basalt-granulate layer– 0,10 g/sm3; the depth up to the roof of the granulate-basalt layer is estimated as 20 km, up to the Moho boundary as 40 km. That boundary is immersed into the mantle on 10 km; the height of the extrusion of the granulate-basalt layer is equal to 10 km. The two forms of the relief in the plane are isometric and their radii are approximately equal to 40 km. The value of the average stress in the area of the circle is equal to 100 MP. Using that data we had constructed a three layered model of the crust (Vandysheva, 2011). The calculation of the absolute values of the maximum tangential stresses had been in (Trubitsin, Karasev, 1979) developed partly for each density heterogeneities. From that calculations we can see that the tangential stresses of the upper density heterogeneity increases to the upper surface of the Earth from 7 to 10 MP; of the bottom – decreases from 40 to 30 MP. As we can see the action is of different directions, therefore they compensate each other.

Therefore that effect can achieve the violation of hydrostatic stress state in the crust from the bottom parts up to the surface, that is the balance in the medium and therefore develop the conditions of migration of the mantle matter to the Earth's surface and forming ultra basalt protrusions.