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Mantle seismic tomography beneath East-European Platform

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3D P-velocity model of the mantle under East-European platform was received as the solution of the seismic tomography problem by Taylor approximation method, which was supposed by V. S. Geyko [Geyko, 2004]. The solution don't depend from the referent model selection and can be imagine in Cartesian and spherical coordinate system. The used tomography method permits recovering the mantle model being optimal in the given metric in respect with the whole totality of P-wave first arrival traveltime data within the frame of selected basic model of interpretation. It includes the apriory assumptions? Theory and algorithms of numerical inversion, parameterization of velocity function, the smoothing method and other regularizing factors. The results are imagine in horizontal, longitude and latitude sections of the model. The generalized velocity-depth caracteristics $V_{\text{aver}}(z)$ were used in definitions high and low velocities and residual of velocities

$$V_{\max} = \sup_{\varphi,\lambda\in S} V(\varphi,\lambda,z), \qquad (1)$$

$$V_{\min} = \inf_{\varphi,\lambda\in S} V(\varphi,\lambda,z), \qquad (2)$$

$$V_{aver}(z) = z\left(\int_0^z \frac{d\zeta}{\sum(\zeta)} \iint_{S(\zeta)} \frac{d\varphi d\lambda}{V(\varphi,\lambda,\zeta)}\right)^{-1}, \qquad (3)$$

where $S(\zeta)$ is the domain into horizontal section at the depth ζ, and $\sum(\zeta)$ is its space in the coordinates φ, λ.

The first time arrival from the ISC from 1964 to 2005 year were used as the input data.

The 3D P-velocity model analysis shows the next properties:

1) common velocities characteristic for received mantle model under EEP is layer velocities structure, which defined by inverse changing of phone velocity for each layer: high velocity tomographic lithosphere layer(upper mantle velocity characteristic), low velocity Golitsin — Geyko layer (transition zone velocity characteristic), high velocity zone of division-1? low velocity middle mantle, high velocities zone of division-2, low velocities low mantle, Mantle under EEP surrounding, except eastern part, characterized by common inverse relate to mantle velocities characteristics under EEP;

2) by velocities characteristics tomographic lithosphere under EEP can be devided on three layers: 50—100±25 km, 100±25—200±25 km, 200±25 km — tomographic lithosphere bottom;

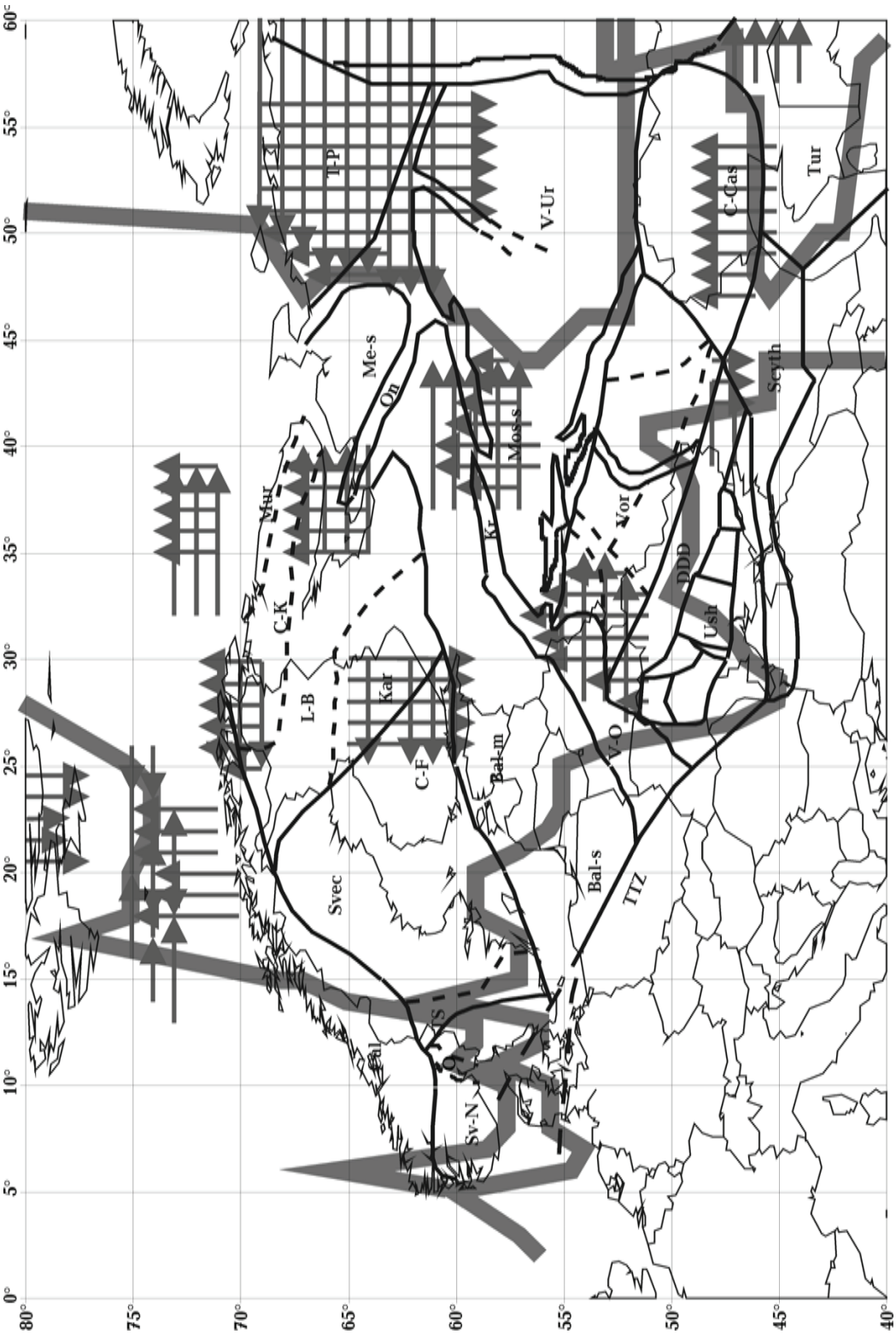
3) mantle velocity boundary under EEP don't coincides with EEP tectonic boundary. Maximum agreement is on the depth 50 km, and maximum changing at the Golitsyn — Geyko depth;

4) as a whole by velocity characteristics mantle under EEP can be divided into three parts:

- boundary mantle velocity region of interaction with 1 type activation;
- main part with two type mantle velocity activations;
- east part of mantle under EEP, which has different velocity characteristics from another mantle part. The first type of velocity activations correspond to propagation of high velocity layers from the Golytsin — Geyko layer under surrounding regions to the low velocity Golytsin-Geyko layer under EEP and increase the part of high velocities in upper mantle layers under surrounding zone to EEP. Second type of velocity activation correspond to subvertical low velocities layers propagation from the middle mantle to the upper mantle. It is pick out inclined layers, which mainly corresponded boundary mantle velocity region of interaction (Figure);

5) mantle under Barents-Pechora Platforme units with mantle under EEP by velocity characteristics

So that by velocity characteristics we have both horizontal process and the vertical process in the mantle under East European Platform.



Velocity boundaries of 1 and 2 types of activations: Bal-m — Baltic monocline, Bal-s — Baltic syneclise, C-Cas — Cis-Caspian depression, C-F — Central-Finland massif, C-K — Central-Kola block, DDD — Dniper-Donetsk depression, Kal — Scandinavian Caledonides, Kar — Karelian block, Kr — Krestovsky avlacogen, L-B — Lapponial-White sea belt, Me-s — Mezen syneclise, Mos-s — Moscow syneclise, Mur — Murmansk block, O — Oslo graben, On — Onega graben, Scyth — Scytian plate, Sv-N — Sveconorwegian block, Svec — Svecofenian block, T-P — Timan-Pechora plate, T-S — Transscandinavian belt, TTZ — Teyseyr-Tornquist zone, Tur — Turanian plate, V-O — Volyn-Orsha avlacogen, V-Ur — Volgo-Uralia, Vor — Voronezh massif, USh — Ukrainean Shield.

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The disturbances of the equilibrium state of the rotating Earth and the physical nature of its tectonic activations and modern earthquakes: generality and differences

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Most scientist in the whole world supposed Earth tectonogenesis and particularly its tectonic activations are controlled by endogenous forces caused by intra earthy spontaneously physical geological and geochemical processes flowed in its interior. The role of external factors leaded to the disturbances of the Earth equilibrium state determined the nature of the geodynamic processes appearance was showed in monograph being published recently [Tyapkin, Dovbnich, 2009]. In this work the new notions are justified and stated. In accordance with it observed geodynamic processes caused by the interaction between our planet and its surrounding space fields. So face of the Earth and its interior structures form under the influence of two opposed groups of forces according to it: the phenomena leaded to the keeping the dynamic equilibrium of the rotating Earth (geoisostasy) happen under the influence of one group; the other forces group aspired to disturb this equilibrium state. The physical nature of the first group forces is studied well enough. This group control peneplanization processes of the Earth surface trying to rich its equilibrium figure-ellipsoid. The source of the second group forces are the stresses occurred in tectonosphere as a result of the Earth rotation regime variations: changes of the angukar velocity and the displacements of the rotating axes relatively to geoid.

For the first time the geoisostasy conditions was stated and insonified on the XXVII session of IGC [Tyapkin, 1984]. Based on this conception M. M. Dovbnich gained the calculation algorithm of the stress fields in tectonosphere, caused by variations of the Earth of rotation regime. They were described in the II part of monograph in detail [Tyapkin, Dovbnich, 2009]. I can be find in free access in internet [www.nmu.org.ua/ru/scientific/publications/].

The analysis of the global stress fields occurred in the Earth tectonosphere as a result of the rotating regime variation made it possible to make following conclusions.

1. A main contribution in the global filed of the rotating stresses in tectonosphere make a component caused by the displacement of the Earth rotation axes relatively to the geoid. The value of these stresses of this component exceeds breaking point of tectonosphere rocks (10^7 Pa), so it can be seen as a reason of the Earth tectonic activations.

2. The contribution of stress field component caused by the variation of the angular velocity of the Earth rotation is much less. Maximum value of this stress component can rich the value 10^5 Pa. So, the Earth tectogenesis in essence determined by the component of the global field in tectonosphere, caused by displacement of the Earth rotation axes relatively to the geoid.

The Earth tectonic activations appeared in the tectonosphere zones, in which the rotation stresses rich the values exceeded breaking point of its constituent rocks. The specified tectonosphere fault system is developed as a result of every tectonic activations. This system is presented as hierarchically subordinated faults of two mutually orthogonal directions. The interaction of the both direction faults created an appropriate blocks system. Relational block displacements on the faults initiate a denudation sedimentary process generating a mainframe terrigenous matter necessary for surface structure formation.

Experience of our scientists argued that in Eurasia six Precambrian fault systems of tectono-