| Brandenburgische Geowiss. Beitr. | Kleinmachnow | 8 (2001), 1 | S. 39-41 | 4 Lit. |
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# Depth of Mohorovičić discontinuity (map 7)

## Neogeodynamica Baltica IGCP-Project 346

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The Mohorovičić (M) discontinuity structure reflects special features of the Earth's crust thickness variation over the territory, its vertical subdivision and specific association with recent geodynamics. The map of the M-discontinuity includes the information presented on several other previously published maps (their authors are listed in the map's legend). It is based on results of deep seismic and magnetotelluric sounding, study of exchange waves from earthquakes, and correlation calculations of geophysical potential fields.

The M-discontinuity separates the high-gradient crust with prevailing wave velocities less than 6,5-7,5 km/s from the low-gradient upper mantle with velocities mainly exceeding 8 km/s. According to the data available today, the M-discontinuity is a transition zone of variable thickness including interstratified thin layers with high and low velocities of compressional waves. Therefore, the correlation of the different-age M-boundary (or boundaries) in various parts of the young West European and the old East European Platform presents a difficult problem.

These both platforms essentially differ from each other in the character of the M-discontinuity structure. The southwestern boundary of the East European Platform running along the Teisseyre-Tornquist Zone (TTZ) is shown by a vertical displacement of the M-discontinuity of some 10 km, the zone itself being distinguished as a belt where the M-discontinuity occurs at a depth of 50-65 km. This zone separates Europe into territories showing different crust thicknesses: 20-35 km within the West European Platform and 40-65 km in the old platform.

Deep Seismic Sounding (DSS) has not been evenly performed throughout the territory of the western part of the East European Platform including the Belarus-Baltic region, northern Ukraine and eastern Poland. A high density of these data is related to the Ukrainian Anteclise and the TTZ, where the DSS materials available permit the compilation of a quite substantiated map of the M-discontinuity. For the Belarus-Baltic region there are only few DSS profiles and, therefore, the map is compiled using a complex interpretation of the geologic-geophysical data as follows: deep seismic and magnetotelluric sounding, local and regional gravity and magnetic fields and their various transformations, heat flow and data describing the temperature variations in various horizons, M-discontinuity included, the crystalline basement relief and material composition, and density distribution of the sedimentary rocks.

To give a quantitative estimate of the mutual integral correlation of this complex of geological and geophysical data available for the western part of the East European Platform, it should be noted that the confidence of physical and geologic data is about 60 % for the territory as a whole, but ranges from 80- to 85 % for the Ukrainian Anteclise, and is 70 % for the Belarus-Baltic region.

The correlation of neotectonic and deep platform structures with the M-surface in the East European Platform shows a number of peculiarities. Within the recent Ukrainian Anteclise the depth of M-discontinuity varies generally between 38 and 60 km, and from 50 to 60 km over the most part of territory. The Central-Ukrainian Uplift, a part of the anteclise, is confined to the meridional zone of uplifts in the M-discontinuity. The Kirovograd neotectonic unit is located in a zone of jointing meridional and sublatitudinal structures of the M-discontinuity occurring at a depth of some 50 km. The Volyn-Podolian Uplift, like the Central-Ukrainian Uplift, is confined to a meridionally raised structure in the M-surface, and the Rovno Saddle separating the above uplifts is found in an area with deeper Moho occurrence.

It should be noted that the axial part of the recent Dnieper Syneclise - the Krementschug Depression is not represented in the crustal bottom as an independent structure, but occupies the slope of a well-defined large linear elevation of northwestern strike. It is confined to the northern part of the Syneclise, and in the basement surface to the Dnieper-Donets Palaeorift Graben.

The recent Baltic-Belarus Syneclise is bounded to the south and southwest by active faults that roughly coincide with the translithospheric faults, that are defined in the Moho relief and run along the northern boundary of the Ukrainian Anteclise, Volyn-Podolian Uplift and the TTZ.

The Moho discontinuity displays some zonality features within the Baltic-Belarus Syneclise and the adjacent Voro-

nezh-Tver Anteclise. In the first of them there are a western and a central system of big linearly elongated uplifts in the M-discontinuity, that strike northeastward and occur at depths of 45 to 47 km. Both structures are separated by a deep trough (55 km and deeper). In the transition zone between the northern part of the Baltic-Belarus Syneclise and the Voronezh-Tver Anteclise, the M-discontinuity relief shows some anomalies. For example, in the region of the Latgale High there is a big elevation of northwestern strike in the M-relief. A similar situation is observed in the transition zone between the Baltic-Belarus Syneclise and Ukrainian Anteclise. So, the recent Pripyat Step overlying the central and southern zones of the Pripyat palaeorift corresponds to an uplift in the M-discontinuity relief, which is replaced by a large latitudinal negative structure close to the northern boundary of the anteclise.

The analysis of the above anomalies in the M-relief together with the other data available suggests that the activity of these latitudinal zones became evident in the Late Devonian and later as volcanism and some transformations at the crust-mantle interface. This resulted in the development of the crust-mantle mixed layer in the young M-discontinuity, which formed a positive structure against the background of an old trough.

The East-Baltic System of Grabens is not generally reflected in the strike and composition of the main M-relief features. However, some local areas with low crust thickness are found in the region of the West- and East-Gotland Grabens and southern parts of the Grabens of Bothnia and Finland, where the depths of the M-discontinuity vary by 10-15 km. This may be due to the beginning of transformation at the crust-mantle interface, which was caused by the pre-rift endogenic regime. Attention should be drawn to the fact that maximum sea depths and amplitudes of neotectonic subsidences are confined to just these anomalous areas.

In the zone of transition from the East-Baltic System of Grabens and Baltic-Belarus Syneclise as a whole to neotectonic structures of the West-European Platform there is a rotation of the M-relief features into the northwestern direction parallel to the TTZ strike.

The analysis of correlation the recent structures of the East European Platform with the main M-discontinuity features shows that both are in general fairly corresponding.

The other features of neotectonic structures are evident within the West European Platform. Even in the area where it joins the East European Platform, the West-Baltic Step is distinguished from its southeastern part being coincident with a sharp bench in the M-relief in the TTZ. The Silesian Zone and the Poland Uplift are found within just this area. The depth of M-occurrence within the above structures changes from 40 to 60 km, according to data of Polish geophysicists there is a high-amplitude trough with border steps. A monoclinal structure of the same northwestern strike in the M-relief corresponds with the northwestern part of the recent West-Baltic Step. Within the recent Jütland-Rügen Swell, the monocline is replaced by a small depression, and in transition to the recent Skagerak depression by an elevation in the M-relief.

The Central European Subsidence Zone paralleling the TTZ coincides in area with a linear low in the M-discontinuity. Generally latitudinal trend of the M-discontinuity structures has been revealed within the area occupied by the Central European Zone of Uplifts running latitudinally. It should be noted that the recently active grabens to the southwest, Lower Rhine Graben, Upper Rhine Graben, are characterized by inverse correlation with the corresponding elevations in the M-relief.

In conclusion it should be mentioned once again that recent structures of the West European Platform are typically conformable or inverse to major elements of the M-discontinuity. Neotectonic structures of the East European Platform correspond to only individual elements in the M-discontinuity.

**Summary**

The information containing the presented map of the Mohorovičić discontinuity (Moho) as well as the compiled data are explained. The studied area comprises the young West European and the old East European Platform. Owing to the geological reasons both platforms essentially differ from each other in the structure of the Moho. The different platform reaches defined by their tectonical and geological features are described in relation to the position of the Moho.

The fairly correlation between the recent structure of the East European Platform and the features of the Moho is generally shown. Within the West European Platform the correlation of neotectonic structures with the Moho is more evident, either in a direct conformable manner (e.g. Central European Subsidence Zone) or in a inverse one (e.g. Upper Rhine Graben) to major elements of the Moho.

**Zusammenfassung**

In der Kurzerläuterung zur Karte „Depth of Mohorovičić discontinuity" werden die Ausgangsdaten und darauf aufbauend die Unterschiede in der Tiefenlage der Moho-Diskontinuität im Untersuchungsgebiet dargestellt. Die Tiefenlage der Moho unterscheidet sich wesentlich zwischen der alten Osteuropäischen und der jungen Westeuropäischen Tafel. Sie resultiert aus dem unterschiedlichen geologischen und tektonischen Werdegang beider Großstrukturen. Die Beziehungen zu den neotektonischen Strukturen werden diskutiert, wobei es im Bereich der Westeuropäischen Tafel engere Bezüge zwischen der Ausbildung der Moho-Tiefenlage und den neogeodynamischen bzw. neotektonischen Strukturen gibt als auf der alten Osteuropäischen Tafel. Einige Beispiele für konforme und inverse Beziehungen zwischen der Moho-Tiefenlage und den neotektonischen Strukturen werden aufgeführt.

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