

## **Determination and analysis of rock densities in the Carpathian-Pannonian lithosphere: based on the CELEBRATION 2000 experiment**

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One of the most important goal of the CELEBRATION 2000 project was to research the structure and the dynamics of the lithosphere in the Carpathian-Pannonian region. In addition, the goal was to broaden the knowledge of deep-seated structures and the geodynamics of the complex continental lithosphere and to study the relationships between the main tectonic units of Central Europe.

The aim of this contribution is to determine and analyze densities of rocks in the Carpathian-Pannonian lithosphere. We present a density analysis based on the seismic interpretation along suitable seismic refraction profiles of the CELEBRATION 2000: CEL01, CEL04, CEL05, CEL06, CEL09, CEL11 and CEL12 (Janík et al., 2011). To these profiles we applied transformation of seismic P-wave velocity  $v_p$  to densities  $\rho$  by using Sobolev and Babeyko's (1994) and Christensen and Mooney's (1995) formulas for crustal rocks, and Lachenbruch and Morgen's (1990) formulas for the lower lithospheric rocks. This contribution presents the determined densities in different depth, which depend on the pressure and temperature conditions in the crust and lower lithosphere. These results are shown for seismic refraction profiles CEL01, CEL04, CEL05, CEL06, CEL09, CEL11 and CEL12 crossing tectonic units of the Pannonian Basin, Transdanubian Range, Central Western Carpathians, Outer Carpathian Flysch, Carpathian Foredeep, Paleozoic Platform including the Lysogóry and Malopolská Units, East European Craton with Lublin Trough, and Bohemian Massif. Seeing that some of the seismic refraction profiles cross the same tectonic units, we were able to create graphical display range of depth and densities in the upper and lower crust, and lower lithosphere in individual tectonic units. A simplified chart is shown in Table 1.

These results provide significant input data for the density modelling of the Carpathian-Pannonian lithosphere.

**Acknowledgments:** This research has been supported by the Slovak Grant Agency VEGA, grants No. 1/0141/15, and No. 2/0042/15.

### **References:**

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Tectonic Units		h [km]	$v_p$ [km•s <sup>-1</sup> ]	$\rho$ [g•cm <sup>-3</sup> ]
Pannonian Basin	Upper Crust	2 - 21	5,95 - 6,2	2,61 - 2,78
	Lower Crust	9 - 30	6,35 - 6,65	2,84 - 2,97
	Lower Lithosphere	21 - 100	7,85 - 8,4	3,29 - 3,47
Transdanubian Range	Upper Crust	0 - 20	5,9 - 6,25	2,69 - 2,8
	Lower Crust	17 - 30	6,5 - 6,65	2,89 - 2,94
	Lower Lithosphere	30 - 110	7,9 - 8	3,3 - 3,37
Central Western Carpathian	Upper Crust	2 - 25	6,05 - 6,25	2,66 - 2,8
	Lower Crust	13 - 36	6,55 - 6,7	2,9 - 2,97
	Lower Lithosphere	25 - 140	7,9 - 8,4	3,32 - 3,51
Outer Carpathian Flysch	Upper Crust	3 - 25	5,3 - 6,3	2,4 - 2,82
	Lower Crust	23 - 42	6,3 - 6,8	2,76 - 3,05
	Lower Lithosphere	35 - 170	8,08 - 8,05	3,33 - 3,45
Carpathian Foredeep	Upper Crust	3 - 25	5,55 - 6	2,56 - 2,71
	Lower Crust	23 - 42	6,1 - 6,8	2,68 - 3,01
	Lower Lithosphere	35 - 170	7,9 - 8,15	3,32 - 3,4
Paleozoic Platform	Upper Crust	3 - 27	5,5 - 6,3	2,54 - 2,82
	Lower Crust	20 - 44	6,65 - 7,05	2,94 - 3,13
	Lower Lithosphere	30 - 180	8,1 - 8,15	3,36 - 3,43
East European Craton	Upper Crust	4 - 22	5,2 - 6,2	2,41 - 2,78
	Lower Crust	10 - 51	6,45 - 7,15	2,83 - 3,13
	Lower Lithosphere	34 - 240	8,15 - 8,25	3,37 - 3,44
Bohemian Massif	Upper Crust	0 - 20	6 - 6,3	2,73 - 2,82
	Lower Crust	15 - 38	6,7	2,96
	Lower Lithosphere	30 - 140	8,05	3,36 - 3,38

**Table 1:** Thicknesses, seismic P-wave velocities and determined densities.