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Geochronological Constraints of Mesozoic and Tertiary Reworking of Paleozoic Basement Units in SW Carpathians

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We present a set of twenty new K-Ar cooling ages from metamorphic rocks of Vepor and Gemer units. The rocks have been collected in agreement with recently defined structural succession of deformations in southern part of West Carpathians (Lexa and Schulmann 2003). These authors interpreted the earliest Cretaceous deformation fabric – the prominent Gemer Cleavage Fan (CGF) to result from an indentation of southern block of unknown origin with the Gemer Paleozoic basement. The second structural fabric in this domain is the flat amphibolite to greenschist flat foliation reworking the Variscan metamorphic and igneous structures of the Vepor basement in the north (Janák et al. 2001). The first structure which is common to Vepor and Gemer tectonic units is so called Trans-Gemer Shear Zone (TGSZ), which constitutes the southern contact between both units and transects the central part of the Gemer unit including the GCF. This sinistral transpressive shear zone is duplicated in the Vepor basement further to the north, where two large scale shear zones rework the flat Cretaceous foliation. In addition, Faryad and Henjes Kunst (1997) and Arkai and Faryad (2003) described Jurassic high pressure event that affected Permian and Triassic rocks of Meliata accretionary wedge as well as southeastern part of Gemer unit. Faryad et al. (2004), based on purely structural observations, proposed that westward Jurassic thrusting of Meliata accretionary wedge affected also western part of the Gemer unit perpendicular to main Cretaceous northward shortening direction.

The first group of samples has been collected from southernmost Lower Paleozoic and Permian Gemer sequences affected by east dipping cleavages indicating top to the west thrusting. Muscovites growing in this intense slaty cleavage yielded three ages ranging between 198 and 165 Ma. The second group of ages was determined from muscovites growing in cleavage of central and western part of GCF and yielded four ages ranging between 141 Ma and 114 Ma. Two muscovite cooling ages of 83 and 87 Ma were produced from flat metamorphic fabric reworking Late Carboniferous and Permian cover of the eastern part of the Vepor basement. Eight new K-Ar ages ranging between 115 and 80 Ma were produced from Late Carboniferous slates and to different degree reworked Variscan basement of the Vepor complex along the southern contact with the Gemer Lower Paleozoic rocks. Finally, fresh biotite from contact aureole of small pegmatitic granite intrusion penetrating the Permian cover of the Vepor complex yielded cooling age 49.7 Ma.

These data shed a new light on a Mesozoic and Tertiary metamorphic and tectonic history of south Carpathians. We confirm a hypothesis that the Lower to Middle Jurassic shortening (198–165 Ma) of Paleozoic basement of Carpathians is a large scale crustal event, which is responsible for significant reworking of the Gemer unit. The switch in plate movements from E-W to N-S occurred already during Lower Cretaceous times (between 140–110Ma) and is responsible for large scale and heterogeneous reworking of the whole Gemer unit resulting in formation of GCF. The Late Cretaceous age of flat metamorphic fabric in the Vepor basement (87–83 Ma) very shortly preceded the welding of Gemer and Vepor units, which is manifested by formation of TGSZ and development of internal Vepor sinistral transpressive shear zones also during Late Cretaceous times (85–75 Ma). Finally, the Eocene age of magmatism affecting the Vepor and Gemer boundary indicates that this major Carpathian tectonic contact zone was thermally and possibly also mechanically rejuvenated during Tertiary period.

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Geological Structure of the Czech Republic Depicted by the New Gravity and Magnetic Field Images

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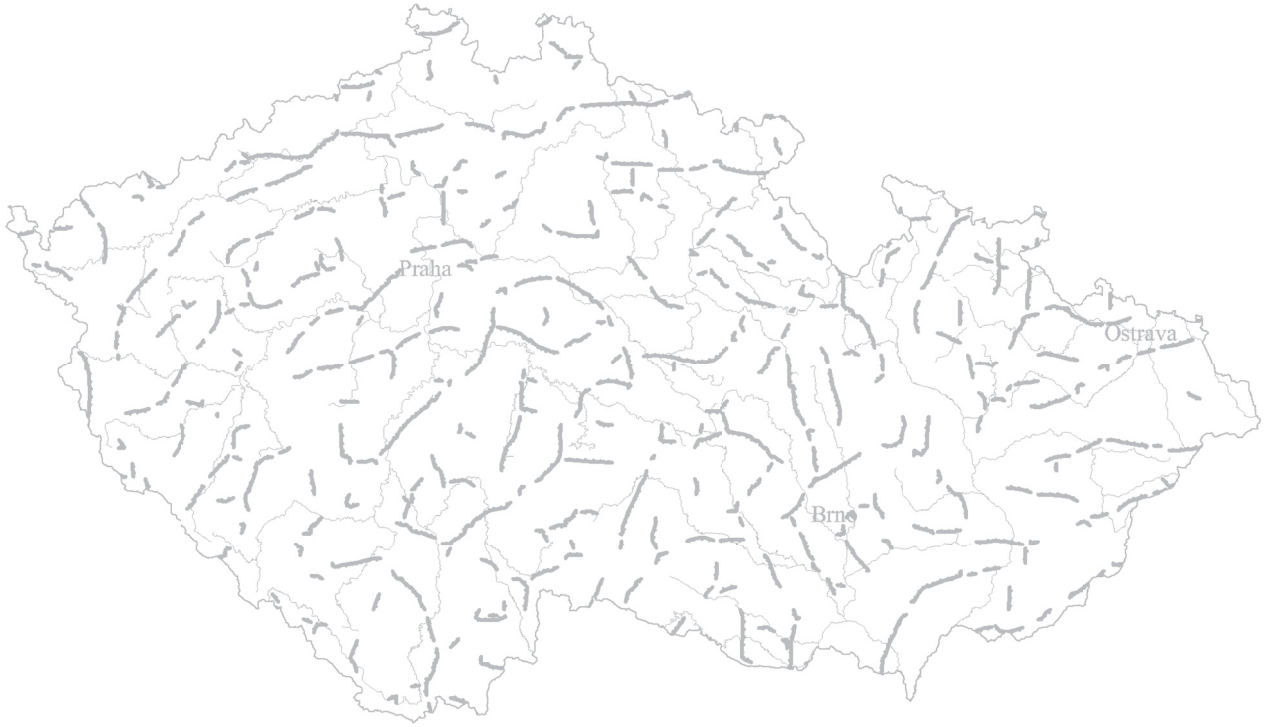
Analysis of the Earth's potential fields serves as a useful tool for understanding of the geological structure. The new detailed digital regular grids of the gravity and magnetic fields gives the possibility to evaluate a new set of basic and derived potential field maps of the Czech Republic. These maps offers new stimuli to the interpretation of the geological structure.

A new set of gravity maps

The Bouguer gravity anomalies (reduction density of 2.67 gcm^{-3}) represent the fundamental set of gravity data, from which various secondary maps are derived. The separation of the regional and the local (residual) components by two-dimensional local splines fitting under tension enables to distinguish the pattern of two types of gravity sources. Hence, the huge and extensive geological structures depicted by regional gravity anomalies can be studied separately without the complicating effects of the local-sized structures. The analysis of the regional features of the gravity field enables to characterize the main tectonic units of the Czech Republic such as the Saxothuringian and the Lugian (mostly negative), the Bohemian (predominantly positive), the Moldanubian (negative), Brunovistulian (positive) and it also enables to indicate their burried boundaries.



■ **Fig. 1.** Density boundaries (depth level 3 km).