These mantle rocks must have formed close to a subduction in a fore-arc setting. The closest subduction scar to both occurrences is that of the Vardar Ocean.

We discuss the location and polarity of all potential subduction zones of the area that may account for the igneous rocks and orthopyroxene-rich mantle rocks. Results of seismic tomography on subducted slabs beneath the studied area combined with geological data demonstrate that igneous rocks and mantle rocks may not be explained by the same subduction process. Instead, we propose that the western portion of igneous rocks in the Periadriatic zone is related to the Penninic subduction, whereas most of their Paleogene-Early Miocene counterparts in the Mid-Hungarian and Sava-Vardar zone could have originated from the Budva Pindos subduction. The most likely solution is that these oppositely dipping and synchronous subductions relayed each other and accommodated together the Europe-Africa convergence during the Paleogene.

The present diverging shape of the proposed arc has been achieved by considerable shear and rotations of major continental blocks. The Paleogene magmatic belt was strongly affected by lithospheric scale, arc-parallel, right lateral strike slip shear. This shear was initiated in the Late Eocene but maximum motion was achieved during Oligocene. The fault-induced pervasive fracturing could have localized magmatic activity, and vice versa, the heat impulse of the magmatic activity could have rheologically softened the country rocks and rendered them more easily deformable. This second case is strongly suggested for the Mid-Hungarian zone, which must have experienced highly intense deformations during the Early Miocene rotations (Fig. 1).

The occurrence of Late Oligocene-Early Miocene and also a part of the Middle Miocene-subrecent igneous rocks along the Mid-Hungarian zone in the Pannonian Basin match with those of the Late Eocene-Early Oligocene igneous rocks. We speculate that the genesis and ascent of Late Oligocene-Early Miocene magmas was initiated when the rotations took place. Thus, the rotated blocks could have also brought their earlier metasomatized lower lithosphere into the Carpathian embayment. The large volume of Early Miocene magmatic rocks associated with the Mid-Hungarian zone also suggests that the ascent of these magmas was controlled or facilitated by the most deformed part of this structural zone. Furthermore, a part of Middle Miocene igneous rocks close to the Paleogene-Early Miocene igneous rocks might have had the same subduction-related mantle source that had been transported to its present position from the former Paleogene arc. Consequently, it is proposed here that the same enriched mantle source could be reactivated several times during its geodynamic evolution providing different styles of volcanics depending on the process responsible for magma generation.

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Depositional Systems and Lithofacies of the Zlín Formation near the Contact between the Bystrica and Rača Units (Magura Nappe, Outer Carpathians, Eastern Slovakia)

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Magura basin has a complex tectono-sedimentary history with several phases of its evolution. Tectonic activity and sea-level changes controlled the sedimentary supply to the basin and induced formation of individual depositional elements and their migration in time and space.

Geological mapping (Žec et al. 2005) and detail sedimentological analysis on selected, relatively well exposed profiles revealed the significant differences between sedimentary character of Zlín Formation in Bystrica and Rača Units near their contact. Studied area is situated between Oľka and Laborec river valleys in the eastern Slovakia. Stratigraphic range of the Zlín Formation in the area is from the upper part of the Middle Eocene up to the Late Eocene. The formation is developed in overlayer of the Early to Middle Eocene Beloveža Formation which sedimentary conditions were affected by the subsidence and sea-level rise. During the uppermost Middle Eocene and Late Eocene, a significant uplift in the Magura basin was recorded (e.g. Oszczypko et al. 2003). This event influenced the sedimentary conditions in the area and triggered origin of depositional elements of the Zlín Formation.

The Zlín Formation of Bystrica Unit is characterized by higher sand/mud ratio (usually > 2) and the coarse-grained lithofacies resemble to those from Krynica unit (Strihovce Formation sandstones). Medium- to coarse-grained sandstones (lithofacies B1.1 sensu Pickering et al. 1986) are laterally continuous and often amalgamated. Grading is absent or poorly developed (coarse-tail grading), in some cases fluid-escape structures are preserved. Lithofacies B1.1 originated by the deposition from quasi-steady concentrated density flows (Mulder and Alexander 2001) and is alternating with the thin- to thick-bedded, normaly graded fine-grained sandstones representing turbidites sensu stricto with well preserved Bouma´s intervals (lithofacies C2.1, C2.2, C2.3 sensu Pickering et al. 1986). Tabular geometry, great lateral extent and lack of channelization suggest deposition in lobe and interlobe environments commonly interpreted to be diagnostic of an outer submarine fan (Mutti and Normark 1987).

Sedimentary fill of the Zlín Formation in Rača Unit (near the contact with Bytrica Unit) has a different character. Thick (up to 50–100 m) mudstone dominated horizons are alternating with several metres or tens of metres thick sandstone packages. Mudstone horizons are characterized by low sand/mud ratio (<0.5). Thin to very thick fine-grained sandstone beds are overlain by very thick mudstone drapes (up to 10–15 m, lithofacies C2.4 sensu Pickering et al., 1986). These sandstone/mudstone couplets probably originated by ponding of huge turbidite flows, in which the mud component of the flow was retained within a tectonically restricted depocenter. Paleoflow direction inferred from sole structures are usually oriented from SE to NW. However, some ripple and dune orientations indicate flow direction at a high angle to that deduced from associated sole structures. These different directions are caused by reflection off containing slopes (e.g. Haughton 1994). We suppose the slopes were paralel with basin axis (NW-SE trend) and the gravity flows dispersed from the basin margins were forced by basin topography to flow along the axis (longitudal filling).

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Depositional Environments and Biostratigraphy of the Lower Part of Rača Unit Paleogene (Magura Nappe, Outer Carpathians, Eastern Slovakia)

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We have studied sedimentology and biostratigraphy of the lower part of Rača Unit sedimentary infill at several localities in the eastern Slovakia – near Mrázovce village in the southern part, and in Vyšný Komárnik village and Dolhonec valley in the northern part of the the unit. Near Mrázovce village, the upward-fining and thinning bed succession was interpreted in more then 220 m long, well exposed profile from the basal sandstone-conglomerate horizon to overlying thin-bedded and fine-grained lithofacies of the Beloveža Formation (Kováčik and Bóna 2005).

In the lower part of profile the coarse-grained lithofacies, deposited by concentrated density (gravity) flows (sensu Mulder and Alexander 2001) in submarine channels, are presented. Cobble to pebble conglomerates, coarse-grained to granule sandstones are thick- to very-thick-bedded, massive (lithofacies A1.1, A1.4, B1.1 sensu Pickering et al., 1986), graded (lithofacies A2.2, A2.7) or partially stratified (lithofacies A2.8). The thick-bedded sandstones are rich in intraclasts of grey calcareous mudstones containing mixed foraminifera fauna (plankton>>benthos), ostracods, and inoceramid prisms. Benthos is mostly calcareous. Plankton with *Globigerinelloides subcarinatus*, *Gansserina wiedenmayeri*, and *Globotruncanella petaloidea* evidences the Maastrichtian age. Fauna is of "Frydek-type" biofacies. The mudstones were originally deposited under the well-oxygenated outer-shelf settings and later eroded and transported by gravity flows to the site of deposition (base of slope?).

Towards the top (in the middle part of the profile) the finer-grained, thin- to medium bedded turbidites (lithofacies C2.3, C2.2.) gradually prevail above the coarse-grained lithofacies ha-