NNW-directed maximum contraction was estimated from fold axes, reverse faults and striation on reactivated faults. At the prolongation of these basement faults towards SE, transpressive structures like basement pop-ups and positive flower structures were identified on seismic profiles. Episode of basement-involved compression was probably coeval with last stage of thin-skinned orogenic movements. These movements are related to formation of syndepositional compressional structures within the frontal part of the Carpathians that also involve CFB deposits. Both outcrop and seismic data point to northward-oriented compression. During compressive deformations, E component of Alcapa motion probably ceased due to resistance of the Ukrainian part of European plate.

During the Sarmatian, the Alcapa advance to the N was locked. Therefore, it continued its escape towards the NE. This resulted in thrusting of the Skole and Stebnice Units over the Badenian foredeep complex. It was accompanied by normal faults offset in the foreland plate. End of the Sarmatian or during Pannonian collision, sinistral strike-slip reactivation of NE-striking basement faults took place. These faults are clustered in the linear zone at the extension of the Mur–Muertz–Žilina lineament towards the foreland plate. In the Outer Carpathians, the shift of compression direction from N to NE was reported, but timing of this change was not possible prior to this study.

The uppermost part of the foreland basin fill was eroded, due to post orogenic uplift driven by isostatic rebound and elastic deflection of the plate enhanced by slab detachment.

Present-day tectonic stress directions from breakouts in the basement of the Carpathians and their foredeep shows compressive stress in NW direction in the basement of the Bruno–Vistulicum massif and dramatically different NNE direction in the eastern segment of the Małopolska massif. NNE direction of basement compression is similar to contemporary advance of the Carpatho–Pannonian microplate against the N European plate as determined by means of GPS. This suggests a possibility of stress transmission between the Carpatho–Pannonian plate and the Małopolska massif basement across the suture, but mechanical décollement between the Carpatho–Pannonian plate and the Bruno–Vistulicum massif.

Development of strain parameters in front of an obliquely colliding indenter

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We discuss the deformation in a ductile viscous zone in front of an obliquely moving indenter. We approximate solutions for the velocities in the interior of a viscous sheet deformed by a converging indenter (England et al. 1985), and show that the deformation across the zone decreases exponentially with the distance from the indenter and that the transcurrent deformation has a higher attenuation factor than the compressional deformation. In this model, the across-strike width of the indenter, a frontal or lateral type of collision, together with the viscosity of the foreland, play key roles in the indentation process.

Similar to other models of oblique transpression (Tikoff and Teyssier 1984) we consider the velocity of the indenter to be split into components parallel and perpendicular to the indenter - depending on the angle of collision. Thus, we develop a model of deformation in front of an obliquely moving rigid indenter producing such strain partitioning

To describe the deformation history in front of the indenter we consider a rock sample in the deformed zone and compute its relative velocity with respect to the approaching indenter. As the velocity of the ductile material is always less than the velocity of the indenter, the distance of the sample to the indenter is progressively shortened. For the considered rock sample we compute temporal development of finite strain parameters - strain intensity, strain symmetry, lineation and foliation.

The model typically produces a narrow domain near the indenter with prevailing tangential strain followed by a wide zone dominated by compressional strain. We develop a formula expressing the distance at which the strain rate for the tangential strain and the compressional rate equal each other. Below this distance the instantaneous shearing parallel to the indenter boundary prevails over the compression. However, from the viewpoint of finite deformation, the domain observed as being dominated by simple-shear is much thinner, due to the more effective accumulation of the pure-shear type of deformation.

Such a deformation history is accompanied by strike-slip partitioning, which develops in areas with strong vertical anisotropy originating in more distant pure-shear dominated areas. As the indenter approaches this domain, instantaneous simple-shear dominated deformation creates high shear stress on pre-existing planes thus enhancing possible strike-slip faulting. We therefore, define a critical distance from the indenting zone where strike-slip zones parallel to the indenter develop.

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Intraplate collisional regimes on the eastern margin of Barguzin microcontinent (Baikal region) in Early–Middle Paleozoic

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Arc of the Baikal orogen belt was formed due to destruction of continental crust in Late Proterozoic, accretion of island arc and microcontinental terranes in Late Riphean time and intraplate collision in Early–Middle Paleozoic. In the inner part of this orogen belt are areas of granitic pluton formation, that are evidence of existence large massif with continental crust (Barguzin microcontinent). The structure of Paleozoic tectono-sedimentary units on the eastern edge of Barguzin microcontinent formed due to collision of it with southerly laying passive margin of Siberia in Early–Middle Paleozoic times. There two types of intraplate collisional regimes occurred, that controlled settings in regional tectonic framework. (1) The evolution of post-collisional basins along Precambrian suture was terminated by intraplate transpression. Internal structure of these transpression zones such as Kelyana–Irakinda may be interpreted as a group of numerous blocks which are bounded and separated by thrust, reverse-slip, strike-slip and oblique slip faults. (2) The structure of Early and Middle (?) Paleozoic sedimentary cover in internal part and eastern margin of the Barguzin microcontinent are defined by thrust development as a result of basement – cover interaction. Strain data collected from Upper Riphean–Paleozoic tectono-stratigraphic units demonstrate that complex regional strain pattern was created by northward displacement of Barguzin microcontinent or composite terrain during the Early–Middle Paleozoic stage. This massif may be interpreted as indenter, that defined collisional faulting and deformation.

Tertiary evolution of the Carpatho-Pannonian region: an interplay of subduction and back-arc diapiric upraise in the mantle

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The Tertiary evolution of the Carpathian arc and Pannonian Basin is generally interpreted as a coupled system of the (1) gravity driven subduction of oceanic or suboceanic lithosphere underlying former flysch basins, (2) back arc extension associated with the diapiric upraise of asthenospheric mantle and (3) lateral escape of lithosphere from the Alpine collision assisted by transform faults. The gravity driven subduction involves an exchange of space, which requires a