reactivated faults, flat S dipping thrust faults and folds, giving a north-vergent overthrust. Based on similar structures across the border, the age of the deformation is inferred to be Albian. Two ductile-brittle phases follow, both giving spectacular structures. Depending on lithology they are characterized by folds or strike slip faults. A supposedly first phase has NE−SW fold axes and a SE vergence, while the second has NW−SE fold axes and a NE vergence. Both might be related to Paleogene−Early Miocene deformations and their relative positions or successions might be explained by large rotations during the Early Miocene. These rotations affect large areas in N Hungary−SE Slovakia.

Two more brittle tensional phases were recorded. A NE−SW extension and a NW−SE extension. The former might be Miocene in age, while the latter might be recent, because of the structures on cavity fillings in the caves. The found structures might be fitted in a complex model in the contact area of the Austroalpine, Dinaric, Meliatic plates and complete previous data on the Hungarian and Slovakian side.

Ongoing orogeny? Comparing Miocene and recent dynamics of the Eastern Alps for seismic risk assessment

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Miocene as well as active tectonics in the Eastern Alps and the surrounding areas are triggered by the plate convergence between Europe and the Adriatic plate. A comparison of reconstructed Miocene convergence rates with GPS data (H. Sünkel, Technical University of Graz) serving as a snap-shot on recent plate motion indicates continuous convergence with a velocity similar to the Miocene average. We report on a first approach of a geologic study which is carried out to discriminate faults in the Alpine thrust belt which could account for this shortening and to assess the seismic potential of such faults. The Austrian Alps show moderate seismicity and maximum intensities of historical quakes of I=9. Until now, seismic hazard assessment relied on the probabilistic analysis of historical earthquake catalogues, which, however, are extremely short compared to any geological process and which may be incomplete.

The fault pattern in the Eastern Alps is dominated by Miocene thrusts and strike-slip faults which formed in a N−S to NW−SE-compressive paleostress field. The paleostress directions are comparable to recent NNW−to NW-directed compression indicated by focal solutions and in-situ stress measurements. The comparison of the Miocene fault pattern in the Eastern Alps with the location of earthquake hypocenters and with the orientations of nodal planes of focal solutions indicates a good agreement of Miocene and recent kinematics. Neotectonic slip may dominantly occur on (N)NE- and NNW-striking strike-slip fault zones which are favourably oriented with respect to the compression direction. Frequency analyses of faults lengths show that most faults have lengths between 10 and 30 km. Large fault zones like the Inntal-, Salzach-Ennstal-, Mur-Mürz-, Vienna Basin-, Lavanttal and Periadriatic faults display variable segmentation with about 100 km maximum lengths of individual segments. Faults in the northern parts of the Eastern Alps root in the Alpine floor thrust and do not penetrate to the basement, thus only dissecting the uppermost 10 km of the crust. Information about the depth range of faults in the Central Eastern Alps comes from rheological modeling of the Alpine lithosphere which indicates that, due to the thermal structure of the lithosphere, brittle fracturing is restricted to the uppermost 10−15 km of the crust. This matches the observed distribution of hypocenter depths.

This reasoning allows to estimate maximum strike-slip fault surfaces which are in the order of 500 to 1000 km, and which could be used to constrain the magnitude of the hypothetical largest possible earthquake.

Heteroaxial shortening, strike-slip faulting and displacement transfer in the Polish Carpathians

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The Oligocene−Miocene tectonic evolution of the Outer Carpathian nappes in the Beskidy Mountains (Poland) is characterized by the superposition of two distinct thrust events, by the reactivation of thrusts during sinistral wren-
Thermal and rheological structure and evolution of the lithosphere—clues of tectonic interactions in the Carpatho-Pannonian area

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The temperature field of the lithosphere and, consequently, the mechanical state, in particular its rheology, are strongly dependent on the past or ongoing tectonic processes involving the entire lithosphere or parts of it. The paper presents the rheological consequences of tectonic processes for areas in the Carpathian system. It is shown that the pre-Miocene subduction of an oceanic lithosphere followed by a Miocene continental collision leading to the Moldavian thermodynamic tectogeneses responsible for the present day structure of the Eastern Carpathians is a major thermal event, creating a characteristic temperature field of the lithosphere, persistent for a few tens of million years, with certain volumes in which intermediate-depth earthquakes can occur. The thermal and rheological structure is discussed in connection with the seismic structure as revealed by tomographic studies of the area. The extension of the Pannonian lithosphere since the Badenian, and the complex evolution of the Transylvanian Basin since the Senonian are discussed as well.

The shallow lithospheric mantle beneath the Carpathian-Pannonian region: evidence from ultramafic xenoliths

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The nature of the shallow lithospheric mantle beneath the Carpathian-Pannonian region has been investigated via the study of several suites of mantle-derived ultramafic xenoliths which occur in the widespread Tertiary/Quaternary mafic alkaline magmatism of the region. Localities of mantle xenoliths include the Balaton Highlands, Graz Basin, Little Hungarian Plain, Nograd-Filakova and Persani Mountains, so geographical coverage is wide. Most of the xenoliths are anhydrous spinel peridotites, with harzburgites, dunites, pyroxenites and hornblendites being much less common. The mineralogical and chemical variations of xenolith suites found in most Carpatho-Pannonian localities are very similar, reflecting the operation of similar processes in the mantle.