took place within the Alpine Wilson cycle. (1) Rifting processes of some 40-50 Ma duration which ended in the Late Triassic. (2) Opening of the Dinaridic Tethys which took place in Late Triassic/Early Jurassic time when a spreading center was set up. This made possible the generation of the oceanic crust during the period of 60-70 Ma. At that time there was probably also subsidence of the northeastern marginal parts of the CP composed of the Triassic formations with unconformably underlying Paleozoic formations, which were thus included in the basinal parts. (3) Subduction processes started in a subsequent Late Jurassic/Early Cretaceouc time as indicated by the first emplacement of ophiolites. By the end of these processes, the Paleozoic-Triassic formations overlain by the oceanic crust were probably detached and thrust onto the emplaced ophiolites and their country rocks. The emplacement of ophiolites and stocking of the Paleozoic-Triassic nappes was accompanied by the first strong Alpine metamorphism (120-110 Ma). (4) In the northern Dinarides, in the Late Cretaceous a magmatic arc has been already generated as indicated by the presence of trench sediments and igneous rocks characteristic for such a geotectonic setting. (5) The main deformational (compressional) event (about 40-50 Ma) and medium-pressure metamorphism accompanied by synkinematic granite plutonism took place after the Eocene termination of subduction processes. This deformation produced main NW-SE-trending fold, thrust and imbricate structures with the southwestern vergences. Only north of the presumed subduction zone, opposing northeastern vergences due to obduction were recognized. (6) Post-orogenic evolution started after the Eocene uplift of the Dinarides which gave rise to the separation of the Tethys into the Mediterranean and the Paratethys.

Which is the time of rotation? Review of paleomagnetic and K-Ar data from Romania

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Recent K-Ar data from Romania has changed or improved the age of some magmatic rocks sampled for paleomagnetic studies. A first important change concerns the age of basaltic andesites from Mures Valley (Apuseni and Poiana Rusca Mountains). These rocks, previous considered as Paleogene, have ages between 66 ma and 72 Ma. The second important contribution of the radiometric data concerns the ages of the two groups with different paleomagnetic directions from Miocene magmatic rocks of Apuseni Mountains. Two K-Ar data from the group with a declination around 70° suggest an age between 14.7 - 12.4 Ma. The K-Ar data from the group that show no rotation suggest an age around 11 Ma. The paleomagnetic data support the existence of a domain characterized by a large clockwise rotation in the eastern part of the Carpatho-Pannonian area. The amplitude of the rotation is variable from 70° in the Apuseni Mountains -Banat area to 120° in the Bucegi Mountains. Data from the Apuseni Mountains suggest a very fast rotation during Sarmatian. This rotation was coeval with the counterclockwise rotation of the Gutai Mountains, but took place after the end of the counterclockwise rotation of the North Pannonian Paleogene basin (around 16 Ma). This fast rotation was accommodated in the brittle layer by coeval trusts and strike-slip faults in the East and South Carpathians and extensional grabens and shear zones in the Great Hungarian Plain. These rotations reflect probably the continuously deforming lithosphere beneath the seimogenic upper crusts. K-Ar data from Pannonian-Quaternary volcanic rocks of East Carpathians show the migration of the volcanism along the arc and a short duration of volcanic activity in individual segments. Paleomagnetic rotations are absent in these magmatic rocks, but the migration is in the same sense as the previous clockwise rotation. The above features are all consistent with the slab breakoff model. Cinematic parameters derive from these data will be discussed with respect to the proposed tectonic models for this area.

Styles of Miocene thrusting, strike-slip faulting and extension in the eastern Calcareous Alps

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The final stage of collisional shortening in the Eastern Alps was characterized by intense brittle deformation of the Calcareous Alps during the Miocene. Thrusting over the European margin occurred until the Early Miocene (Karpatian stage, 17 Ma) as dated by overthrust Molasse sediments. Thrusting was generally directed northwards and exceeded 34 km since the Late Oligocene (Wessely, 1987). The irregular morphology of the overthrust European basement controlled deformation styles in the upper plate. From the

Early Miocene on continued shortening was accommodated by distributed sinistral shear during eastward lateral extrusion (Ratschbacher, 1991; Linzer et al., 1995) of the central Eastern Alps. Three stages of Miocene deformations can be distinguished in the Calcareous Alps.

(1) Early Miocene N-directed shortening during the onset of eastward lateral extrusion led to the formation of (N)NE-striking sinistral faults. Older NW-striking faults continued to move dextrally. N-directed shortening in the Calcareous Alps correlate to the N-directed translation of the Adriatic plate.

(2) Middle Miocene NE-directed shortening of thrust- and strike-slip type during the subsequent stage of extrusion caused sinistral movements along E-W to NE-SW striking faults which were partially linked with NE-directed thrusts. The Königsee-Lammertal-Traunsee fault shows spectacular examples of convergent strike-slip duplexes, flower structures and connected thrusts. Thrust distances along thrust planes connected to strike-slip faults locally exceeded 6 km (Warscheneck nappe). Sinistral offsets at strike-slip faults reached up 30 km (Pyhrn fault). Most of the sinistral displacement along the Salzach-Ennstal fault occurred during this stage leading to the formation of positive flower structures. Older NW-striking dextral faults were partially reactivated as high angle reverse faults. Deformation style changed east of the overthrust Bohemian basement spur, which formed a morphologic high of the lower plate and which can be traced up to 50 km behind the alpine deformation front (Wessely, 1987). West of this basement spur, NE-directed thrusts dominated, whereas east of it extensional deformation prevailed. At the eastern margin of the Calcareous Alps, increasing extensional strain marks the transition towards the Vienna Basin. NE-directed shortening in the Calcareous Alps resulted from the drag of the eastward extruding central Eastern Alps which added a component of sinistral simple shear to overall N-directed shortening.

(3) Middle Miocene E-directed extension led to the formation of E-directed normal faults and to normal-sinistral movement along NE-striking faults. Deformation at the Salzachtal-Ennstal shear zone changed from transpression to transtension. Extension in the Calcareous Alps was associated with orogen-parallel detachment faulting in the central Eastern Alps. There, E-directed extension paralleled the direction of mass transfer towards the Pannonian Basin during lateral extrusion. Extensional faulting was induced by reduced lateral confinement east of the Alps due to the eastward motion of the Pannonian lithospaeric wedges.

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Chronology of Cretaceous tectonic events in the Central Western Carpathians

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The Cretaceous stage was the main period of tectogenesis of units in the Central Western Carpathians (CWC, here considered as an area between the Penninic-Vahic and Meliata-Hallstatt oceanic sutures, i.e. corresponding to the Austroalpine system). The paleotectonic evolution encompasses preorogenic pelagic and synorogenic flysch sedimentation, magmatism and metamorphism of different types, subduction of zones floored by oceanic or attenuated continental crust, stacking of collisional thick-skinned crustal imbricates and emplacement of d,collement cover nappes, as well as superimposed transpressional and transtensional movements. All processes involved exhibit a forelandward (generally northward) progradation and vergency of dominant structures. The interpretation of relatively rich, sufficiently age-constrained material and structural rock records enables a sophisticated temporal-spatial reconstruction of Cretaceous orogenic processes within the CWC, partitioned into seven principal periods:

(1) Late Jurassic - Early Cretaceous (150-125 Ma). Closing of the Meliata ocean and collision of its margins, exhumation of some HP/LT metamorphosed Meliatic units, loading of the South Veporic basement and cover by the collisional stack, general crustal thickening in the southern CWC zones. In the northern CWC domains (Fatric-Tatric-Vahic) an extensional regime, lithospheric stretching and mostly pelagic sedimentation continued.

(2) Late Early Cretaceous (125-110 Ma). Shortening prograded to the southern margin of the Fatric basinal realm, cessation of sedimentation in the transitional Veporic-Fatric Velkì Bok domain, contraction is heralded by huge olistostromatic bodies in the Fatric Zliechov basin, extension-related submarine basanitic volcanism and resedimentation events in the Fatric-Tatric foreland, probably bulge-related shallowing of the South Tatric ridge with Urgonian carbonate platforms.