Principal geological and geophysical characteristic of the Alpine-Carpathian-Pannonian junction

Michal Kovác[1], Ján Šefara[2], Dušan Plašienka[3] and Oldrich Krejcí[4]

[1] Dep. Geol. Paleont., Comenius Univ., Bratislava, Slovakia
[2] Dep. Geophysics, Comenius University, Bratislava, Slovakia
[3] Geological Institute, Slovak Academy of Sciences, Bratislava
[4] Czech Geoligal Survey, Brno, Czech Republic

The map of general tectonic structure of the Western Carpathians and surrounding areas can be divided to following zones:

The outer zone, represented by the autochthonous sedimentary fill of the Carpathian foredeep and by allochthonous accretionary wedge of the Flysch Belt units overthrust on the slopes of the Bohemian Massif (part of the North European platform).

The suture zone between the outer and central zones is reflected on the surface by the Pieniny Klippen Belt. Southwards the closing of the South-Penninic ocean basin (Ligurian-Piemontais or Vahic ocean respectively) is supposed during the latest Cretaceous and earliest Paleogene.

The central zone is formed by the pre-Alpine and paleo-Alpine complexes of the Central Western Carpathians. The present nappe structural pattern of the zone has been formed during the Middle to Upper Cretaceous; the deformational structures reflect outward (northward) polarity. Besides the overthrusting of the superficial nappes (Hronicum, Fatricum and Silicicum) composed mainly of carbonate rocks, also the large basement nappes (Tatricum, Veporicum and Gemericum) have been formed. The Lower, Middle and Upper Austroalpine units in the Eastern Alps and in the pre-Neogene basement of the Vienna Basin represent the analogous units to the Carpathian nappes.

The inner zone was as a whole formed during the paleo-Alpine and/or Late Cimmerian (Late Jurassic - Early Cretaceous) tectonic movements; later its structure was modified by the Late Cretaceous and mainly by the Tertiary extensional and wrench tectonics. This crustal segment, named also the Pelso Unit, is bordered from the NW and N by the Rába-Hurbanovo-Diosjenö fault-lines, from the south by the mid-Hungarian lineament. Surficial part - the Transdanubian Central Range is in the nappe position with respect to the Austroalpine units.

Geophysical characteristics of the examined area reflect the processes connected with the Neogene development of the Eastern Alps, Western Carpathians and Pannonian Basin s.l. junction area.

Lithosphere thickness diminishes considerably from the west, from the Bohemian Massif and Eastern Alps, eastwards. Below the Transdanubian Central Range it reaches only about 60 km. This anomalous phenomenon can be explained as a result of the mantle upwelling in the back arc area.

Gravity minimum characteristic for the Alpine orogene as well as for the Eastern Carpathians is not so prononced in the Western Carpathians as is evident in the Bouguer gravity map. The origin of this anomaly is in the folded accretionary wedge complexes of the Flysch Belt and in the basement (Bohemian Massif) overriden by the Carpathians during the Neogene oblique collission.

Crustal thickness ranges within 34-26 km in the majority of the examined area. Considerable thinning is characteristic for the Pannonian region s.l., except the Transdanubian Range. The zone of thinned crust is situated in the centre of the Danube Basin.

The values of heat flow density are most expressive in the Slovak part of the Danube Basin, since the high thermal gradient area coincides with buried volcanic bodies. Outer Carpathians itself, as well as the majority of the Central Western Carpathians, are characteristic by a low thermal activity.

The pre-Tertiary basement contour map documents situation of depocentres in the central part of the Vienna and Danube basins, as well as in depocenters in the northern embayments of the Danube Basin (Blatné, Rišòovce and Komjatice depressions).

Geological evolution and hydrocarbon habitat of the External Albanides

Peter Krois

OMV Aktiengesellschaft, EP-EXP, Vienna, Austria

Albania is part of the Alpine-Mediterranean orogenic belt. Its Mesozoic and Tertiary evolution was controlled by relative movements between the Adriatic subplate and the European plate.

The External Albanides (Krasta-Cukali, Kruja, Ionian and Sazan Zones) are characterised by a thick series of mainly passive margin Triassic to Tertiary carbonates diachronously overlain by syntectonic Tertiary Flysch, Pre-Molasse and Molasse sediments.

Sediments of the Neogene Periadriatic Depression cover the north-western parts of the Ionian and Kruja Zone. Large scale northwest-southeast striking ramp anticlines characterise the internal structural style of those two zones.

Oil and Gas Plays in Albania: Oil and gas exploration and production has a long history in

Albania. The main oil play type are Ionian Carbonates of an Upper Cretaceous to Eocene age in a ramp anticline or imbricate structure. Porosity and permeability are mainly created by fractures in the crestal part of the anticline. In near platform or slope settings, dolomitisation is likely to enhance porosity and fracture density. Shaly and marly Oligocene Flysch sediments act as lateral and top seals. Sourcing is possible from a variety of Upper Triassic to Upper Cretaceous, moderate - high quality, high TOC, oil-prone source rocks within the individual imbricate or duplex.

A variety of structural and stratigraphic plays in the Neogene has been defined in the Periadriatic Depression. Reservoir rocks were deposited in shallow marine to deep water environments. Shaly intervals within the Neogene section act as lateral and top seals. Play types include lateral and up dip pinch-outs, four-way dip closed drapes, fault bounded sandbodies and four-way dip closed backthrust ramp anticlines.

Both oil and gas have been discovered in the Neogene. Gas is mainly of a biogenic origin from disseminated organic matter in the Neogene, with some admixture of thermogenic gas. Oil is sourced from source rocks in the carbonate section and migrates along carbonate structures and breached seals and fracture zones into the Neogene above.

Neogene superterranes of Dinarides and Carpatho-Balkanides in SR Yugoslavia

Nadezda Krstic[1], Slobodan Stanic[2,3], Vladica Cvetkovic[3], Jugoslav Zic[4] and Dragoljub Petrovic[3]

[1] Geoinstitute Beograde, Yugoslavia
[2] Nafta Gas, Novi Sad, Yugoslavia
[3] Mining-Geological Faculty, Beograd, Yugoslavia
[4] Institute of Technical Investigation, Podgorica, Yugoslavia

Two regions of the Miocene lacustrine sedimentation on Balkan Peninsula are known for more than 100 years. Better studied is the Dinaridic realm of ancient K&K. The lacustrine Miocene between the Drina and Timok rivers were often, but unsuccessfully equalized to the Dinaridic one. After the recognition of the older terranes (Karamata et al., 1994) was possible to deliminate two large Neogene superterranes, one in the Dinarides and the other in the central Balkan Peninsula.

On the deep seismic profile (from Petrovac-na-Moru to Negotin) there is a sign of a dislocation in the region of Tutin delimiting, possibly, the two Neogene superterranes.

The sediments of the two lacustrine systems belong to two large sedimentary cycles, the single cyclotheme each. In SR Yugoslavia the older cyclotheme is developed in Northern Montenegro and, as a "gulf" (trench?), it cross from Pranjani, via Cacak and Trstenik to Alcksinac. In that area there is overlapping of the two cyclothemes. The younger cyclotheme covers all of Serbian area. ('Serbian Lake') reaching in some time portions to the Skopic surroundings in the South. It is in places ca. 1000 m thick; because of the great depth of burial the vitrinite reflectance is 0,77-0,91 for the Ibar coal (Ercegovac, 1991).

The age of the western Balkan lacustrine system was determined as Karpathian equivalents while covered by the marine Upper Karpathian and Badenien (Kochansky and Sliskovic, 1978) The age of the central Balkan lacustrine system ('Serbian Lake') is determinable by the findings of the ostracode genus *Mediocypris,* the key fossil for the lacustrine Middle Miocene for Eurasia (Kheil, 1968). Some controversy of the age determination by flora and mammals were caused by the great stratigraphical reach of these land fossils (Pavlovic, 1995).

Several thick tuff beds appear in the upper part of the Serbian Lake cyclotheme. Some of its measurements gave 15-16 Ma of age (Duraki, in press). The tuff was extruded from the few large volcanic centres like Kontlenik and Borac. That ancient volcanic activity, placed mostly in the Vardar Zone Composite Terrane, are the result of the collision and following relaxation (Cvetkovic et al., 1995). Differential neotectonic movement complicate present geological structure.

From compression through extension to inversion - Miocene tectonics of the Polish Carpathian Foredeep basin

Piotr Krzywiec

Polish Geological Institute, Warsaw, Poland

Polish Carpathian Foredeep (PCF) basin developed in Miocene times in front of the advancing Carpathian thrust belt (Oszczypko, Slaczka, 1989).

Recently completed structural interpretation of four regional, basin-wide seismic profiles located between Kraków and Przemyœl provided information on large-scale framework of Miocene tectonic development of this part of the PCF.

For the western part of the study area located between Kraków and Rzeszów it was concluded that only minor tectonic deformations of Miocene age can be observed within the PCFs' Mesozoic basement. They developed in form of normal faults located NW-SE. Immediately in front of the Carpathians, particularly between Bochnia and Tarnów, series of frontal thrusts developed within the foredeep sediments. Gentle flexure of