comparison with 1,2-1,6 mkcal/cm^2/sec in Folded Carpathians; - considerable emergence of Moho border up to 25-30 km in Trans-Carpathian flexure in comparison with 55-65 km near Folded Carpathians and Carpathian foredeep. In Trans-Carpathian flexure the heat flow sharply increases to over 2 mkcal/cm^2/sec. Such values are characteristic to the Slovakian, Pannonian and Transilvanian depressions. 4. Variety of fluid shows on Carpathian border and in Trans-Carpathian flexure (gas fields, shows of oil, big amount of mineral water springs). In Trans-Carpathian flexure during the last time 5 gas fields have been discovered: Rusko-Komarivske, Stanivske, Solotvynske, Korolivske, Dibrovske and one carbon dioxide field (Martivske). Oil shows have been observed in salt mines near the towns of Solotvyno and Khust and in 6 wells at prospects of Solotvyno, Nonkove, Makarove etc. 5. Presence of gravity markers of collision area by which in Trans-Carpathian flexure is clearly fixed Maximum connected with marginal swell of Eurasian plate, Minimum connected with deep-sea gutter and again Maximum connected with plate plunge in flat area of subduction under Pannonian microplate. 6. Presence in Badenian and Sarmatian deposits of Trans-Carpathians flexure intrusion - granite-diorite-porphyries. 7. Ore mineralizations (basemetal and gold deposits): Biganske basemetal and Muzhyivske gold field in the zone of Beregiv horsts, as well as Saulyak gold field in the Marmarosh crystalline massif. 8. Thrust and fold structure of Carpathians. Presently the thrust and fold structure of Carpathians raises no doubts of the investigators. The Moho boundary shows a significant uplift (to 25-30 km) in Trans-Carpathian flexure comparing to its subsidence (to 55-65 km) below the Folded Carpathians and Carpathian foredeep along the line Beregove-Dolyna-Vyshnevets. The corresponding values are along the line Chop-Sambir-Gorohiv – 28-32 km in Trans-Carpathian flexure comparing to 55-65 km in the folded part of the Carpathians and Carpathian foredeep. The above-stated indicates that in Trans-Carpathian flexure there is collision and flat subduction of Eurasian plate under Pannonian microplate.

Geodynamics of Carpathian and Crimean fold belts formation

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Carpathian arched fold-and-thrust belt has formed as a result of its occurrence at the beginning of its formation within the rigid limits of Precambrian geo-structural units: Czech massif, Volyno-Podolian and Moesian plates, Pannonian middle massif with a consequent collision of a number of plates and microplates: of East-European microplate with African plate, which moves from south-west through the intermediate Adriatic and Pannonian microplates, of West-European microplate, which moves from west-north-west, with Pannonian microplate and of Arabian plate, which moves from south-south-east through Anatolian and West-Black Sea microplates with microplate of Transilvanian and Pannonian depressions. Differences in mass of plates and microplates are not big, that is why their collision occurs according to the scheme of collision and low-angle subduction under Pannonian and Transilvanian depressions of somewhat heavier and cooler plates from north-west, north-east and south-east. Collision belts of these plates and microplates are limited by fold-and-thrust subduction zones. Collision and low-angle subduction caused heating of the mantle mass, forming of the mantle asthenolith and its uplift, which resulted in intense heat flow and crust thickness reduction under Pannonian and Transilvanian depressions. This explains the high position of Moho under these depressions. As a result of subduction of the European plate under the Pannonian and Transilvanian microplates during Late Cretaceous till present, about 150 linear kilometers of substrate have been assimilated, and the Cretaceous-Paleogene flysch has been displaced from its platform basement and intensively deformed into structures of north, north-east and south-east vergence.

In front of the Crimean fold belt, on the north-east, the platformian part (Skythian microplate) is distinguished, further southwards – the system of depressions and somewhat

uplifted structures of latitudinal extension and more southwards the mountains of Crimea and Caucasus formed during the Kimmeridgian and Alpine folding phases. Southwards from these mountains the Paleogene depression of Black Sea has formed, in which the West- and East- Black Sea parts are distinguished. Southern coast of the Black Sea is represented by the mountain massifs of the Pontian Mountains (Pontides) formed during the Alpine folding and with a convex part of the arc directed to south-east. System of Crimean and Caucasus Mountains, taking into consideration their both subairial and submarine occurrence, has an arched shape and with its convex part directed to south-east. It has formed as a result of collision of the Eurasian plate with the plates of the present-day East- and West-Black Sea depressions. The beginning of collision is referred to Triassic (Kimmeridgian folding). During Triassic, Jurassic and Cretaceous a system of depressions, Crimean and Caucasus Mountains, Black Sea depression has been formed. During Jurassic-Cretaceous-Paleogene the process of denudation of the Crimean Mountains took place. At the end of Cretaceous the tectonic movements of the Alpine orogeny recommenced, which is evidenced by the laccoliths in the internal ridge of the Crimean Mountains.

During the Alpine folding cycle as a result of the movement of Arabian and Anatolian plates to south-west their movement has been transferred to the west of the Black Sea plate, which as a wedge along the Teisseyre-Tornquist line is pressed into the body of the Eurasian plate. This movement is observed till the Baltic Sea region. At the present epoch the movement of the Eurasian plate to south-west and its collision with the East-Black Sea plate continues. As a result was formed the Azov Sea depression, Indolo-Kuban depression continues to be formed, Sivash lagoon has been formed. The present-day Sea of Azov is an external part of the foredeep where the molasse deposits are formed. The present-day Black Sea is an intramontane depression.

At the present epoch the movements along the Trans-European tectonic activation zone – the Teisseyre-Tornquist zone have activated. This is confirmed by a number of earthquakes, existence of “hot” points and GPS measurements.

Structure and Miocene evolution of the frontal Polish Carpathians: a synthesis

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The Polish Outer Carpathians comprise several thrust sheets composed mostly of Cretaceous through Paleogene deepwater siliciclastic flysch. The most external units in the nappe pile is built of the Miocene sediments of the Carpathian foredeep basin. The lower plate (i.e. the sub-Carpathian basement) consists of the generally flat-lying Mesozoic to Permian sedimentary rocks, underlain by tilted blocks of Carboniferous, Devonian and Early Palaeozoic strata that rest on top of Precambrian basement. Top of the lower plate is very rugged; the youngest event that has shaped it was significant erosion post-dating Late Cretaceous – Palaeogene inversion of the Carpathian foreland. This widespread erosion resulted in incision of deep valleys generally directed towards S - SE. The morphology of the sub-Carpathian basement top and the distribution of the Badenian foredeep evaporites were two important factors that have influenced the evolution of the Carpathian orogenic front. A new structural model of the orogenic front and its basement has been recently constructed using outcrops, numerous wells and high quality 2D/3D seismic data.