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THE VIENNA BASIN: PROBLEMS OF ITS GENESIS AND TYPE

(Figs. 7)

Abstract: The Vienna basin represents an intricate type of basin, manifesting the features of rift, fore-deep and namely intermontane depression. In its development, the Vienna basin inclined to be similar to the basins occurring on both divergent and convergent margins of plates and/or blocks.

Its pre-Neogene evolution has so far been hypothetically connected with triple junction pattern riftgenesis. The rift was generated on thin, most probably suboceanic crust. There does not exist any evidence supporting newly-formed oceanic crust. The paper discusses the following models of basin origin: pull-apart basin, subduction or via thermal subsidence. The new model is based on peripheral position towards the Pannonian mantle diapir. Rapid subsidence before Pliocene collapse of diapir is put into connection with bending and subsidence of crust into mantle rim syncline surrounding uprising diapir during Miocene.

Резюме: Венская впадина представляет собой сложный тип впадины, выявляющий признаки рифтового, передового, а именно межгорного прогиба. Венская впадина своим развитием похожа на впадины располагающиеся на обеих расходящихся и сходящихся окраинах плит — блоков.

Ее донеогеновое развитие было до сих пор гипотетически связывано с генезисом рифта по образцу тройного контакта. Рифт был образован на тонкой, вероятнее всего субокеанической коре. Нет никакого доказательства о заново образованной океанической коре. В статье обсуждены следующие модели происхождения впадины: пулапартовая впадина, субдукция или оседание путем термальным. Новая модель основана на периферийном положении по направлению к мантийному диапиру в паннонском регионе. Быстрое оседание до обрушения диапира в плиоцене связывается с изгибанием и оседанием коры в синклиналь каймы мантии окружающей поднимающийся диапир во время миоцена.

The Vienna basin represents an intricate megastructure usually ranged to Neogene intramontane basins of the Western Carpathians. It is situated between the Eastern Alps, Western Carpathians and Bohemian Massif. Sedimentary filling of the basin is Middle and Upper Miocene in age, in a lower extent also Pliocene. The space below sediments is represented by pre-Miocene thrust sheets of the Eastern Alps and Western Carpathians. Deep autochthon in the depth of 7—10 km has not been reached in Czechoslovakia by bore-holes until now. Several models, treated in this paper, attempt to present a hypothesis of both genesis and type of the Vienna basin.

The Vienna basin includes also its pre-Miocene basement, considered in this paper as being its part. Pre-Miocene development dependent upon segmentation and type of crust is supposed to have predisponed both emplacement and structure of the basin.

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Genesis and type of basin are important for estimating perspectives of oil and natural gas deposits in deep basement as well as for the strategy of projecting geophysical and drilling surveys. The problem of genesis and type of the basin was tackled from geosynclinal aspect and plate tectonic model. Mainly the type of crust, proximity of basin to a plate margin (blocks) and the nature of boundaries — connection of plates in the neighbourhood of basin (Dickinson, 1974) were taken into consideration. Also new classifications of basin types with hydrocarbon deposits were applied

Main data on deep structure of basement

Geophysical surveys report noncontrast Moho discontinuity which leads to anunivocal interpretation of crust thickness. Plíva (1981) recorded the thick-

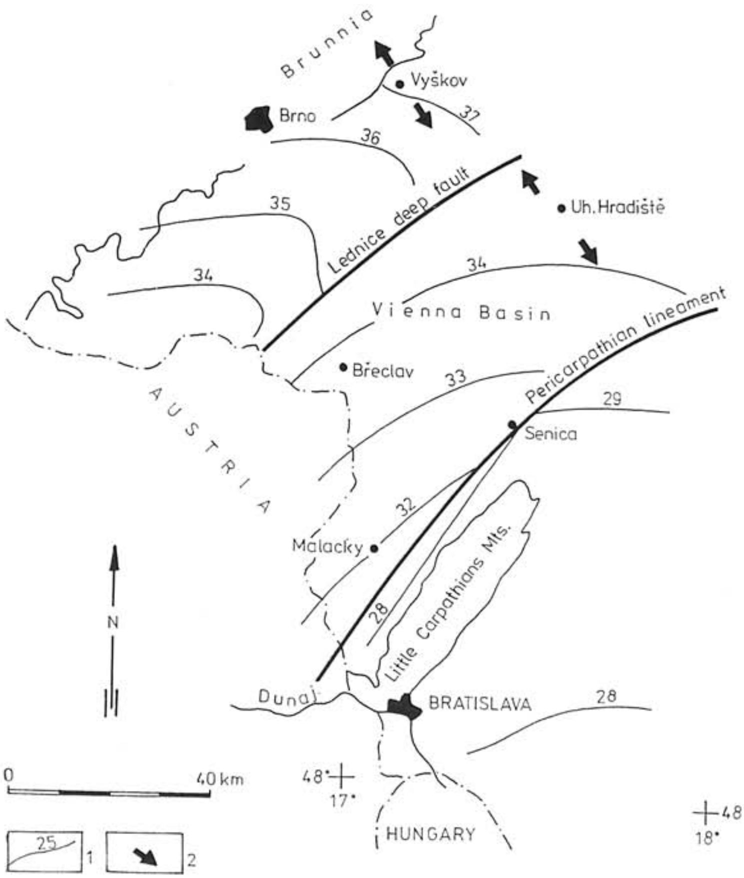

Fig. 1. Thickness of crust below the Vienna basin (adapted according to Beránek, 1978 and Kvitkovič—Plančár, 1975).
Explanations: 1 — isolines of crust thickness (km); 2 — arrows designate horizontal recent movements according to Vyskočil (1981).

ness of crust being 35 km from seismic profiles, from which, 22 km should represent sediments from Paleozoic to Neogene including. The thickness of crystalline crust amounts to 13 km, which corresponds with thin non-typical-continental crust. Kvitkovič and Plančár (1975) calculated the thickness of crust being 32—33 km (Fig. 1) from gravimetric maps. Original crystalline crust could have been thicker by only several few km supposing that the lower part of crust could gain physical properties of mantle in interaction crust-mantle (cf. Rezanov, 1980). The thickness of the crust is diminishing suddenly (abruptly) SE of the Peripienic or newly designated Pericarpathian lineament (Beránek et al., 1980), which is not identical with the course of the Klippen Belt.

Low heat flow was measured in the basin (Čermák, 1981). Magnetotelluric measurings indicate the depth of conductive zone (surface of asthenosphere?) within the range 110—120 km (Praus et al., 1981). The zone forms slight elevation in relation to the Bohemian Massif (the depth of 130 km). Further conductive zone in the depth of 60 km remains of unknown character.

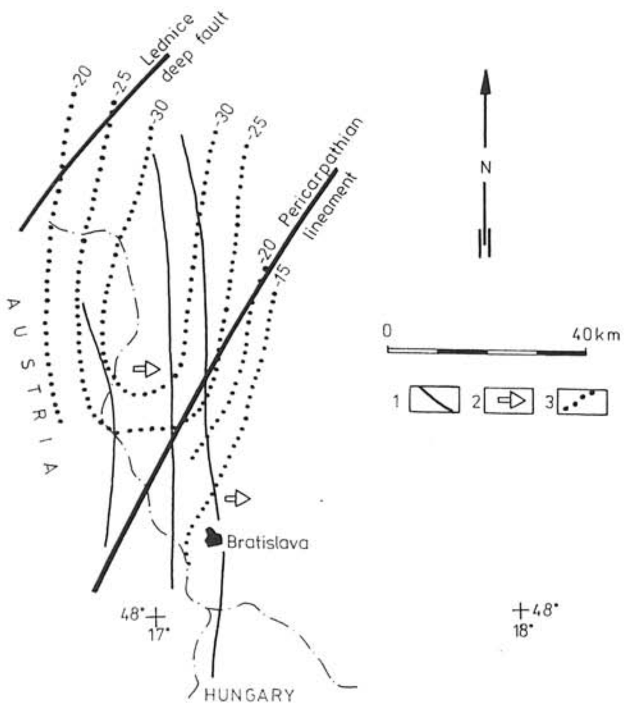

Fig. 2. Propagation of seismic energy and gravity isanomalies in the region of the Vienna basin.
Explanations: 1 — the zone of energy propagation — typical isoseists of alpine earthquakes (according to Procházková—Zeman, 1982); 2 — direction of energy decay; 3 — isanomalies of regional anomaly of gravity according to Griffin r = 5 km (according to Ibrmajer, 1981).

Recent subsidence in the basin attains 2–2.5 mm/per year (M a r č á k, 1978). Recent horizontal movements (V y s k o č i l, 1981) record recent trend of the basin opening (Fig. 1).

The basin behaves as seismically scarcely active. Energies from alpine earthquakes spread over in its basement in S-N direction and absorption of energy takes place below the basin (Fig. 2). There is good correlation between isoseits and isanomalies of gravity. P r o c h á z k o v á – Z e m a n (1962) assume anisotropy in the upper part of crystalline crust in N-S. The same structural trends can be observed in the crystalline complexes of Moravicum, Brno Massif (D u d e k, 1981) and in that of the Eastern Alps.

The direction of negative isanomalies of gravity N-S was usually put into relation with that of zones of Neogene maximal thicknesses (cf. Fig. 4). Yet deeper structural cause of the N-S orientation of gravity field is not out of question. Negative gravity field of the Vienna basin is not in relation with negative anomaly of the Eastern Alps, as supposed before. The latest, yet unpublished gravity map elaborated by N o v o t n ý records autonomy of both regional anomalies.

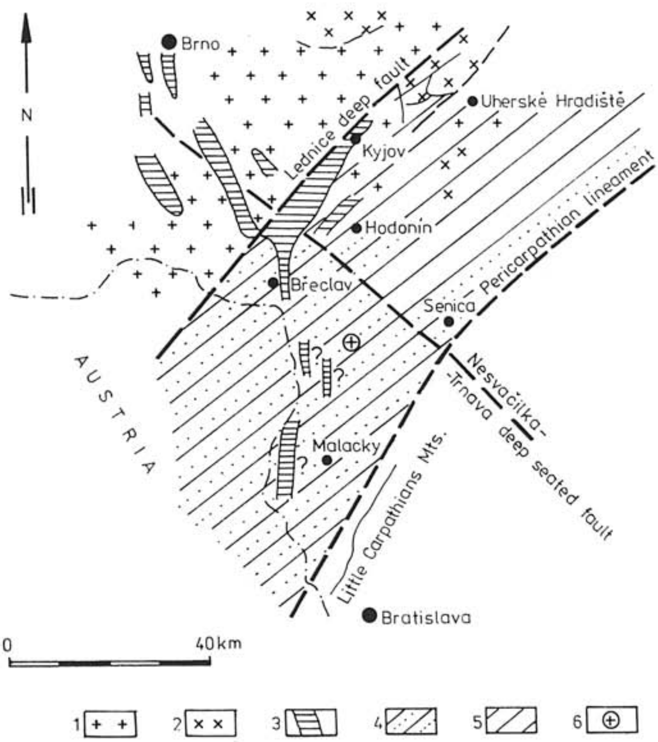

Fig. 3. The scheme of crust types in the basement of the Vienna basin.
Explanations: 1 – granitoides; 2 – tonalites; supposed complexes: 3 – basics (metabasites) and ultrabasics; 4 – paragneisses with metabasites; 5 – paragneisses, in places weakly migmatized; 6 – positive gravity field in exposed gravity map (T o m e k – B u d í k, 1981). (Granitoid rocks adapted according to D u d e k, 1981).

Gravimetric data enable to consider the relation of the structure of the basin sedimentary filling to the deep structure of its basement. Heterogeneity of basement structure is also indicated by stripped gravity map of the Vienna basin. Tomek – Budík (1981) as well as Jiříček – Tomek (1981) distinguished the southern segment with positive gravity field (after subtracting gravity effects of Neogene sediments). This segment is separated from the northern one – showing negative gravity field, by the Nesvačilka–Trnava deep-seated fault defined by Čech (1982 b) – Figs. 3, 4. In their view, positive gravity fields are also considered as the expression of heavier simatic (suboceanic) crust below the southern part of the Vienna basin. In this region, Neogene sediments attain the highest thicknesses.

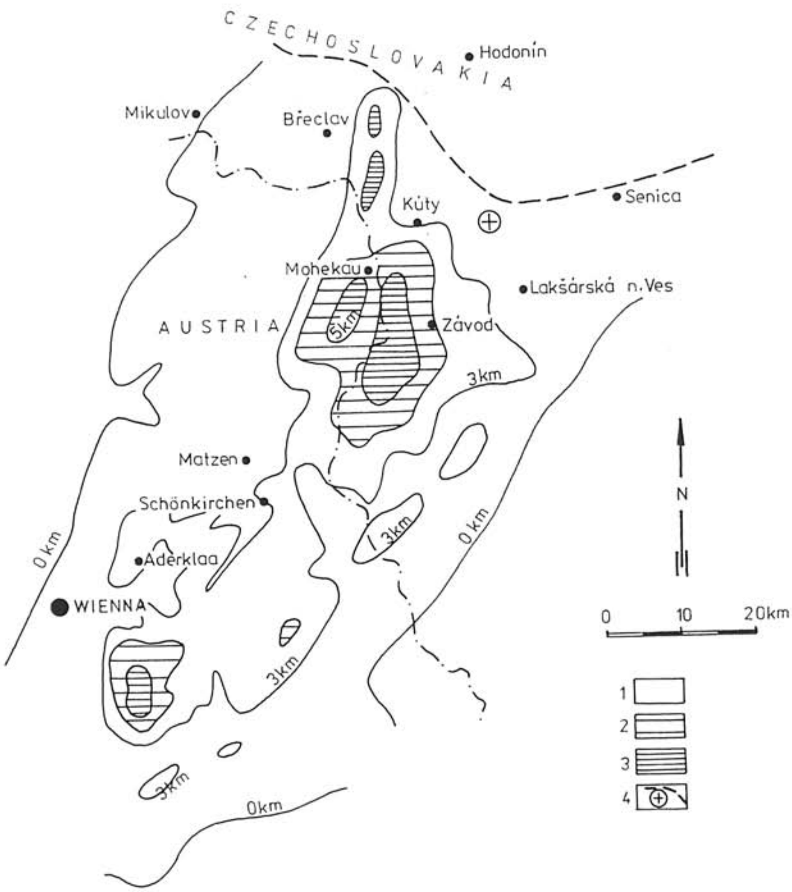

Fig. 4. Direction orientation of sections with maximal thickness of Neogene sediments in the Vienna basin. (Reconstructed according to Tomek – Budík, 1981 and Jiříček – Tomek, 1981).
Explanations: 1 – thicknesses of 0–4 km (3 km); 2 – 4–5 km; 3 – 5 and more km; 4 – northern border of positive gravity field in exposed gravity map.

Types of crust below the Vienna basin

Positive gravity field of the Brno Massif (Brno Block) probably reflects low thickness of granitoides and weak Late Paleozoic and epi-Hercynian consolidation of the crust. The rocks of the Brno Massif are strongly tectonically desintegrated even crushed which does not correspond to higher rigidity of crust. My considerations assume basic rocks to dominate more and more over granitoides and granitized rocks eastwards below the Vienna basin, mainly SW of the Nesvačilka–Trnava deep-seated fault (Fig. 3). Therefore the crust below the basin could have been mobilized since the Mesozoic or even earlier – since the Permian.

Dominating basite composition of crust is supposed also on the basis of geophysical data on thin crust in the basement of sedimentary sequences (Plíva, 1981). More basic composition of (suboceanic) crust is indicated also by extensive magnetic anomalies from which the one at Břeclav perhaps links with the Brno Massif basite zone (Tomek—Budík, 1981) — Fig. 3. Also high velocities of seismic P-waves around the Lednice deep-seated fault can record elevation of basalt layer (Beránek – Weiss, 1979) or fossil mantle. Kadlečík et al. (1980) assumes the thin crust of distinct composition in comparison with that of orogenic elevations on the basis of further geophysical data.

The existence of basic (simatic) crust of low thickness can be resolved from the following four aspects:

a) Crust is the relict of not subducted thinned Mesozoic oceanic crust of the Tethys, generated during riftgenesis and opening of the ocean (Tollmann, 1978).

b) Crust generated from basalt layer by obduction (Beránek – Weiss, 1979) or it was basicificated by mantle diapir.

c) Originally platform crust was basicificated in the process of alpine mobilization, in places the oceanization character (Roth, 1980).

d) Basic composition is the relict of originally perhaps oceanic crust during Upper Proterozoic, weakly granitized and Hercynian non-consolidated, but perhaps mobilized (Culm) with tendency to new larger mobilization in the Mesozoic. Heavy crust in its lowest parts gains the properties of mantle when subsiding into mantle due to dehydratation influence (Rezanov, 1980).

On the basis of obtained geological and geophysical information my considerations favour the last explanation. Elevation of crust thickness in sedimentary cover could be partly lowered by the uprise of the Moho discontinuity for instance as the boundary of dehydratation on the present length of 32–35 km. Weak or absent sialization of originally pre-Cambrian oceanic crust and partial basification of Neoid crust basis functioned as the main processes in crust formation below the basin. The crust has suboceanic character. Also Klemme (1978) assumes the basin to have originated on the crust of transitional type on the continental margin.

Type of basin

The geosyncline model attributes the Vienna basin to longitudinal intramontane depressions (Buday, 1961). Buday (1961) and Roth (1980) report the boundary of the Outer and Inner Western Carpathians in its basement. Roth (1980) identifies this boundary with gravity minimum axis. Also linearity of Badenian basin filling is identical in direction with the axis of gravity minimum.

The Vienna basin has always been viewed as an intricate structure. Its origin was thought to be in connection with folding of the Outer Western Carpathians and emplacement of the basin was influenced by deep-seated faults. The basin inherited mobility and direction of the deep-seated faults — hence designation hereditary basin (Buday, 1961). I have supplied the type defined by Buday (1961) with new aspect — that of crust type, when the Vienna basin inherited the mobility mainly from thin suboceanic crust. Deep-seated faults effected delimitation of the basin and its internal segmentation (Čech, 1982 a). In my considerations, the basin is an interblock, intermontane basin on thin, most probably suboceanic, more mobile crust.

Tollmann (1978) regards the basin to be a graben originated by riftgenesis. In Jurassic, the trough should have NNE-SSW trend. The concept of sea basin in the Mesozoic, yet without faults and grabens, is supported by Ziegler (1982). Horváth – Royden (1981) and Royden et al. (1982) view the basin as pull-apart basin of typical box form. All authors try to respect Neogene graben structure of the basin, yet they fail to acknowledge its preceding development. The epoch of shifting of nappes and generation of autochthon is generally connected with other tectonic units.

I have made an attempt of correlating the Vienna basin with certain type of new basin classifications with hydrocarbon deposits, elaborated by Klemme (1980) and Curtis (1980) on more general level. Classifications respect the whole development of basins and put emphasis on their genesis. According to both classifications, the basin shows the features of marginal, extracontinental basins. Klemme in his scheme assigns the Vienna basin (and other main Carpathian basins) to the rift type with emplacement between intra and extracontinental position.

When evaluating the complex of features determining eight main types of basins I have ascertained that the Vienna basin can not be compared with any of the types proposed by Klemme, without exceptions. The basin is similar to median basins (intermontane basins), which, yet have folding and not deep basement. If considering initial graben or rift structure, then the Vienna basin as a unit corresponds to the type of composite basins exhibiting features of very complex basins. The latter one is intracontinental basin. If accepting the rift stage in basin basement then the early stage could correspond both to divergent margin of the Bohemian Massif block and the position of rift outside this margin.

The existence of nappes attributes the area below Neogene basin to convergent margins of fore arc type of basin. Post-Badenian development shows again the features of the basin on divergent margin or better those of intracontinental rift.

Subsidence with values more than 0.04 and almost always at least 0.07m/1000 yr is the leading criterion for basins proximal to plate margins (Schwab, 1976). The rate of Neogene subsidence in the Vienna basin being even 0.75m/1000 yr during Badenian (Vass, 1979) corresponds to this category of basins.

The classificational system of basins, as proposed by C u r t i s (1980), ranges the Vienna basin closer to marginal type, on passive divergent margin. Also its relation to the subtype of basin is similar on the contact of continental and (quasi) oceanic crust. Certain grabens of NW-SE trend, if adjacent to sea, showed the character of ocean facing failed arms of triple junctions, that is, pseudoaulacogen of C u r t i s. In my thinking, this type of basins is supposed to have existed during pre-Neogene sedimentation.

Because of its position in the frontal part of orogene, as superposed on nappes A – subduction (alpine type), the Vienna basin is close to the basins of fore-deeps, aulacogens and intermontane depressions. The postorogenic intermontane basin is a final stage in the evolution – break up of fore-deep basins (C u r t i s, 1980).

By its partial features, the Vienna basin is similar to different types of basins. In that way, it reflects complicated development which has not been initiated in Neogene. Reconstruction of earlier development suffers from the deficiency of data on deep structure of the basin in thrust-sheets and below them. Therefore the solution of both history and type of the basin is more or less ambiguous.

The Vienna is emplaced above the crust contant of the Bohemian Massif and the Western Carpathians. As suggested by some authors (for instance J i ř í č e k, 1981), the mentioned contact shows the character of suture. From this standpoint, the basin is emplaced on the edge of megablock (the term plate can be applied to north-European platform) of the Bohemian Massif. The basin has interblock position (Č e c h, 1982 a, b) and from this viewpoint, it is rather intermontane basin than the intramontane one. The character of margin could have been changing in the course of Neoid development: from divergent in the Mesozoic (T o l l m a n n, J i ř í č e k) through convergent in Paleogene until again being divergent in Neogene and maybe in Recent (Fig. 1).

In the Mesozoic, the rift stage with rifts striking NW-SE (transversal faults on the slopes of the Bohemian Massif) and NE-SW directions could have taken place (see the mentioned trough of T o l l m a n n). The Kúty graben with thickness exceeding 5 km of sediments (Fig. 4) can be regarded as the hereditary structure originated by repeated subsidences on old rift faults. In this way of handling the problem, the contact of crust blocks of mobile simatic margin of epi-Hercynian platform and the basement of the Carpathians (Carpathian – Pannonian, and/or Carpathian – Transylvanian block in the sense suggested by R o t h, 1980) could be emplaced in the segment of the Vienna basin basement on the Pericarpathian lineament (B e r á n e k—W e i s, 1979). The margin of the platform would be delimited by rift. The present stage of knowledge lacks the evidence required to ascertain divergent character accompanied by the origin of ocean and this process, connected with opening of the Paleotethys (T o l l m a n n, J i ř í č e k) is highly hypothetical.

Reconstruction of the following main pre-Neogene grabens in the region of the Vienna basin: Nesvačilka and Vranovice, hypothetical graben below the Kúty graben and along the Lednice deep-seated fault yields triple junction fracture pattern characteristic for the origin of rifts (Fig. 5). It could be due to the origin of locally-embryonic dome without volcanism (?). Elevation of basalt layer at the Lednice deep-seated fault could correspond to fossil elevation below NE rift arm. This rift would belong to the group of non-volcanic rifts

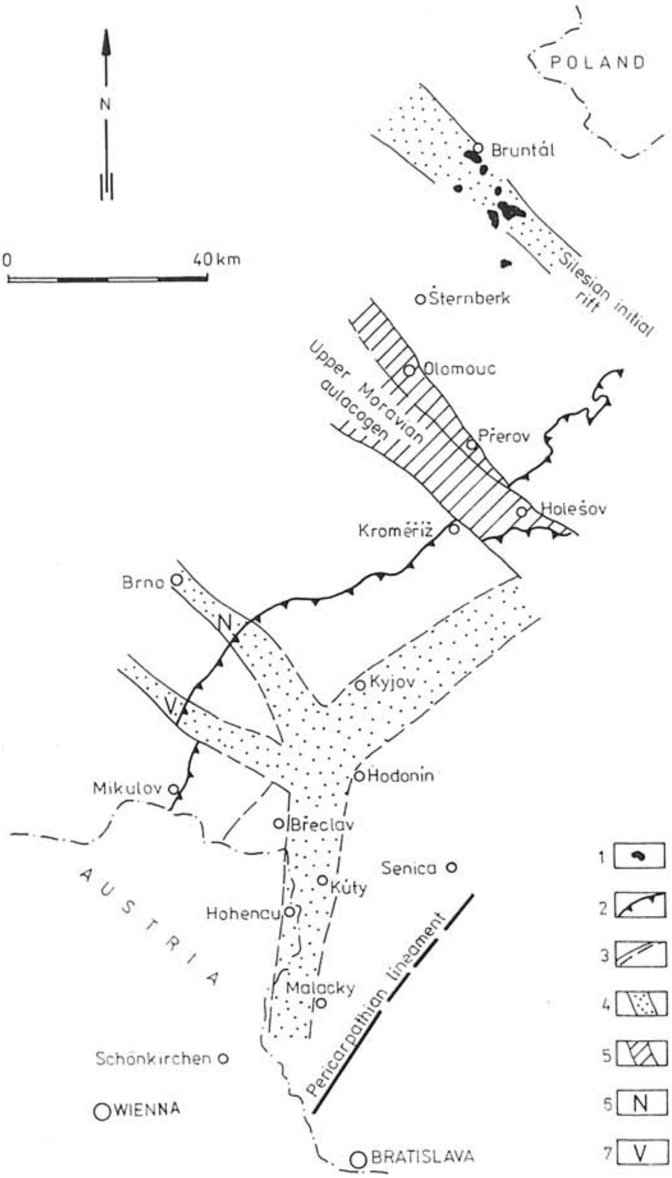

Fig. 5. The scheme of main types of graben structures at the contact of epi-Variscan platform and the Western Carpathians on the Czechoslovak territory.
Explanations: 1 – basalts; 2 – the frontal part of the Carpathian nappes; 3 – indicated and supposed border of graben (rift) structures (in south-Moravian and Slovak parts the assumed extent before Neogene), structures: 4 – rift; 5 – aulacogen; N – the Nesvačilka graben; V – the Vranovice graben.

without the main rift axis — the rift type of the Northern Sea (cf. R a m b e r g — N e u m a n n, 1978). In the case of this rift type, that is, without opening and formation of new oceanic crust, repeated riftgenesis can take place. The Neogene even perhaps Recent stage of subsidence in arms of failed triple junction (N-S and NE-SW directions) could correspond to new period. The rift of NW-SE direction would be a failed arm of pseudoaulacogen character as proposed by C u r t i s (1980).

Problem of aulacogen character of basin

The region of the Vienna basin, with regard to graben structure recorded geophysically, is attributed by P l í v a (1981) to aulacogen being of NE-SW direction below the Eastern Alps. P í c h a (1979) considers the Nesvačilka and Vranovice grabens to be a part of aulacogen with its faults reaching the Moldanubicum and delimited by faults coming from south-Bohemian basins towards Vienna on SW. In the view of R o t (1980), the Bavarian-south Moravian "aulacogen" with distinct direction from those of the above two mentioned authors, reaches the Vienna basin and follows alpine fore-deep.

None of the authors presents aulacogens as corresponding to the definition derived from the works of Š a t s k ý (1955). According to definitions used in plate tectionics (B u r k e—D e w e y, 1973; C u r t i s, 1980), aulacogen is failed arm striking into the continent from a compressional or orogenic belt. Aulacogen terminates in fore-deep. Aulacogen as suggested by P l í v a, trending towards the Eastern Alps, should correspond to this definition. Yet, this graben follows the Carpathian fore-deep, it is longitudinally filled with nappes since it is not perpendicular to convergent contact of Carpathian orogene.

P í c h a's concept (1979) of aulacogen is also contrary to the definition because the system of submarine canyons terminating in the sea corresponds to failed arms of rifts or pseudoaulacogens. According to P í c h a (1979), miogeocline prisms have been deposited on the slopes of continent. The concept of P í c h a has been controverted by E l i á š (1979). On the contrary, geophysical data (B e r á n e k et al., 1980) indicate high thickness (even 10 km) of sediments in deep part of the Bohemian Massif fold which can ben theoretically regarded as former continental slope. Aulacogen in P í c h a's concept corresponds to pseudoaulacogen in the sense of C u r t i s (l. c.), that is, to failed rift arm terminating in sea. This type of rift could be favourable for the origin of parent rocks and for their maturity.

Supposing aulacogen to have existed in the fore-land of the Western Carpathians, then the Pliocene graben of Upper Moravian basin exhibits its features. The features of young initial failed rift are shared by the Silesian neo-volcanic zone striking the Moravian — Silesian Culm (Fig. 5).

Also because of the orientation of deep basin parts towards the Eastern Alps, the Neogene Vienna basin does not correspond to aulacogen. The basin is also not a rift although some of its features correspond to neovolcanic rifts. It is important that the knowledge about deep structure, mainly the absence of young mantle elevation, low temperature flow and others, do not correspond to rifts.

The Vienna basin can not be designated pull-apart basin because there does not exist evidence confirming that it is a marginal basin on divergent margin of the continent pulled apart.

The Vienna basin is a type of intricate structure, designation intermontane (interblock) basin expresses the relation to neotectonic Moravian and alpine--Carpathian orogene, corresponds to geophysical data on autonomy of gravity field and incontinuity with alpine gravity minimum.

The basin represents a complicated type which is a result of complicated development. It must be respected also when discussing the genesis of the basin.

Genesis of the basin: discussion

The origin of the Vienna basin has most frequently been connected with folding of the Alps and the Western Carpathians. Solving the genesis of the basin was difficult because of the phenomena as tension in nappe fore-lands and on nappes — that is, on the boundary of the Outer and Inner Carpathians. Buday (1961) put into connection the basin genesis with movements on deep-seated faults. The genesis was also discussed by Čech (1982 b), yet excluding these deep-seated faults. Roth (1980) assumes sinistral strike slip in the basement of the basin and also in its sedimentary filling on Bulhary-Schrattenberg fault zone. These movements are controverted by Jiříček (1981, 1982) who puts the origin of the basin into connection with subduction on the Lednice deep-seated fault and Pericarpathian lineament. According to geophysical data (Plíva, 1981; Beránek et al., 1980), both deep structures show steep dip. Subduction along subvertically dipping faults should be accompanied by volcanism from partly melted lithosphere. On the contrary, Jiříček (1981) supposes subhorizontal subduction generally not associated with volcanism (Gastil, 1982). During subduction compression and folding of autochthonous sediments should take place around sutures below nappes or these sediments should have been burried in subduction zones (Čech, 1984). Both cases are not favourable for retaining of hydrocarbons in autochthonous series below nappes. Geophysical survey (Beránek et al., 1980) and extremely deep bore-hole Zisterdorf — 1 (7 544 m) in Austria record not-folded sediments below nappes.

The origin ("opening") of the basin is explained by neither anticlockwise rotation of the Western Carpathian nappes (Jiříček, 1982) no large horizontal movements on the contact of the Eastern Alps and the Western Carpathians (Roth, 1980). Sinistral strike slip on the side of the Bohemian Massif towards the Alps and the origin of box-form Vienna basin as pull-apart basin are supposed by Horváth and Royden (1981) and Royden et al. (1982). According to these authors, a few tens of km of strike slip displacement is sufficient to produce the Vienna basin. The mentioned authors suppose 50—100 per cent stretching of crust in W-E direction in Miocene.

However, stretching of crust by 50 per cent should be accompanied by reduction of thickness to present 28—30 km without 4—5 km thick Neogene sediments. Original crust thickness should have been 42—45 km, it means higher than that in uprising Bohemian Massif and the Central Western Carpathians.

In the case of horizontal strike-slip on discontinuous fault which conditions the origin of pull-apart basin (Crowel, 1974) in NE-SW direction, the W-E one is not possible, but NE-SW direction movement takes place (Fig. 6). Shear faults of N-S direction can be opened by tension. But they are connected with master fault and theoretically, they can cause the generation of short grabens in N-S direction. Yet the axis of main stretching and opening are of NW-SE direction. Grabens of both types do not exist in the Vienna basin.

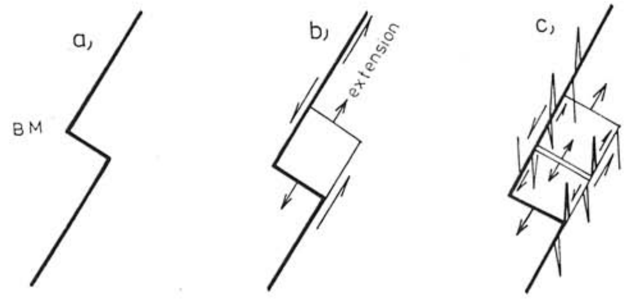

Fig. 6. The concept of the Vienna basin generation via horizontal strike-slip (the pull-apart type basin).
Explanations: a — originally discontinuous fault; b — the strain is oriented in the direction of strike-slip at horizontal strike-slip in separated block; c — resulting fault picture in the basin (N-S oriented strain structures opened by faults, should connect with the main horizontal strike-slip). The scheme sub C differentiates from the concept of strain tensions suggested by Horváth—Royden, 1981.

The Vienna basin is one of peripheral basins of mantle diapir below the Pannonian basin (Vass, 1976). In peripheral basins rapid subsidence existed before the collapse of diapir in Badenian. The collapse is connected with inversion of subsidence velocity. From this reason, the origin of peripheral basins in the Carpathians is put into connection with dynamics and thermal regime of diapir (Vass, 1979; Royden—Sclater, 1981; Čech—Zeman, 1984). Royden and Sclater (1981) explain subsidence of basin via thermal effect of asthenosphere — diapir. Within the upper brittle crust, the stretching was two times higher, in the upper ductile lithosphere it should be higher (4 times). The authors connected rapid Middle-Miocene subsidence with stretching. The second phase of slow subsidence should have resulted from conductive decay of thermal anomaly.

Therefore thermal and tectonic-mechanic, extremely dynamic, unexplained reasons of crust stretching are pursued to find the origin of the Vienna basin. Both phenomena do not appear as favourable to preserve hydrocarbons in large depths of the basin.

Conclusion: new concept of origin

Both peripheral position of the basin towards diapir and subsidence can be due to the origin of mantle rim syncline around the Pannonian diapir (Fig. 7). Heavy suboceanic crust, segmented by faults, has been folded and subsided into syncline.

Probably partial elevation of mantle basites (?) which could have caused the origin of triple juction fracture and rifts, originated on the Lednice deep-seated fault in the Mesozoic (?). Also the discovery of ultraalkaline dikes NW of Budapest provides the evidence for the existence of initial riftgenesis in the Mesozoic (H o r v á t h—Ó d o r, 1984). Towards the end of Mesozoic and during Paleogene, the Pannonian diapir started to be formed (V a s s, 1979; Č e c h —Z e m a n, 1982). Nappes entered bended crust from the margins of uprising crust. Shear tensions and compression zones originated above the margin of diapir. Heavy crust may have been partly subducted below diapir margins. It is peripheral "round the diapir subduction", indicated recently from the Mediterra-

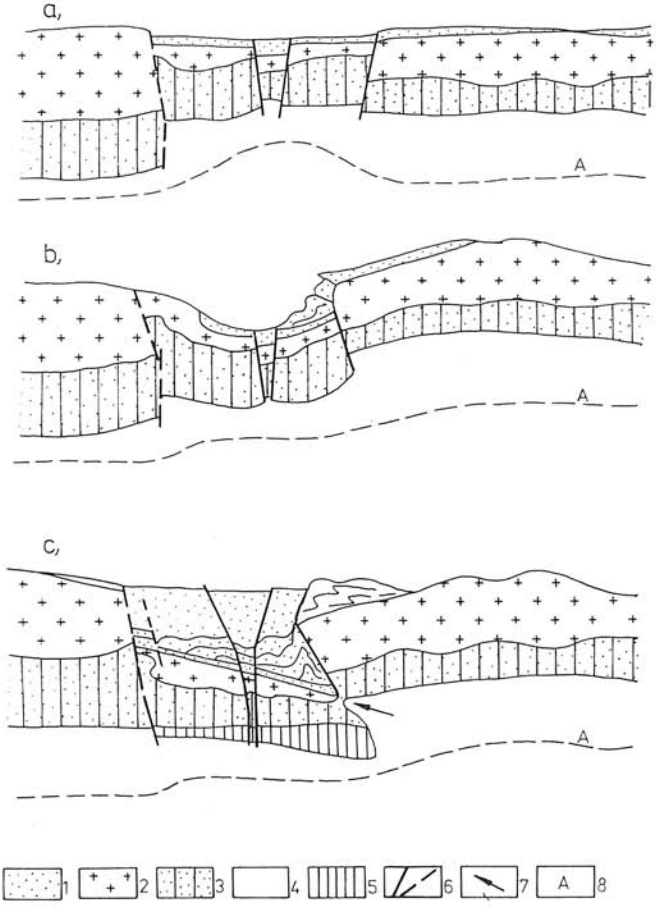

Fig. 7. The development of crust segment on the contact of the Bohemian Massif and the Western Carpathians in the region of today Vienna basin.
Explanations: a — hypothetical rift stage in the Mesozoic; b — subsidence above marginal depression of forming mantle diapir (probably since Upper Cretaceous); c — the stage before the collapse of mantle diapir with local subduction below the diapir margin (the end of Miocene). 1 — sediments; 2 — granite crust with pre-Neoide sediments; 3 — basite crust; 4 — mantle; 5 — the zone of basicified crust with mantle properties; 6 — faults; 7 — direction of diapir expansion; 8 — asthenosphere.

nean region (Č e c h—Z e m a n, 1984). Miocene uprising of diapir witnessed to maximal subsidence in marginal syncline, dawn-saggins and strain tension. Subsidence was renewed above certain triple arms and new, partly synsedimentary faults originated.

The lower part of crust had probably similar physical properties as mantle during subsidence. For that reason, geophysical records show the Moho discontinuity as non contrast.

Initiating of diapir collapse caused in fact terminating of rapid subsidence in the Vienna basin and replacement of maximal mobility towards the end of Miocene into the Pannonian basin.

Renewing of strain tensions and the evolution of basin at divergent margin of blocks could have been accompanied by recurrent migration of hydrocarbons from Neogene basement and their redistribution into new traps. The new concept of basin origin enables to estimate the perspective of hydrocarbon occurrence in autochthonous basement of the basin, for instance in rifts and horsts covered with nappes and in porous horizons of nappes, given new amounts of hydrocarbons from the depth. Geophysical survey should collect more detailed and sufficient data on the relief of basement required to satisfactorily carry out future deep geological survey of the basin.

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