

cal work between Geophysics ÖMV and Geophysics Brno, on the other hand between MND Hodonin and the department of geology of the ÖMV Vienna. The result of this activity was the establishment of a network of regional and, in some areas, of detailed seismic measuring. Thus, after the jointing of also the methodic and interpretation principles, a long-term foundation was laid for the orientation of surveying work with marked effectiveness for both parties. Today, consequently, there is a network of seismic cross-sections, constituted without regard to the course of the state borders.

The most recent example of cooperation in seismic investigation in the borderzone between Austria and CSSR is the common 30 acquisition in the area of Rabensburg — Lanžhot which will be followed by a common interpretation of the data obtained.

Today, mutual cooperation concerns practically all the spheres of the process of tracing deposit traps. Here we must mention, for instance, other cooperation in the methodology of tracing deeply deposited structures and also the solution of the technical problems involved with such surveying. Jointly solved are problems concerning the genesis of hydrocarbon in laboratories in Czechoslovakia and in Austria, an intensive exchange of rock core samples is being carried out for checking analyses, there is an exchange of geophysical drilling data, both parties enabled excursions of specialists, there is an exchange of some supporting projects and attendance at professional seminars and symposiums is made possible.

The achieved standard of cooperation is indisputably a good promise also for the coming years. Both parties express sincere interest to further develop professionally established principles of coordination, bringing indisputable effect in the sphere of application and economic rationalization.

A further intensification of the cooperation also has its material reasons. It will certainly touch upon methodic problems, geological studies and the critical assessment of significant projects. We see, without doubt, considerable resources in the sphere of natural-gas storage and the relevant geological deposit work, etc. In retrospect, the past years of cooperation have fully confirmed the justification to continue to build our mutual relations on the highest concrete professional principles that bring both parties the greatest effect.

At the same time they are also an expression of the good relations between two neighbouring countries.

Eingeschätzt wird auch das Gebiet der Methodik und Interpretation seismischer Arbeiten, der Methodik zur Ermittlung sehr tief gelagerter Strukturen und Akkumulationsbedingungen.

FACIES DEVELOPMENT OF MIOCENE FORMATIONS IN THE SOUTHWESTERN PART OF THE CARPATHIAN FOREDEEP AND ITS OIL AND GAS PROSPECTS

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1. Introduction

On the basis of reflection-seismic prospecting conducted by the CGG Company with the aid of Vibroseis techniques in 1979, Altprerau-2 borehole in the Altprerau region in Austria brought evidence, in 1981, of a natural gas deposit in Karpatian sandstone horizons and in the Oncophora Beds of the undisturbed molasse. The extension of the gaseous hydrocarbon deposit into Czechoslovakia was confirmed by Nový Přerov-3 borehole.

The common Czechoslovak and Austrian Nový Přerov — Altprerau natural gas field is situated in the southeastern part of the Carpathian Foredeep, southeast of the village of Nový Přerov on Czechoslovak territory and southeast of the village of Altprerau in Austria (Fig. 1). The geologic structure of the region comprises Quaternary and Karpatian sediments in its upper sections and, in the west, with Lower Badenian sediments on the top. The gas accumulations lie in Karpatian sandstone horizons of basal clastic development in Oncophora horizons NNo 1, 2, 4 (in Austria, the whole basal sedimentary complex has been assigned to the Ottnangian — Oncophora Beds) and in the schlier (clay marl) development of the Karpatian. The geological data obtained as a result of geophysical prospecting and exploratory drilling were evaluated by Austrian and Czechoslovak geologists and, by agreement, Oncophora horizons 1, 2, 4 were defined as the common gas-bearing formation.

During the subsequent stage of reflection-seismic prospecting in the Neuruppersdorf and Pottenhofen areas in Austria, additional structures in Miocene sediments were discovered and delineated. The presence of gas in these structures was proved by Neuruppersdorf-1, Pottenhofen 2 and Pottenhofen-3 boreholes. The gas accumulations occur in Karpatian sandstone horizons (Oncophora Beds). The upper part of a Jurassic formation composed of light to dark grey limestones deposited in a favourable tectonic setting was found to be gas-bearing in Pottenhofen-2 borehole.

2. Stratigraphy and lithology

The Nový Přerov-Altprerau, Pottenhofen and Neuruppersdorf gas occurrences are localized in the southeastern part of the Carpathian Foredeep. The surface formations include Quaternary, Karpatian and Lower Badenian sediments; the Miocene sedimentary basin is underlain by Mesozoic, particularly Jurassic sediments represented by a carbonate facies gradually passing into a pelite-carbonate facies east of the localities mentioned above. The fill of the Carpathian Foredeep consists, from the underlying to the overlying formations, of Egerian, Eggenburgian, Ottnangian, Karpatian and Lower Badenian sediments.

Abstrakt

V příspěvku je podán ucelený přehled a výklad ke spolupráci mezi ČSSR a Rakouskem v oblasti naftového průmyslu. Jsou zde vzpomenuy hlavní výsledky této spolupráce, která postupně přecházela od vzájemné výměny informací do fáze sestavování společných geologických map a profilů včetně interpretace strukturálních a tektonických elementů.

Obzvláště vysokého stupně spolupráce bylo dosaženo v lokalitách společných ložisek, resp. v oblastech potenciální existence společných perspektivních strukturálních objektů pro průmyslové akumulace přírodních uhlovodíků.

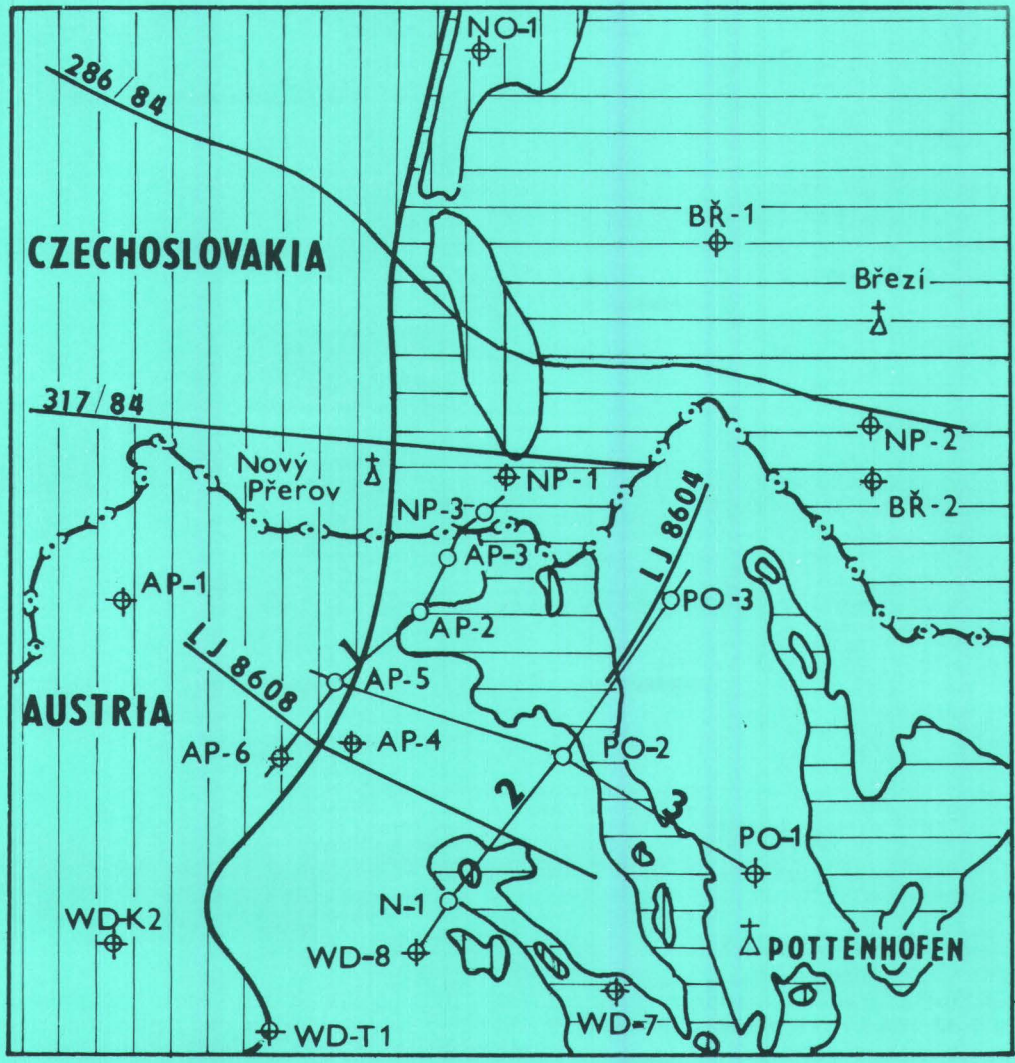
Zhodnocena je též oblast metodiky a interpretace seismických prací, metodiky vyhledávání velmi hluboko uložených struktur a akumulací podmínek.

Zusammenfassung

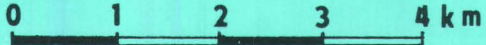
Im Beitrag wird eine in sich abgeschlossene Übersicht und Erörterung der Zusammenarbeit zwischen der ČSSR und Österreich auf dem Gebiet der Erdölindustrie geboten. Es werden hier Hauptergebnisse dieser Zusammenarbeit erwähnt, die sich allmählich von einem gegenseitigen Informationsaustausch zur Phase der Zusammenstellung gemeinsamer geologischer Karten und Profile einschl. der Interpretation von Struktur- und tektonischen Elementen entwickelten.

Ein besonders hohes Niveau der Zusammenarbeit wurde an Fundorten erreicht, wo sich gemeinsame Lagerstätten bzw. mögliche gemeinsame perspektivische Strukturobjekte vorfinden, die förderwürdige Akkumulationen natürlicher Kohlenwasserstoffe enthalten können.

GEOLOGICAL MAP OF THE REGION STUDIED



NP	NOVÝ PŘEROV	WD	WILDENDÜRNBACH
AP	ALTPRERAU	NO	NOVOSEDLY
N	NEURUPPERSDORF	BŘ	BŘEZÍ
PO	POTTENHOFEN		



- | | | | |
|--|-----------------|--|----------------------------|
| | QUATERNARY | | GEOLOGIC CROSS SECTION 1-3 |
| | BADENIAN | | SEISMIC PROFILES |
| | KARPATIAN | | |
| | PAYING WELLS | | |
| | ABANDONED WELLS | | |

Fig. 1.

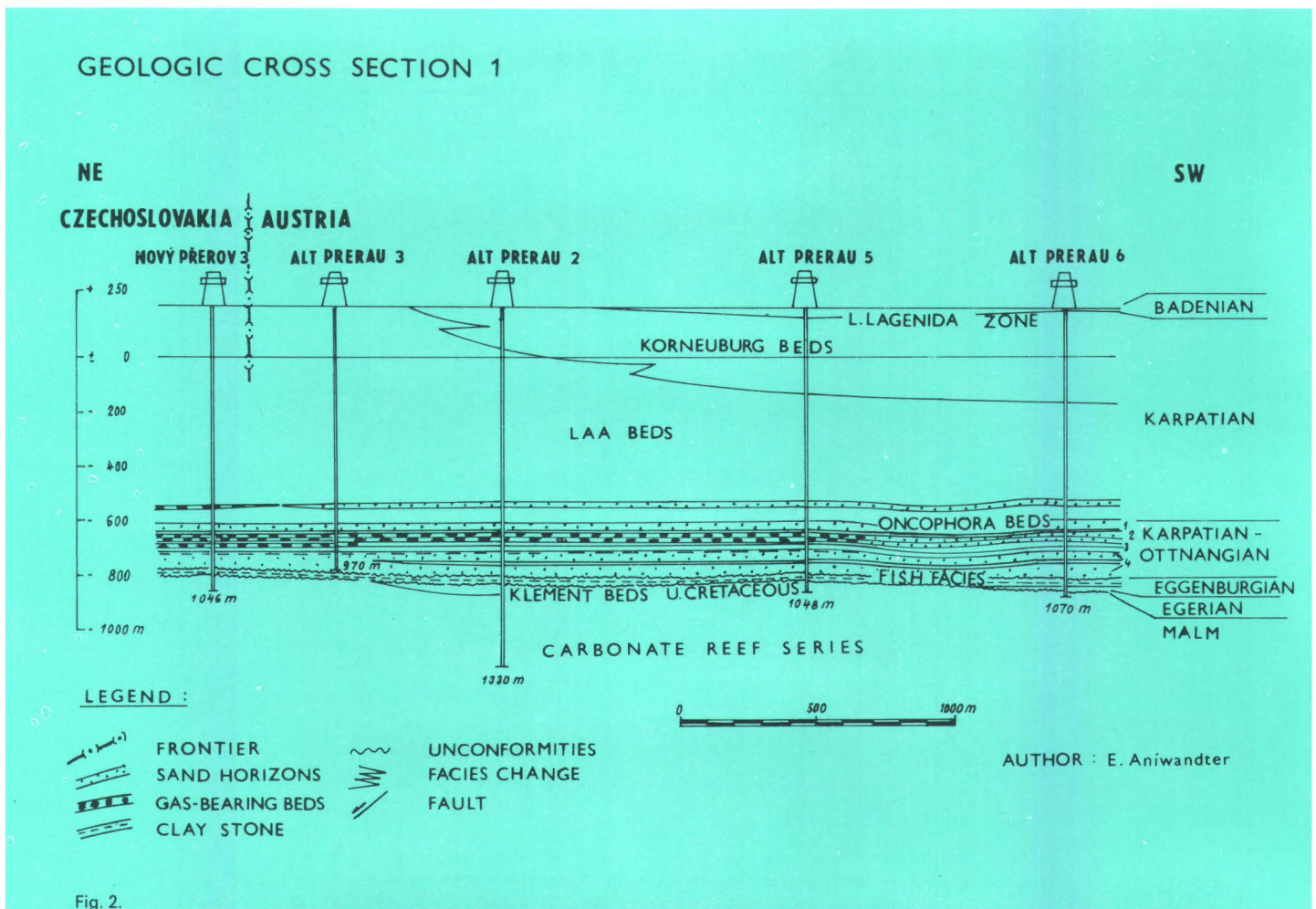


Fig. 2.

In the western part of the region, molasse sedimentation began with **Egerian** sediments in Melk sandstone development and dark grey calcareous claystone development identified with a thickness of 49 m in Altprerau-1 borehole and with 7 m in Altprerau-6 borehole. The sediments were classified in accordance with R. Fuchs analyses of the microfauas of a marine littoral facies.

As stated by Austrian geologists, **Eggenburgian** sedimentation started with a transgressive foraminiferal facies unconformably deposited on the Mesozoic underlying formation in the eastern part of the region under study. The following thicknesses were determined in the boreholes: Neuruppersdorf-1 — 14 m, Pottenhofen-2 — 7 m and Pottenhofen-3 — 27 m. By their lithology, the sediments are dark-grey thin-bedded non-calcareous claystones rich in microfaunas. In the western part of the region, the Eggenburgian sediments are developed as a marine fish facies unconformably overlying the Mesozoic base (Fig. 2), while they are conformably deposited on a foraminiferal facies on the east. (Fig. 3). The fish facies is up to 20 — 35 m thick, lithologically it is identical with the foraminiferal facies. Micropalaeontological analyses have found sporadic representatives of fauna and flora. Bone fragments of teleosts are abundant, shark teeth and small poorly developed foraminiferal shells occur sporadically.

The **Eggenburgian** sediments are unconformably overlain by a complex of prevailingly clastic sediments termed **Oncophora Beds**. Their thickness increases from 106 m on the west (Altprerau-1 borehole) to 714 m on the east (Pottenhofen-1 borehole). In the latter borehole, the Oncophora Beds include a pelite complex 400 m thick, underlying the clastic development. The characteristic de-

velopment of this sequence is present throughout the region studied and very well evidenced by the drill cores recovered. As to lithology, light grey micaceous, fine-to medium-grained sandstones with thin lignite layers alternating with layers of grey-greenish fine-micaceous, calcareous silty claystones have been recognized. The fauna is severely impoverished owing to clastic sedimentation. Coalified plant remains, sparsely occurring small ammonoids, fish bones, pyritized diatoms and minute mollusc remains can be found in the sediments. The problem involved in the stratigraphical classification of this complex is whether it can unambiguously be assigned to the Karpatian or to the Otttangian. The Austrian geologists have placed the Oncophora Beds into the Otttangian. On the basis of palynological analyses conducted by I. Draxter on rock samples from Pottenhofen-3 borehole, Czechoslovak geologists have assigned the whole complex to the Karpatian considering it to represent its basal clastic development. The stratigraphic definition as Karpatian is based on the presence of two specimens of Ostracoda *Senesia* aff. *vadászi* (Zalányi) in drill core No 3 from Dunajovice-1 borehole (depth: —997 m). This ostracode species has appeared in the Paratethys since the Karpatian (R. Jiříček, 1974). Further evidence has been provided by the occurrence of small foraminifers of the genus *Bathysiphon* that are not characteristic of the age of the sediments, but are fully identical with similar occurrences in the overlying clay marl (schlier) development of the Karpatian. The sequence is related to the overlying schlier development by lithologic and faunal transitions.

The Oncophora Beds are overlain by **Karpatian** sediments of schlier and aleurite-pelite development. Typical of

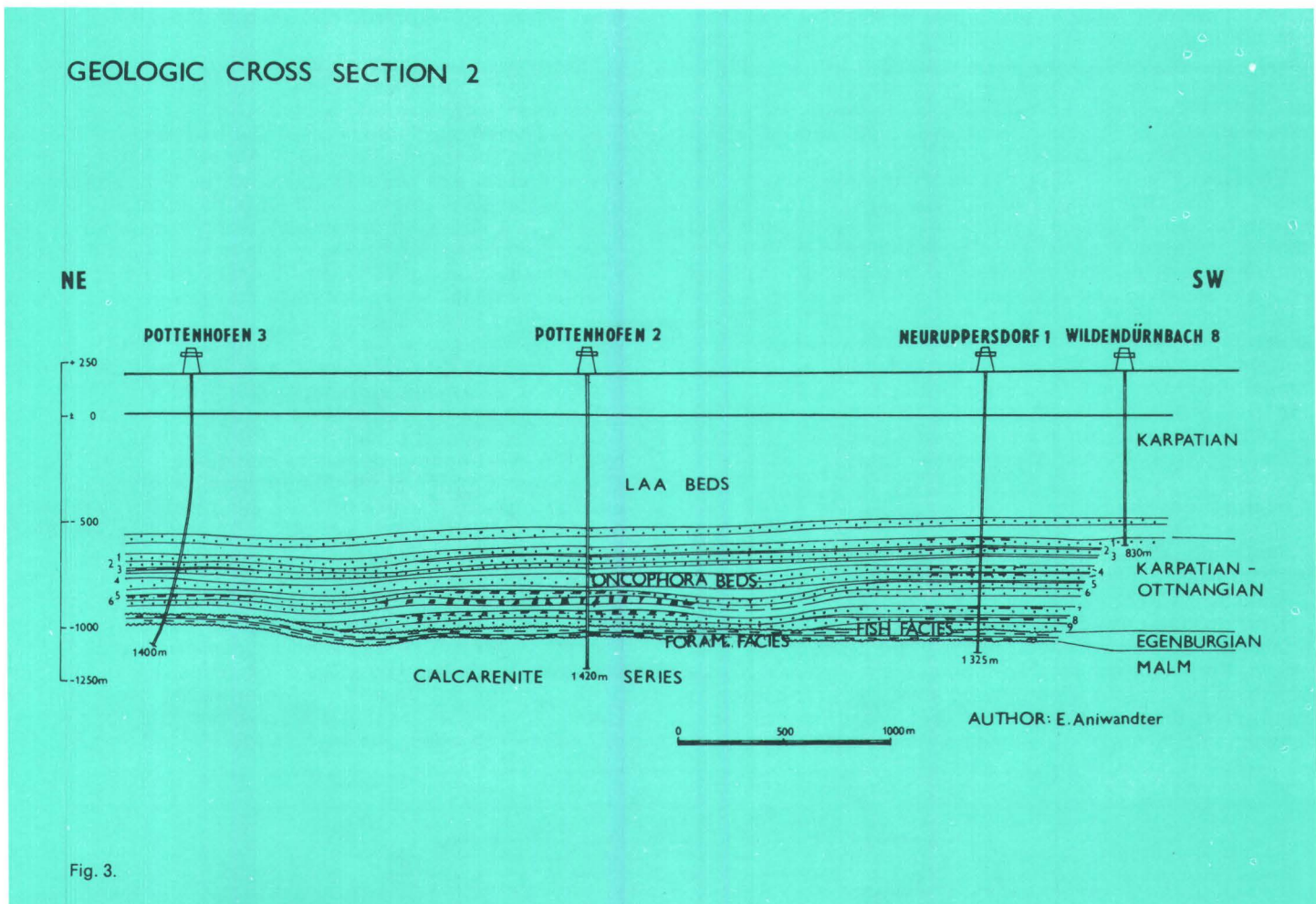


Fig. 3.

the schlier development are greenish-grey, brownish, grey fine-micaceous calcareous clays with silty and sandy admixtures, alternating with laminae, lenses and, locally, layers of light grey micaceous, calcareous, slightly consolidated sandstones and siltstones. The upper part of the Karpatian exhibits aleuritipelite development. Present are prevalently light grey, grey micaceous calcareous silty clays and claystones grading, by intervals, into sand. Palaeontological analyses of rock samples from these complexes have shown the presence of planktonic foraminifers, cryophile agglutinating foraminifers and fish otoliths characterizing the Karpatian in its deep-sea development. This sequence has been termed Laa Beds (Laaer Schichten) in Austria. In Altprerau- 1, 2, 4, 5, 6 boreholes, the Laa Beds are overlain by a marine-brackish facies of Karpatian sediments represented by the Korneuburg Beds. Their thickness increases from zero in the east to 354 m in the west (Altprerau-6 borehole, Fig. 4). Lithologically they consist of layers of grey-greenish calcareous clays alternating with layers of slightly consolidated light grey calcareous sandstones.

The Badenian stratigraphic stage is represented by sediments of the Lower Lagenida zone. Lower Badenian sediments occur at the top of the geologic structure in the western part of the region studied (Fig. 1). Their greatest thickness, attaining 80 m, was identified in Altprerau-1 borehole. The marine sediments form gravels and gravel sands at the base with layers of grey, fine- to medium-grained slightly consolidated sand. They are overlain by greenish-grey, blueish-grey, slightly fine-grained, slightly micaceous calcareous clays with intercalations of fine-grained calcareous sands and silts.

3. Tectonic setting

The results of drilling operations and the interpretation of reflection-seismic surveys have shown the Věstonice fault to be a significant tectonic element in the geologic setting of the region investigated. The existence of the fault has been evidenced by reflection seismic profiles taken through the areas of Dolní Dunajovice, Břeží, Nový Přerov (profiles No 317/84 and No 286/84) and through the Altprerau — Pottenhofen area in Austria. The Věstonice fault strikes NE-SW and, southwesterly, it can be traced from the village of Strachotín to Dolní Dunajovice, where it splits into two branches. The western branch continues through Dobré Pole to Nový Přerov and to Altprerau in Austria. The fault dips westward, its vertical throw is 100—120 m to the surface of Mesozoic carbonates in the Nový Přerov area, as evidenced by reflection profiles 317/84 (Fig. 6) and 286/84. The fault throw decreases westwards near Altprerau and gradually dies out in the area of Altprerau-5 and 6 boreholes. The eastern branch of the Věstonice fault extends from Dolní Dunajovice to Břeží and southwestwards into the region west of Pottenhofen-2 and 3 boreholes in Austria, where it gradually dies out. The fault throw is 160—200 m to the Jurassic surface in the area of the gas deposit near Dolní Dunajovice (J. Adámek, 1977; J. Adámek, A. Petr, 1977). The fault throw gradually decreases towards Austria. The results of exploratory drilling and geophysical prospecting point to probable Miocene age of the fault which, in vertical direction, terminates on the upper boundary between the Oncophora Beds and the base of the Karpatian schlier development.

As reported by Austrian geologists, in Austria the eastern branch of the Věstonice fault shows up particularly in the Mesozoic basement. They assume that, in the Oncophora Beds, the fault had formed flat synclines that have led to the formation of gas-bearing anticlinal structure (Pottenhofen area). This structural type is documented by reflection-seismic profile LJ 8680 (Fig. 7).

The Nový Přerov — Altprerau structure very distinctly appears in the reflection-seismic maps (see Fig. 6). In this structure, the Věstonice fault is an important lateral seal that seems to have decisively affected the accumulation of natural gas in the sand horizons of the Oncophora Beds.

The processing and evaluation of reflection seismic profiles accomplished, since 1986, by means of a digital interpretation system has resulted in the assessment of hydrocarbons on the Pottenhofen seismic structure, which is demonstrated by reflection-seismic profile LJ 8604 (Fig. 8). In the area of Pottenhofen-2 borehole, additional indications of hydrocarbon presence were obtained by using the root-mean-square method and interval velocities.

4. Natural gas deposits

Accumulations of gaseous hydrocarbons are associated with Jurassic limestones, sand horizons of the Oncophora Beds and the Karpatian schlier development.

Light to dark grey fine- to medium-grained sandy limestones are Jurassic reservoir rocks. In the Oncophora Beds and in Karpatian schlier development, the reservoir rocks consist of calcareous, fine-grained, partly silty sandstone to sand alternating with poorly permeable and impermeable laminae and layers of claystones or siltstones.

Nový Přerov — Altprerau natural gas deposit

The deposit was discovered by Altprerau-2 borehole in 1981. In the subsequent stage, Altprerau-3, 4, 5, 6 boreholes and Nový Přerov-1, 3 boreholes were drilled. Nový Přerov-3 borehole demonstrated the extension of the gas field into Czechoslovak territory. Altprerau-4, 6 and Nový Přerov-1 boreholes were dry, because the traps were found to be water-saturated in these wells. Oncophora horizons NNo 1, 2, 4 and a Karpatian sandstone horizon of schlier development are potential deposits in this field. The individual sandstone horizons are vertically isolated from one another by pelite layers. Laterally the gasbearing horizons are bounded by the Věstonice fault in the west and by the water-gas contact in the east, south and north. The gas field stretches SW-NE along the Věstonice fault over a length of 2.7 km and with a maximum width of 700 m.

Oncophora horizon No 4 lies in the lower part of the Oncophora Beds. The sandstone horizon constitutes a narrow SW-NE-trending domal to semidomal uplift (Fig. 9). The gas-water contact was determined by interpreting the electric logs and the results of pumping tests to a structural depth of -735 m in Altprerau-2, 3, 5 boreholes. The average porosity of the sandstone is 18.5 %.

The formation pressure related to the gas/water interface (-735 m) is 9.4 MPa and the formation temperature is 37°C at this depth. The average net pay is 3.92 m and the average water saturation of the reservoir rock is 52 %.

Oncophora horizon No 2 occupies the middle part of the Oncophora Beds. Upon interpreting the results of electric logging and well-log correlations, the horizon was divided into two sections — A and B. (Fig. 10 and Fig. 11).

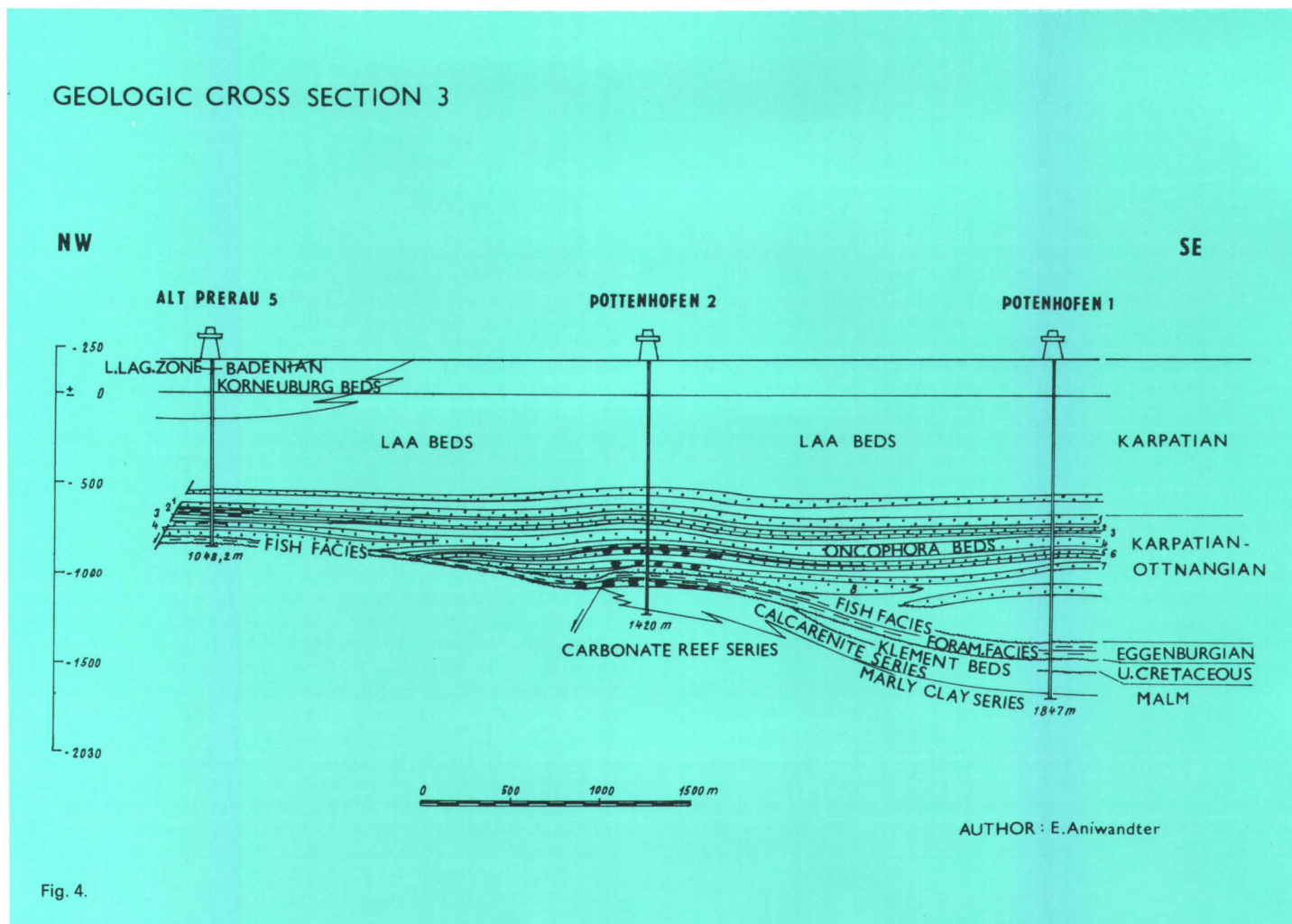


Fig. 4.

The two sections of the horizon form a SW-NE-trending narrow semidomal uplift. The gas-water contacts were interpreted at the structure depth of -662 m (layer A) and -681 m (layer B), respectively, on the basis of the results of electric logging and pumping tests in Altprerau-2, 3, 5 boreholes. Average porosity attains 21 %, the average net pay of layer A is 3.46 m and that of layer B 3.7 m. Average water saturation of the reservoir rock amounts to 50 %. The formation pressure related to the gas-water contact is 8.7 MPa in layer A (-662 m) and 8.9 MPa in layer B (-681 m). The rock temperature is 35 °C for both of the layers (A and B) at the depths mentioned.

Oncophora horizon No 1 forms the upper part of the Oncophora Beds. According to the structural map constructed for the surface of this sand horizon, it is a SW-NE-trending domal to semidomal uplift (Fig. 12). In accordance with the results of electric logging and pumping tests in Nový Přerov-1, 3 and Altprerau-2, 3, 5 boreholes, the water-gas contact was located at a structure depth of -612 m. The formation pressure related to the gas-water contact is 8.2 MPa and the formation temperature 33° C at this depth. The average net pay of the horizon is 1.29 m, average porosity attains 19 %.

The highest-lying deposit of the structure is a Karpatian sandstone of schlier development whose gas-bearing capacity was confirmed by drill-stem testing in Nový Přerov-3 borehole. In the cross-section through Nový Přerov-1 borehole, the results of the pumping test from this horizon and the evaluation of the well logs have suggested the water-gas contact to lie at a structure depth of -556 m. In Alprerau-3 borehole the water-gas contact has been placed at a structure depth of -546 m. Due to the differences in in-

terpreting the depth of the water-gas contact, the horizon is supposed to be divided into two separate units by a facies boundary. The formation pressure related to the water-gas contact at a depth of -556 m is 6.93 MPa and rock temperature is 33° C at this depth. The average net pay of the horizon is 2 m, average porosity attains 19 %.

Natural gas samples were recovered from the Nový Přerov-1, 3 and Altprerau-2, 3, 5 boreholes. The average composition of the natural gas in the individual horizons is as follows:

Oncophora horizon No 4

Methane 98.77 % by vol., ethane 0.23 % by vol., propane 0.02 % by vol., CO₂ 0.14 % by vol., azote 0.82 % by vol.

Oncophora horizon No 2

Methane 99.08 % by vol., ethane 0.13 % by vol., propane 0.01 % by vol., CO₂ 0.04 % by vol., azote 0.8 % by vol.,

Oncophora horizon No 1

Methane 99.02 % by vol., ethane 0.13 % by vol., propane 0.01 % by vol., CO₂ 0.04 % by vol., azote 0.8 % by vol.

The formation waters are highly mineralized (11.77–21.56 g/l), of the chloride sodium type, calcic hydrocarbonate subtype. The iodide content ranges from 33.05 – 90.2 mg/l.

Pottenhofen deposit

The structure was discovered as a result of reflection seismic survey and drilling of Pottenhofen-2 borehole in 1985. The presence of gas was confirmed by an open-hole test in the Oncophora Beds (Oncophora horizon No 5 with a 7.1 m thick gas-bearing section) and in the Upper part of the Jurassic formation. The evaluations of electric logging

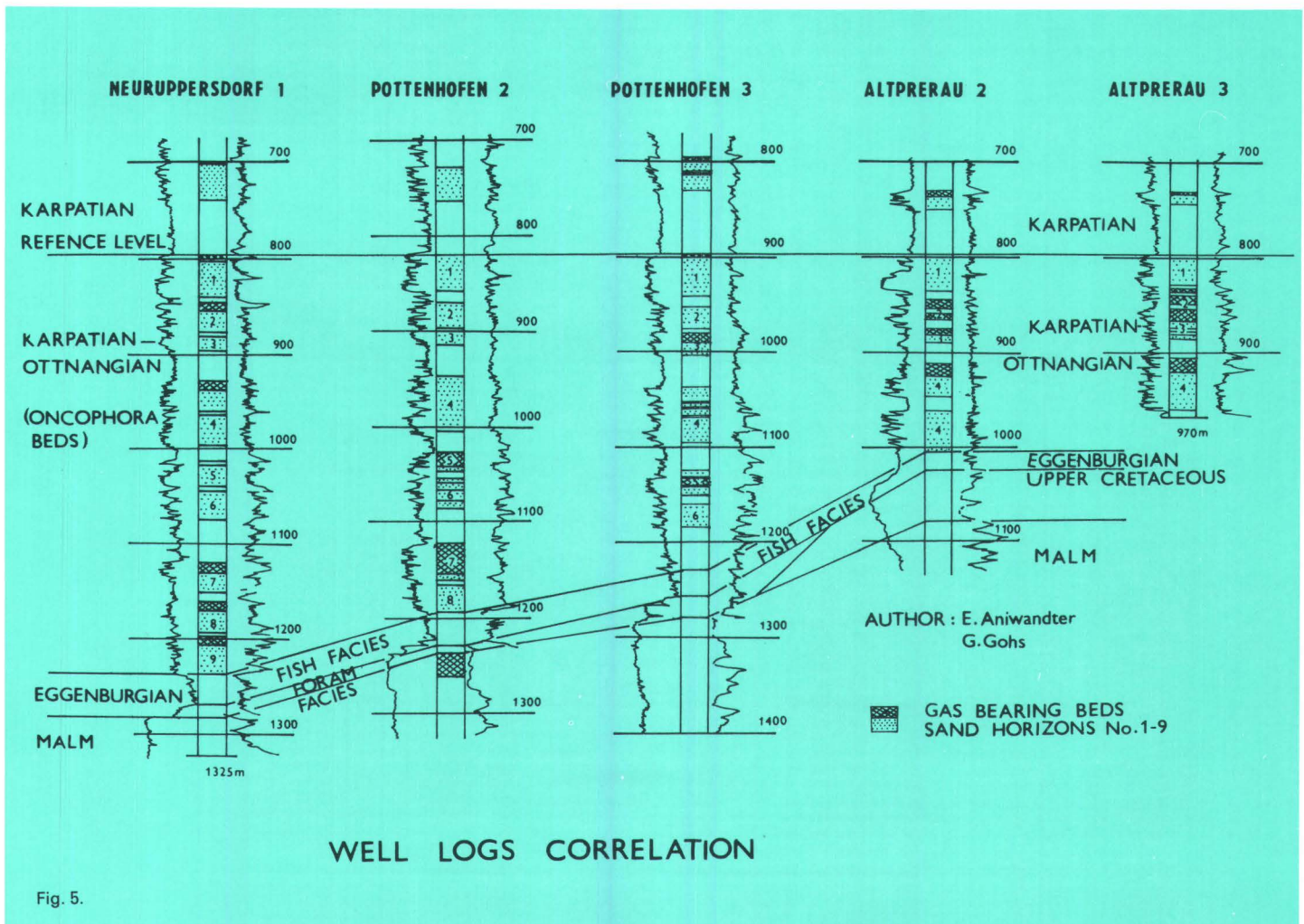


Fig. 5.

REFLECTION SEISMIC PROFILE 317/84

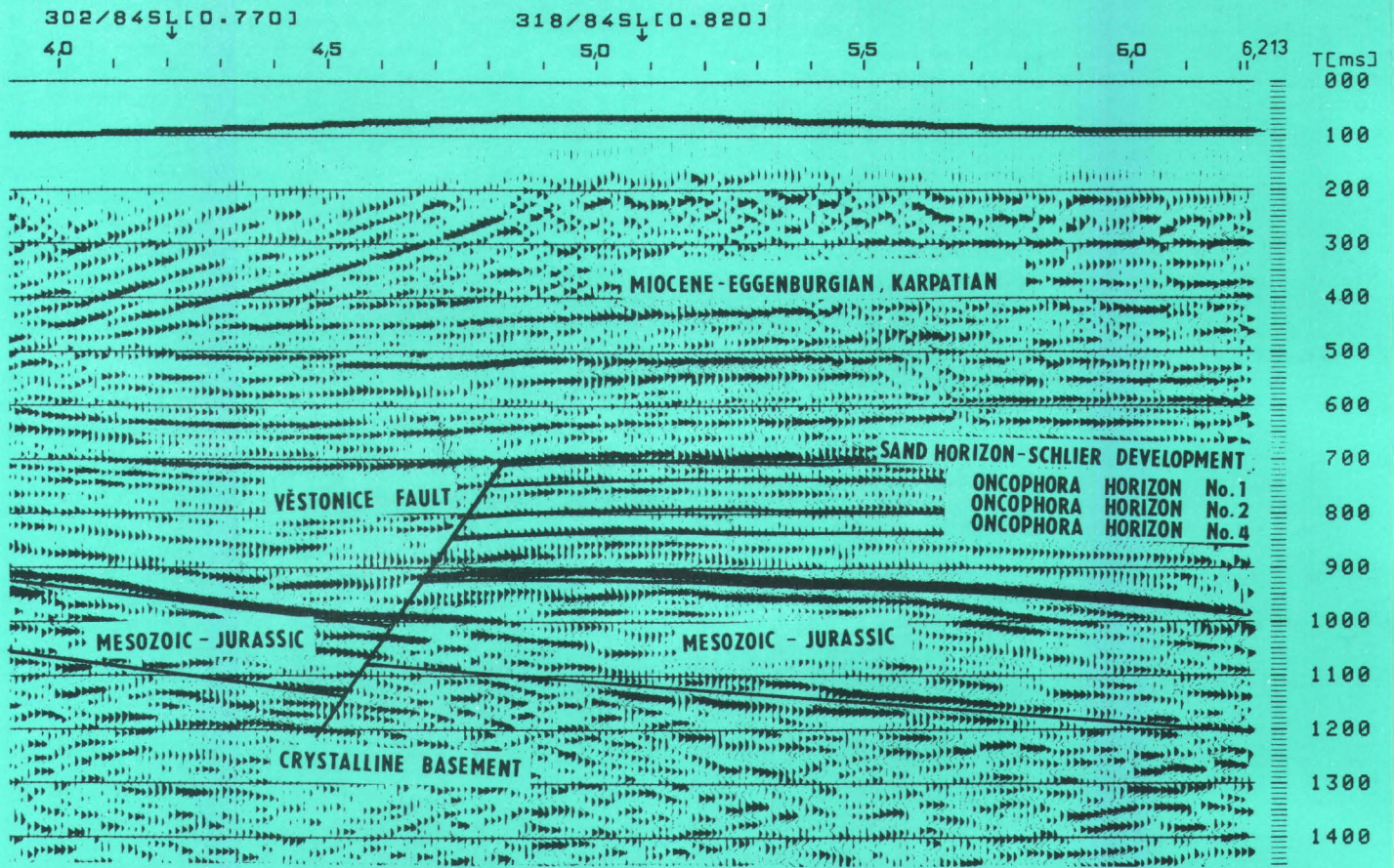


Fig. 6.

REFLECTION SEISMIC PROFILE LJ 8608

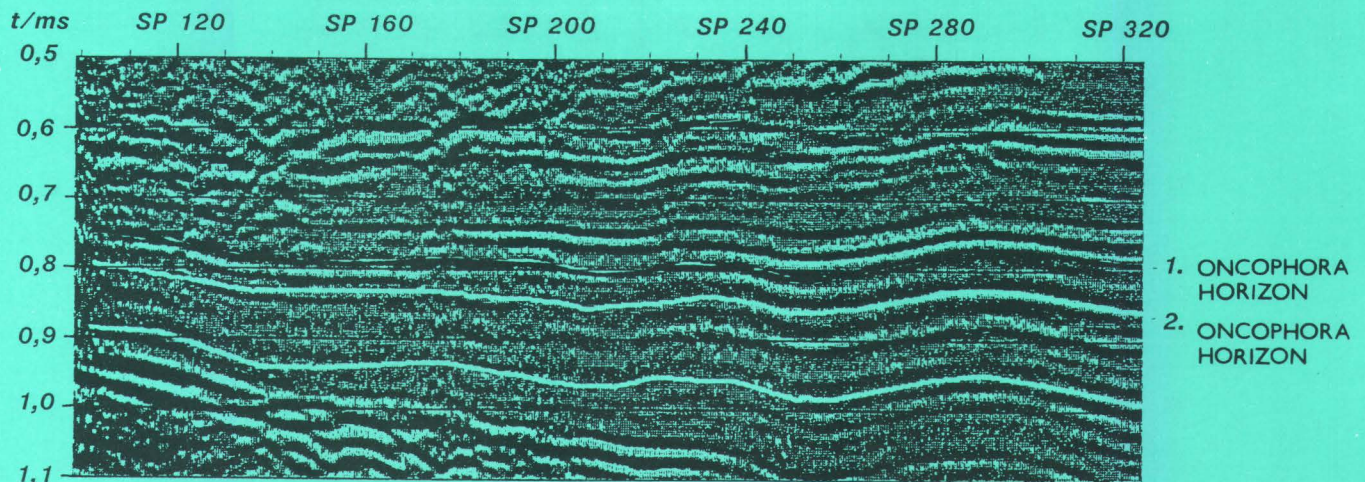


Fig. 7.

in Oncophora horizons NoNo 6 and 7 suggest the presence of additional gas accumulations. The structure is built of a SW-NE-trending flat anticline bounded by the gas-water contact on all sides. The maximum length of the structure is 1.5 km, its maximum width — 800 m. Average porosity was found to be 21.9 % and water saturation 56—59 %.

A similar gas-bearing structure was discovered by Pottenhofen-3 borehole in 1988. In this structure, the deposits lie in Oncophora horizons No 3 and No 5 (the gas-saturated sections of the reservoir rock attain thicknesses of 3.1 m and 9.1 m, respectively). The flat NE-SW-trending anticline is 1.2 km long with a maximum width of 550 m. It is separated from the structure drilled by Pottenhofen-2 borehole by a flat NW-SE-trending syncline.

Another minor structure was discovered by Neuruppersdorf-1 borehole in 1987. This structure is situated north of the Wildendürnbach gas deposit (Fig. 3). Drill-stem testing in the open hole resulted in gas flow from Oncophora horizon No 1. Measurements of the formation pressure did not evidence a relationship of the structure to the Wildendürnbach deposit. As indicated by reflection seismic data, the structures appear to be separated from each other by a transverse W-E striking depression. Regarding the evaluations of electric logging, additional natural gas accumulations are supposed to exist in Oncophora horizons NoNo 2, 4, 5 and 7.

Summary

Petroleum-geological prospecting conducted in the southeastern part of the Carpathian Foredeep in the regions of Nový Přerov, Altprerau, Pottenhoffen and Neurup-

persdorf in the period from 1981 to 1988 has yielded positive results evidencing the gas potentials of the Miocene sandstone horizons of the Oncophora Beds and the schlier development of the Karpatian. The Nový Přerov-Altprerau natural gas deposit was discovered. The exploration of the gas field was terminated and the geological reserves of gaseous hydrocarbons of this deposit have been estimated to be of the order of magnitude of hundreds of millions of cubic metres.

Additional gas-bearing structures were identified and proved by drilling in the Pottenhofen and Neuruppersdorf regions, where exploration goes on at the present time. The favourable exploration results recently obtained point to the fact that the survey of the Miocene sediments in the Carpathian Foredeep should not be regarded as completed. In view of the results obtained, we can express the realistic hope that similar structures may be found in Miocene sediments in the near future.

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REFLECTION SEISMIC PROFILE LJ 8604

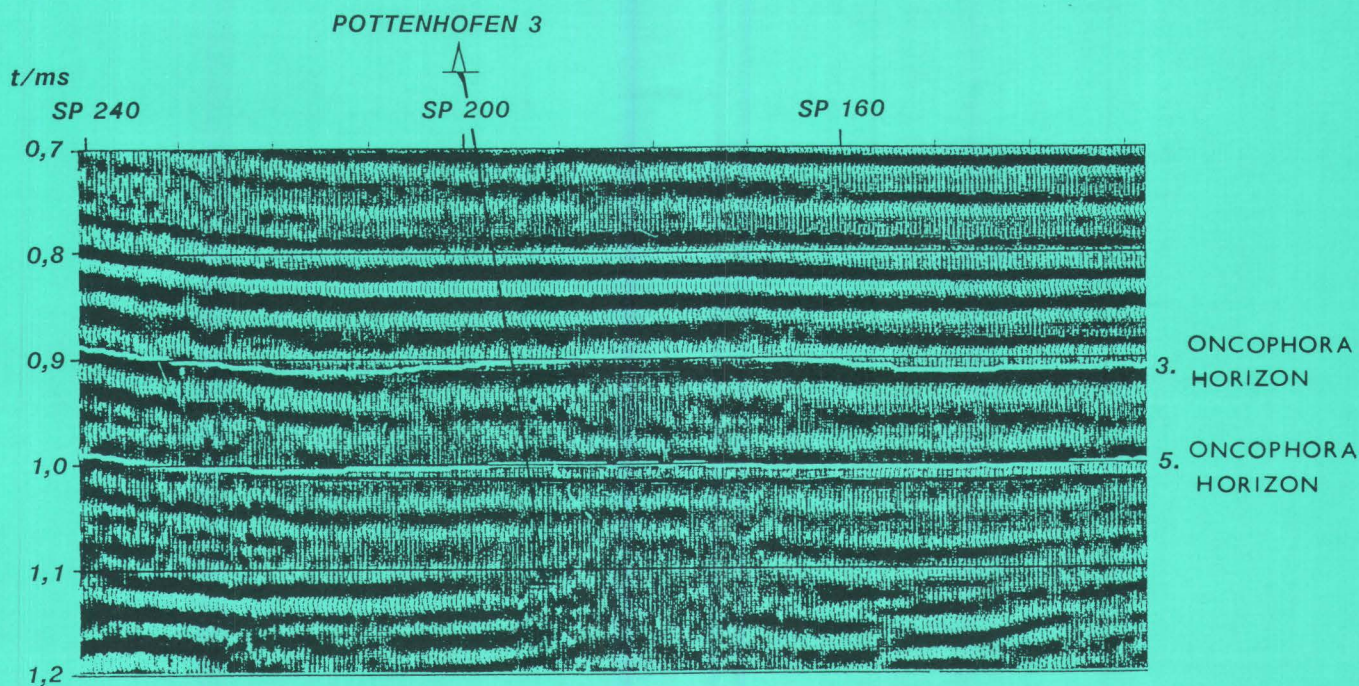


Fig. 8.

MAP OF THE SAND TOP ONCOPHORA HORIZON No.4

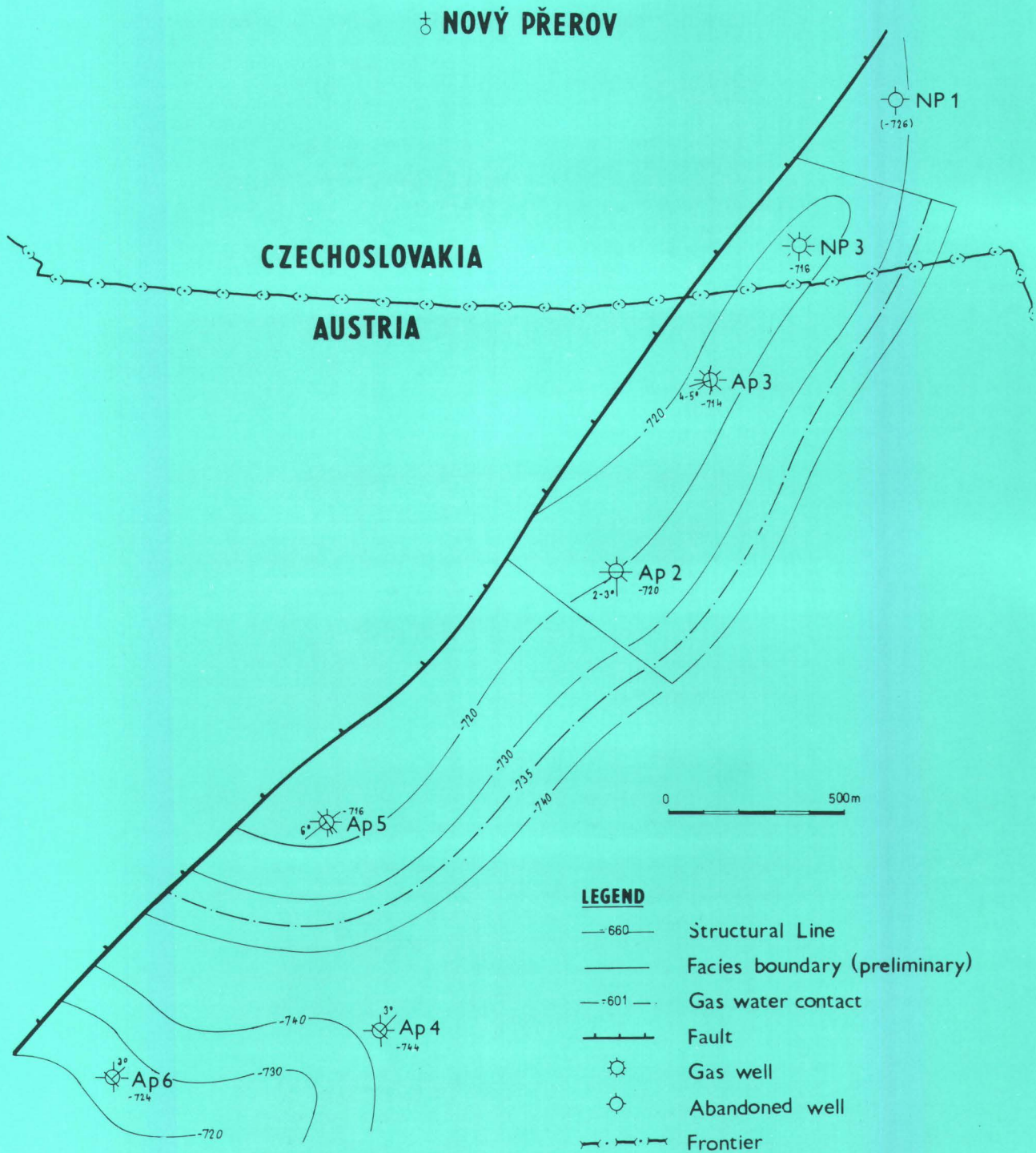


Fig. 9.

MAP OF THE SAND TOP ONCOPHORA HORIZON No. 2 A

† NOVÝ PŘEROV

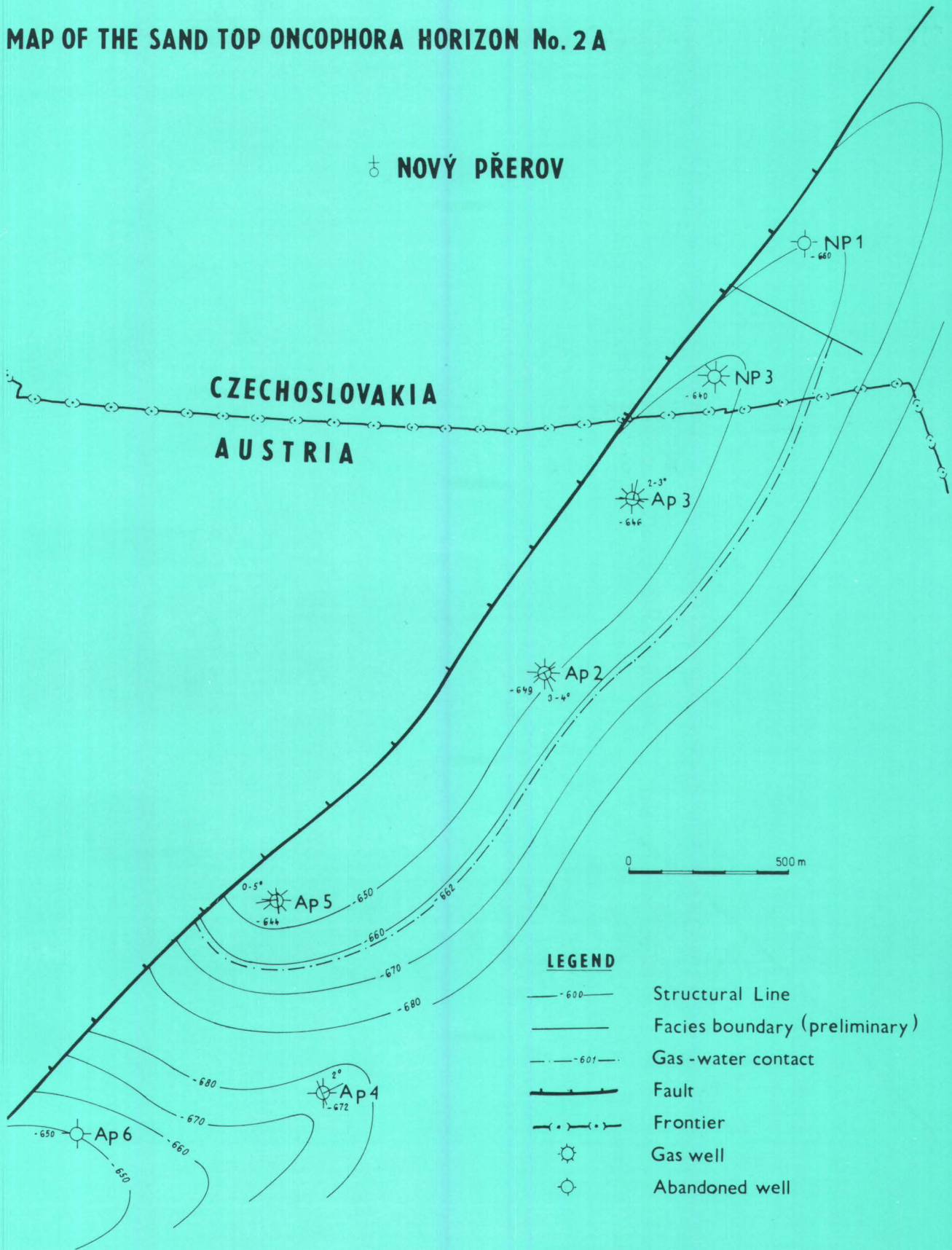


Fig. 10.

STRUCTURAL MAP OF THE SAND TOP ONCOPHORA HORIZON No. 2 B

† NOVÝ PŘEROV

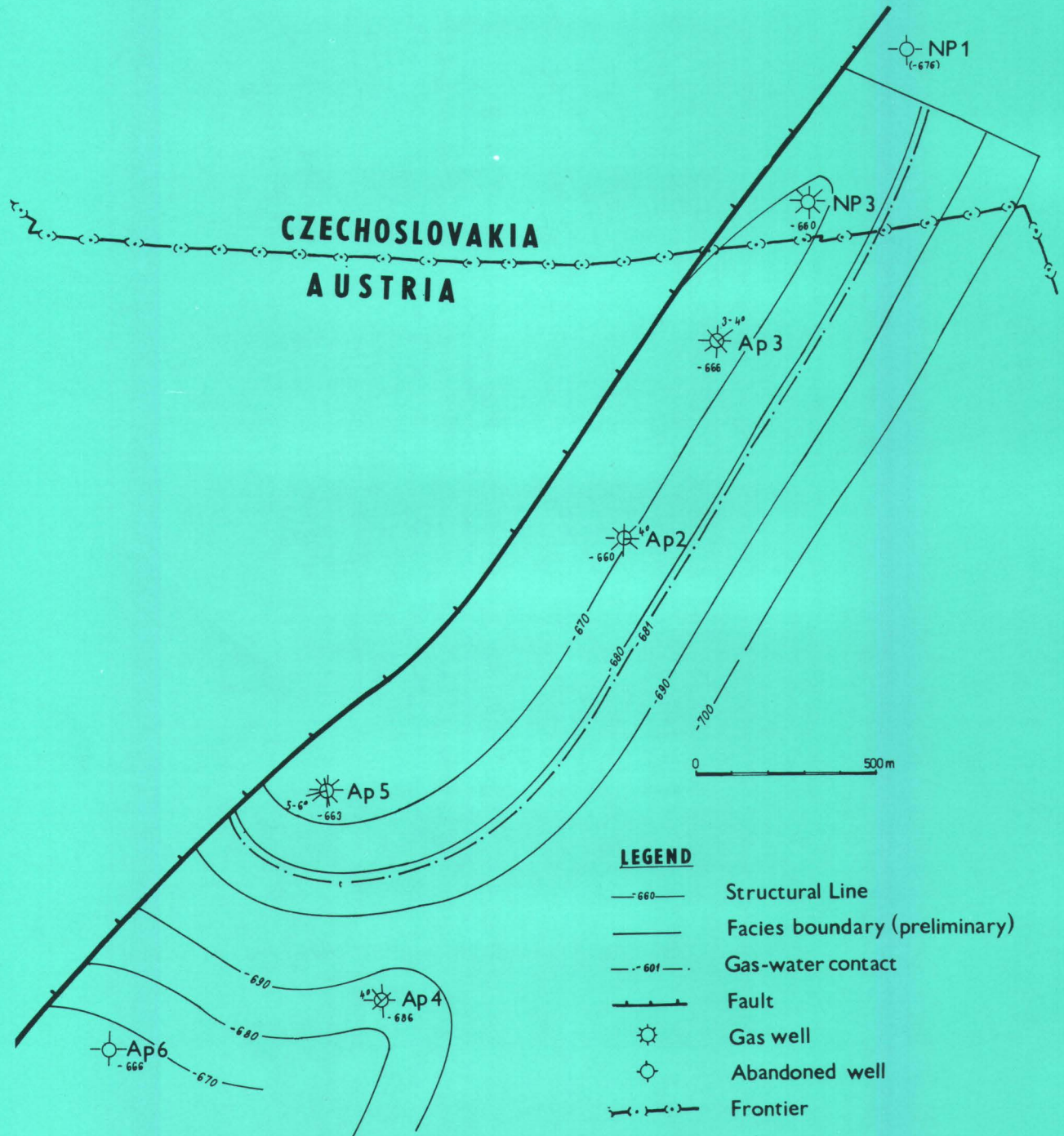


Fig. 11

STRUCTURAL MAP OF THE SAND TOP ONCOPHORA HORIZON No.1

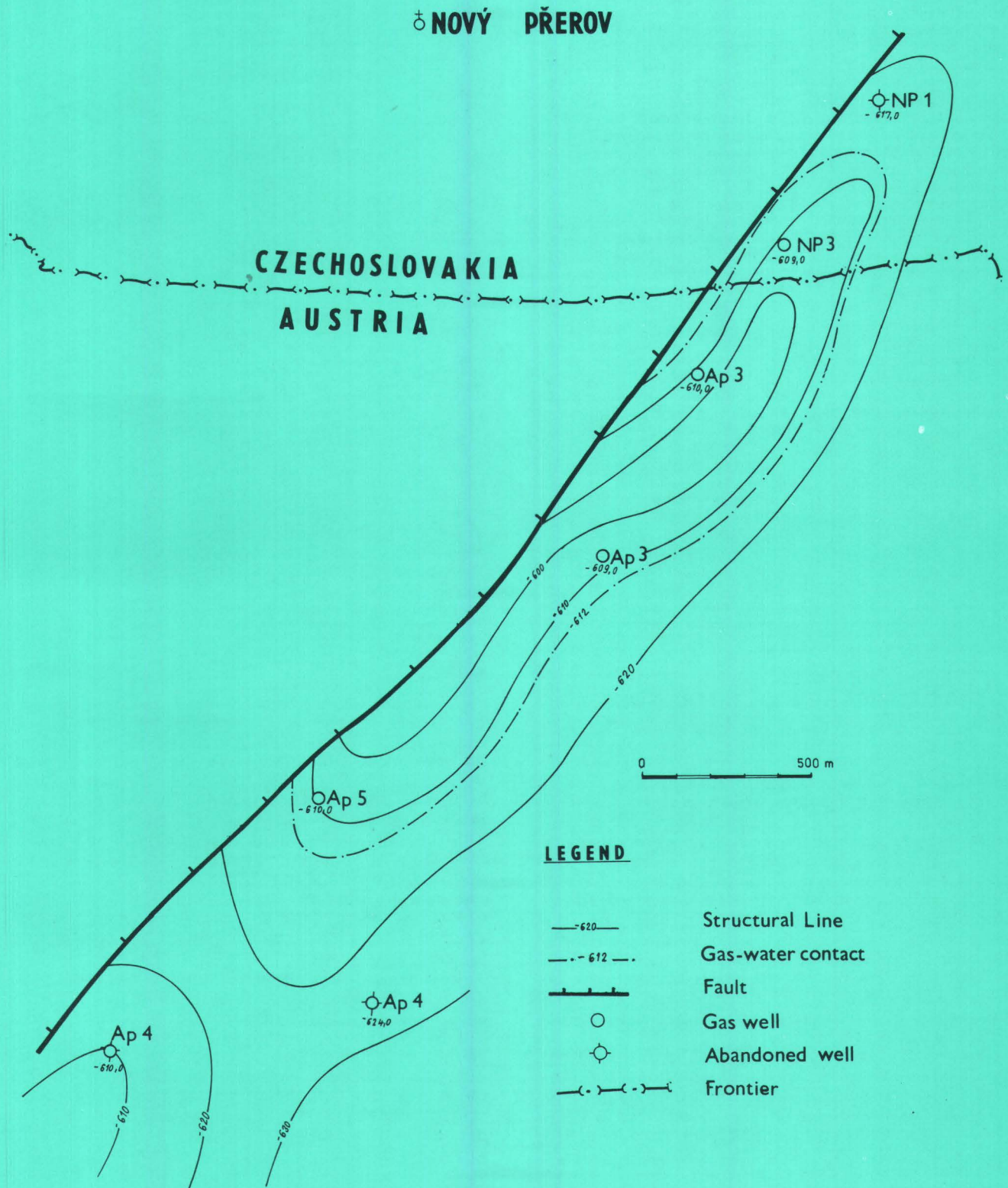


Fig. 12.

Abstrakt

Naftově geologickým průzkumem prováděným v období 1981–1988 v jihovýchodní části karpatské předhlubně byla prokázána plynosnost miocenních pískovcových obzorů v onophorových vrstvách a ve šlírovém vývoji karpátu. Bylo objeveno společně československo-rakouské naleziště zemního plynu Nový Přerov – Altpreerau. Plynné uhlovodíky na tomto nalezišti jsou vázány na 1., 2., 4. onophorový horizont a na pískovcový obzor ve šlírovém vývoji karpátu. Průzkum naleziště byl ukončen a stanoveny geologické zásoby.

V další etapě průzkumu byly objeveny další plynosné struktury v oblasti Pottenhofenu a Neuruppersdorfu. Akumulace zemního plynu jsou vázány na svrchní část karbonátů jury (vrt Pottenhofen–2) a na pískovcové obzory onophorových vrstev (1. – 9. onophorový horizont). Průzkum na těchto strukturách v současné době pokračuje. Na základě těchto příznivých výsledků, získaných vrtným průzkumem v molasových sedimentech, je možno předpokládat objevení dalších analogických struktur vázaných na miocén karpatské předhlubně.

Zusammenfassung

Durch die im Zeitraum 1981–1988 durchgeführte erdölgeologische Erkundung wurde im südöstlichen Teil der Karpatenvorfie die Gasführung der miozänen Sandsteinhorizonte in den Oncophora-Schichten und in der Schlierentwicklung des Karpats nachgewiesen. Es wurde eine gemeinsame tschechoslowakisch-österreichische Erdgaslagerstätte Nový Přerov – Altpreerau entdeckt. Die gasförmigen Kohlenwasserstoffe sind an den 1., 2. und 4. Oncophora-Horizont und an den Sandsteinhorizont in der Schlierentwicklung des Karpats gebunden. Die Erkundung der Lagerstätte ist beendet und es wurden ihre geologischen Vorräte berechnet.

In der darauffolgenden Etappe der Erkundungsarbeiten wurden weitere gasführende Strukturen im Raum Pottenhofen und Neuruppersdorf entdeckt. Die Erdgasakkumulationen sind an den oberen Teil der Jurakarbonate (Bohrung Pottenhofen-2) und an die Sandsteinschichten der Oncophora-Horizonte (1. – 9. Oncophora-Horizont) gebunden. Die Erkundung der genannten Strukturen wird gegenwärtig fortgesetzt. Aufgrund dieser günstigen Ergebnisse, die durch Bohrerkundungsarbeiten in Molasse-sedimentgesteinen erzielt wurden, kann die Entdeckung weiterer, an das Miozän der Karpatenvorfie gebundener analogischer Strukturen vorausgesetzt werden.

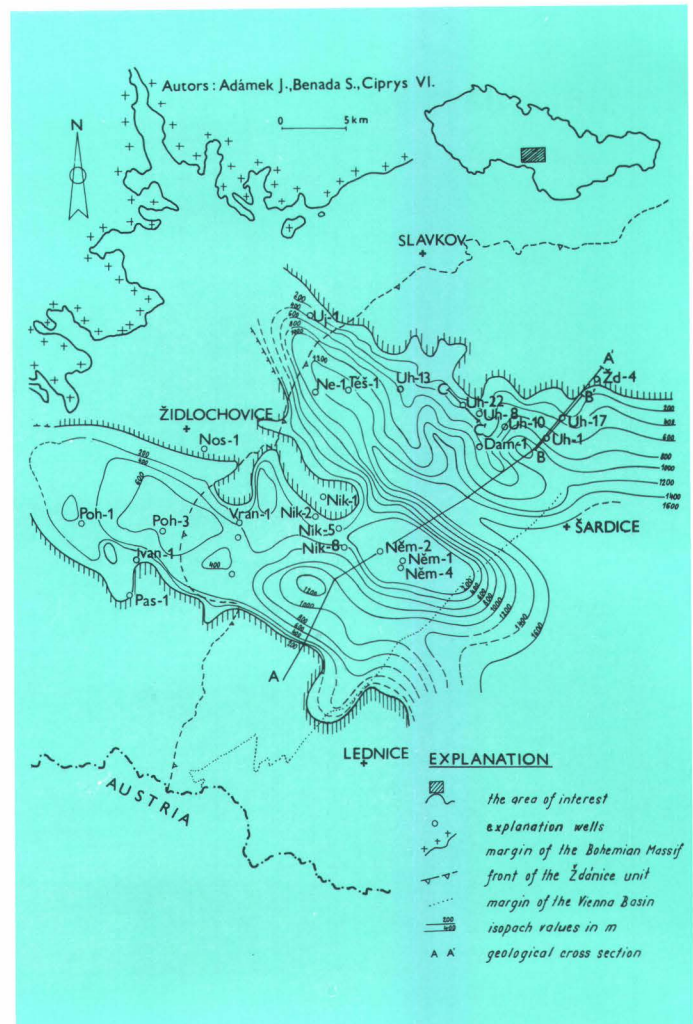


Fig. 1: Isopach map of Paleogene sediments.

NEW DATA ON THE EXTENT, STRUCTURE AND DEPOSITS OF THE AUTOCHTHONOUS PALEOGENE IN THE NESVAČILKA GRABEN

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Recently new results have been obtained when prospecting for oil and natural gas in Paleogene sediments preserved on the southeastern flanks of the Bohemian Massif. Autochthonous Paleogene sediments have widespread occurrence, above all, in two extensive depressions in the Nesvačilka and Vranovice grabens, the axes of which are perpendicular to the margins of the Bohemian Massif. In the northern part, the Paleogene sediments are covered with Neogene sediments of the Carpathian Foredeep while they are overlain by overthrust flysch nappes of considerable thickness in the southern part.

The extent of the Paleogene sediments is obvious from Fig. 1 depicting thicknesses of the autochthonous Paleogene rocks. Both the Nesvačilka and the Vranovice grabens penetrate deep into the Bohemian Massif and, locally, Paleogene sediments even extend beyond the margins of the grabens. The original extent of Paleogene sediments on the flanks of the Bohemian Massif is generally believed to have been a much broader one; however, a part of these sediments was eroded and a part removed by the flysch nappes. Paleogene sediments are included in the basal

parts of the Žďánice unit, but they also form separate para-autochthonous slices.

Paleogene sediments were encountered in more than 40 deep wells; in regions not explored by exploratory drilling these sediments can be correlated by a comparatively closely-spaced network of seismic profiles. A maximum thickness of 1,000 to 1,500 m has been assumed for the axial part of the Nesvačilka graben. The interpretations base on the results of the Těšany-1, Nesvačilka-1 and Pohořelice-3 boreholes. In the southern part, the identification of Paleogene sediments in seismic materials is limited by the margin of the Vienna basin, where the quality of seismic data considerably decreases. In this area, the surface of Paleogene sediments is thought to occur at depths greater than 4,000 m and these sediments are strongly reduced by overthrust nappes.

Stratigraphy of Paleogene sediments has been studied in detail, at the present time, by the geologists of the Moravian Oil Company (MND), Hodonín, of the Central Geological Survey, Prague and of Charles University, Prague. The conception of a consecutive transgression of the sea has been generally accepted. Two somewhat differing opinions on the age of the autochthonous sediments have been presented. Jiříček (1987) places these sediments into the Upper Eocene – Lower Oligocene, whereas Hamršíd, Krhovský, Švábenická (1988), basing on nannoplankton investigations, believe these sediments to be of Paleocene to Oligocene age. Most probably the older sediments were re-deposited, in great part, during the last and most important transgression in the Upper Eocene – Lower Oligocene.