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Pacific Oil & Gas Pty. Limited

REPORT ON THE RESULTS OF ENGINEERING TYPE WORK FOR THE COMPOUND PROCESSING AND INTERPRETATION OF AEROMAGNETIC AND GRAVITY DATA IN THE AMADEUS BASIN

AUTHOR: NPO SIBGEO

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Contract No589/1423602/90010
Between: NPO "SIBGEO"
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G.G. Rempel, E.A. Vaivod, A.V. Migurskii,

V.S. Starosel'tsev, V.S. Surkov

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I. INTRODUCTION

The materials which are characterized below are presented to carry out works planned under the contract with Pacific Oil and Gas Pty Limited.

In the first place we should note six sheets (Lake Amadeus, Henbury, Rodinga, Aiers Rock, Kulgera, Finke) of geologic map at a scale of 1:250,000 and the map of the entire Amadeus Basin constructed on their basis at a scale of 1:500,000. They contain necessary information on stratigraphy, tectonics of Late Proterozoic-Paleozoic strata exposed at the surface. These maps are supplemented with colour space images at a scale of 1:250,000. Unfortunately, a wide development (more than 50% in some sheets) of the Mesozoic-Cenozoic sedimentary cover has essentially hampered reconstruction of surface horizon structural pattern in the area studied. Lack of conditioned topographic base (no isohypses and instrumental control of reference points) in four out of the six abovementioned sheets should be also marked.

Reports on geological survey of southwestern (Forman, Hancock, 1964; Forman, 1966), central (Ranford et al., 1965), southeastern (Wells et al., 1964), northeastern (Wells et al., 1967) parts of the basin and the review paper on the entire basin "Geology of the Amadeus Basin, Central Australia" (Wells et al., 1970) are of great value for understanding of tectonic features of the area studied. Summary of results on oil and gas exploration in the western half of the Amadeus Basin compiled for the middle of 1989 (Western, 1989) is quite similar to this series of reports.

Many original materials on stratigraphy, tectonics, lithology, hydrogeology are given in the reports on drilling of Erldunda-1, Mt Charlotte-1, Dingo-1, Bluebush-1, Ooraminna-1, Finke-1 Wells and others. In particular, in the area of concession EP-26 there were located reservoirs in Stairway Sandstone (Ordovician) with porosity of about 5 percent in Erldunda-1 well. These reservoirs yielded the inflow of saline water with production rate of 50 barrels per hour. Beyond the concession limits, in the areas of Mt Winter and Finke 1 wells, favourable features of petroleum potential have been identified in the Bitter Springs deposits. The relation of petroleum potential to enhanced fracturing revealed in the Palm Valley field is of a certain interest.

Seismic surveys in 1964-65 and in 1982 have greatly contributed to understanding of dislocation genesis in the area considered (Ripper, Smith, 1982). A wide development of thrust dislocations within the Late Proterozoic formations was revealed. The Paleozoic deposits occurring with a sharp angular unconformity are substantiated in different Late Proterozoic horizons up to the Bitter Springs Formation.

General state of theoretical investigations on the problems of structural geology and petroleum exploration is presented quite fully in a number of papers published at the end of the 1960's, in the 1970's and in 1980's (Mc Naughton et al., 1968; Pearson, Renbow, 1976; Wells, 1980; Jackson et al.,1968; Ozimic et al., 1986; Lindsay, 1987; Roe, 1987; Horton-Jones, 1988). More general problems of the Amadeus Basin formation have been arisen by K. Lambeck (Lambeck, 1984), J. Veevers et al. (Veevers et al., 1988), B. Goleby (Goleby et al., 1989).

The following materials provided for aeromagnetic data interpretation: Tanomaly maps of small-scale survey and survey at a scale of 1:50,000 , 1:100,000 , magnetic tapes with processed data of measurements and magnetic field values in cells of square network. Besides, location of aeromagnetic survey profiles and magnetic field sparse profiles are given. Unfortunately, even small-scale aeromagnetic survey does not cover the entire studied area and more detailed surveys have been carried out only in two areas which together embrace about 5,000 km^2. The eastern portion of the area starting from longitude 133^{o}E, except for narrow strip in the north, is not covered by aeromagnetic survey and by other types of geophysical works (besides small-scale gravity prospecting).

Initial gravimetric data are given in the form of a catalogue of gravimetric points, their recording in magnetic tape and Bouguer anomaly map. Scale of survey is approximately

1:1000,000 for much of the territory (latitude 24° to 26°S , longitude 130°30' to 135°E). A number of detailed profiles in which an average distance between observation points is about 500 m have been laid out near the northern boundary. In the east of the Kulgera sheet six profiles trending from north to south and one profile of complex shape are laid out in which the distance between observation points is 1 km. Some bridging of observation points is made in the southeastern portion of the Finke sheet.

When characterizing gravity prospecting data as a whole, it should be stressed that they can be used for reliable quantitative interpretation. Besides, a certain opportunity is provided by Bouguer anomaly map. Its contour lines are drawn with the interval of 1 milligal. Such contour interval is not provided by gravimetric survey scale, but gravity field values can be obtained with a certain risk from the formal interpolation results based on regular network of 5 x 5 km. Data from such network have been used for different transformations of gravity field, including its separation into regional and local components.

When summarizing the review of materials presented by the customer it should be marked that as a whole the initial data availability is quite complete (taking account of geologic assurance of the area) to perform the planned works. It should be emphasized that general state of petroleum exploration in the Amadeus Basin is at the initial regional stage of studies. The amount of deep drilling is quite insufficient for final conclusions to be made structural models. Unfortunately, subsalt deposits which in many regions of the world are one of the main targets for petroleum exploration have been nowhere penetrated.

2. REVIEW OF THE AMADEUS BASIN STRUCTURE MODELS

The main features of the Amadeus Basin tectonics (east-west structure trending, presence of median uplift) are recognized by all investigators. Most of them assign an important role in dislocation style to plastic salt movements in the Bitter Spring Formation (Late Proterozoic) and Chandler Formation (Cambrian). The late Proterozoic salt strata are developed through all the area studied while the Cambrian ones are lacking in its southern and southwestern parts. This salt distribution has essentially influenced dislocation morphology. Substantiation of this thesis will be given below.

Differences in investigator views are mainly related to problems of structural pattern relationships in different horizons of sedimentary sequence. Some of them who are engaged in studies of salt tectonics in the basin history come to the conclusion on the occurence of several decollement surfaces (along salt beds) and, as a result, on pendant nature of some linear structures (Forman, 1966; McNaughton et al., 1968; Wells et al., 1970; Wells, 1980). Presence of the Bitter Springs salts in cores of linear structures is the main argument in favour of these ideas. At the same time more ancient formations have been not found to be involved in their structure through the entire basin. Besides, the morphology of linear dislocations complicated by fractures of reversed fault-thrust nature suggests their formation under conditions of shear stresses, i.e. decollement nature of structures.

However there are some concepts of major tectonic elements taking part in the basin structure together with salt tectonics and basement blocks. They are based on the analysis of geophysical fields and seismic survey data. The Amadeus Basin geologic cross section from its southwestern boundary to the Arunta block is the striking example of these concepts (Schroder, Corter, 1984). There are also some concepts (Lindsay, 1987; Horton-Jones, 1988) that structures of the northern part of the basin are dominated by decollement tectonics with a relatively weak participation of basement uplifts. In the southern part of the basin the pattern is reverse.

Presence of the eastwest trending Central Ridge in the middle part of the Amadeus Basin, manifesting over all sedimentary history of the basin, is now generally recognized (Well et al., 1970; Western..., 1989) . The Ridge has the greatest width (about 50 km) in the west where it covers the area between the Gardiner and Parana anticlines. To the east it narrows gradually to 10 km (James Ranges region). According to many investigators' view, the Central Ridge divides the regions with different sedimentation and deformation history. It should marked that the Central Ridge is not reflected clearly in potential geophysical fields. Therefore its special role in the basin history is questionable.

From purely geophysical point of view a greater attention should be paid to the Angas Downs Gravity Ridge (Wells et al., 1964) . In relation to the Central Ridge it is essentually displaced to the south and lies just along latitude 25° within the Ayers Rock, Kulgera, Finke and northern sheets adjacent to them. The Angas Downs Gravity Ridge divides two large gravity lows, and its most part is incorporated in the concession EP 26. The joint analysis of geological features of sedimentary sequence, gravity and magnetic fields suggests that the Angas Downs Gravity Ridge is confined to positive form of the basement relief (Wells et al., 1970). As its hypsometric position is essentially higher than that of the Central Ridge (Plate 3), it is the preferable target of detailed works.

According to the existing concepts, two folding phases of the Amadeus Basin history has been of a major importance to structural formation. The Petermann orogeny (Late Proterozoic-Early Cambrian) is related to the Musgrave block displacement northward and formation of linear structures at the level of the Late Proterozoic units. The Alice Springs phase reflects movement of the Arunta Block to the south and is attributed practically to the entire sedimentary cover. According to the contribution of two orogenies to structural style formation, several dislocation zones which are somewhat different in morphology are recognized.

The first of them (southern) lies between the Musgrave Block and Angas Downs Gravity Ridge. The main dislocation is fixed along the Proterozoic deposits. Rocks of later age have been much less deformed and rest with angular unconformity on underlying deposits. The formations from the Winnal Beds to Bitter Springs emerge under the unconformity surface (Plate 3). More intensive dislocation is mapped in the southwestern part of the basin south of Aliers Rock. Here large cover folds are found with amplitude of the first tens of kilometers (Forman, 1964, 1965; Wells et al., 1970; Western..., 1989). To the east the contrast of structures decreases rapidly and in the Erldunda I well area folds in the Proterozoic deposits are close to symmetrical and are gentle. Amplitudes are tens, rarely the first hundreds of meters (Plate 3). Further to east structures are still less contrasting.

The second zone (median) lying between the Angas Downs Gravity Ridge and Central Ridge is characterized by a wide development of small contrasting dislocations. In the cores of a part of them the Bitter Springs deposits crop out. The zone width ranges from 10 to 20 (extreme east) to 70 to 80 km (west). It is reasonable to distinguish two subzones in it, which conventionally divided by meridian of 132°45'. The western subzone is characterized by persistent eastwest trend of linear structures, the eastern one by their more random distribution, sometimes by angular pattern. Differences in these subzone structure is probably related to confinement of the eastern subzone to development field of the Chandler Formation salts that creates prerequisites for the formation of additional decollement surfaces and leads to intersalt dislocations.

As the Bitter Springs deposits are frequently exposed in the median zone, a number of authors (Schroder, Gorter, 1984 et al.) think that here the basement uplift reaches the depth of 2.0 to 2.5 km. However in terms of formal analysis of potential geophysical fields, the basement within its limits is buried to the depth of 5 to 7 km. This contradiction may be solved both by a sharp increase (up to two or more times) of separate section intervals and its two fold or more overlapping along the surface of thrust faults and thrust nappes.

The third zone (northern) lies between the previous one and the Arunta Block. Its width ranges within 60 to 100 km, the extension is about 250 km. The distinctive feature of this zone is occurence of large linear structures of 5 to 10 km wide and with extension of tens of kilometers. All sequence of sedimentary rocks from the Proterozoic Bitter Springs Formation to Middle Paleozoic Pertnjara Series is involved in dislocations. As judged from morphology, folds are formed under conditions of shear stress. Decollement surface is apparently confined to the Bitter Springs salt strata. In the considered zone the Alice Springs orogeny is undoubtedly of major importance to structural style formation.

Thus, the review of models of sediemntary sequence structure in the Amadeus Basin shows that there are three distinctive folding zones formed by two major phases of tectonism. In the southern zone main dislocations formed during the Petermann Orogeny, in the northern one during the Alice Springs Orogeny, and in the central zone superposition of both orogenies took place. It is important to note that concession EP 26 occupies near-boundary area between the southern and central zones. Therefore, the Upper Proterozoic strata and Paleozoic basal horizons should be the main object of studies here.

3. INTERPRETATION AND ANALYSIS OF GEOPHYSICAL PROSPECTING RESULTS

3.I. Gravity survey

In accordance with program of work under contract consisting in construction of basement surface relief and probable tectonic model of platform cover the initial purpose was to detect by gravity field transformation that very component of the field which best characterizes variations in structure and framework of the platform cover.

Prior to this study gravity field separation was used for this purpose as well (Schroder & Gorter). It was ascertained that direct correspondence of local anomaly signs to plicate structure signs predominates in the northern part of the Amadeus Basin. Only at the northern boundary of the Basin, where salt tectonics is supposed to play a significant role, negative anomalies correspond to some positive structures.

Map of local gravity field anomalies given as a figure in the above paper has its southern boundary at latitude 25°South. So, it covers half that area, for which we have compiled a map of similar type. Comparison of maps shows that they are similar in general in coincidence region. But there are differences of specific meaning to delineate geologic structures and to study basement surface relief.

Let us begin to analyse local anomaly maps from southern part of the territory, where basement edge is mapped with respect to quite a stable feature (gravitational step). In some places the edge is mapped without certain, then its position is shown by dotted line rather than heavy one. On Plate 1 edge basement line previously determined from aeromagnetic data is drawn for comparison. In general, edge positions are not matched badly, but one has every reason to suppose that according to gravity data they are determined more precisely, where large gravity gradient is observed.

Everywhere but southeast part of the territory the most characteristic feature of local gravity anomalies is their eastwest elongation. It agrees well with general strike of structures in investigated part of the Amadeus Basin. Besides, regularity in alternation of both positive and negative anomalies is also observed. It is impossible to speak about ideal regularity of anomalies (it is broken by noise of various type), but still it is apparent so well that it may be disclosed in visual analysis of the map, with no special methods being used.

As an example one can take a negative anomaly about 30 km wide that, being dislocated by stepped breaks, extends for 140 km from the western boundary of the territory (between latitudes 24°45's and 25°00'S) eastwards. It probably continues eastward for 80 km more with simultaneous displacement of axieal line firstly north for 17-18 km, and then again south for 20 km. In general, the position of negative anomaly under discussion conforms to the basement edge.

North of considered strip of negative local anomalies and adjoining it there is a strip of positive anomalies from 30 to 40 km wide. It also has stepped breaks, which conform to those of negative anomaly strip with respect to their position and amplitude. The most pronounced part of the strip of positive local anomalies lies within the limits of concession EP-26.

North there is second complicated strip of negative anomalies about 30 km wide and more than 310 km long. Its extension with large shifts up to the eastern boundary of the territory is quite probable.

Next strip of positive anomalies from 20 to 40 km wide extends from the northwest corner of the territory northeast. As well as three previous strips of anomalies, it is complicated by knee-shaped (or stepped) breaks and characterized by the largest downwarping southward in the interval from latitudes 131°45' E to 134°20' E.

Farther north, at the northern boundary of the territory, fragments of another two strips of anomalies are traced. As stated above in this part of the territory spacial coincidence of local anomalies with plicative structures of the same sign is observed.Structures are of relatively young age (Alice Springs orogeny).

Mutual general regularity of strips of positive and negative gravity anomalies, conformability of their stepped breaks are the base to consider the existence of these widely-spread fault dislocations that can be both disjunctive and plicative probable. A number of such dislocations without pointing out their origin is given on Plate 1. Predominant trend of the dislocations is northeast.

One of the most important features of the map of local gravity anomalies is that in the southeast part of the territory isometric anomalies or a bit elongated ones with various orientation of long axes are dominant. The most probable boundary of qualitatively various regions of local gravity anomalies is a northeast-trending fault zone shown on Plate 1. This zone, as one can suppose, reflects features of deep geologic structure of the territory (in particular, the latter conforms to variation of direction and limitation of regional negative gravity anomaly), but relative to structures of the platform cover it serves as a boundary, northwest of which linear structures and southeast isometric or a bit elongated ones predominate. Besides, on the basis of indirect data it can be suggested that in the southwest part of the territory the thickness of the platform cover is not large. Direct evidence can come from aeromagnetic survey at a scale of 1:50,000 and laying-out seismic profiles (Fig. 1).

Now, let us interprete those strips of gravity anomalies, which have been characterized above. Direct comparison to geologic map indicates that only in the northern part of the territory one observes conformability of position and sign of anomalies to position and sign of plicative dislocations of the platform cover. In the greater southern part of the territory intense folded structures that mostly comprise Proterozoic rocks are found. Average width of folds is much smaller than strip widths of gravity anomalies, and therefore there can not be any direct relations between them. Nevertheless, orientation of narrow folds and gravity anomalies is generally similar and conforms to the position of the southern basement edge. So, in any case origin of anomalies is associated with folding. On this basis

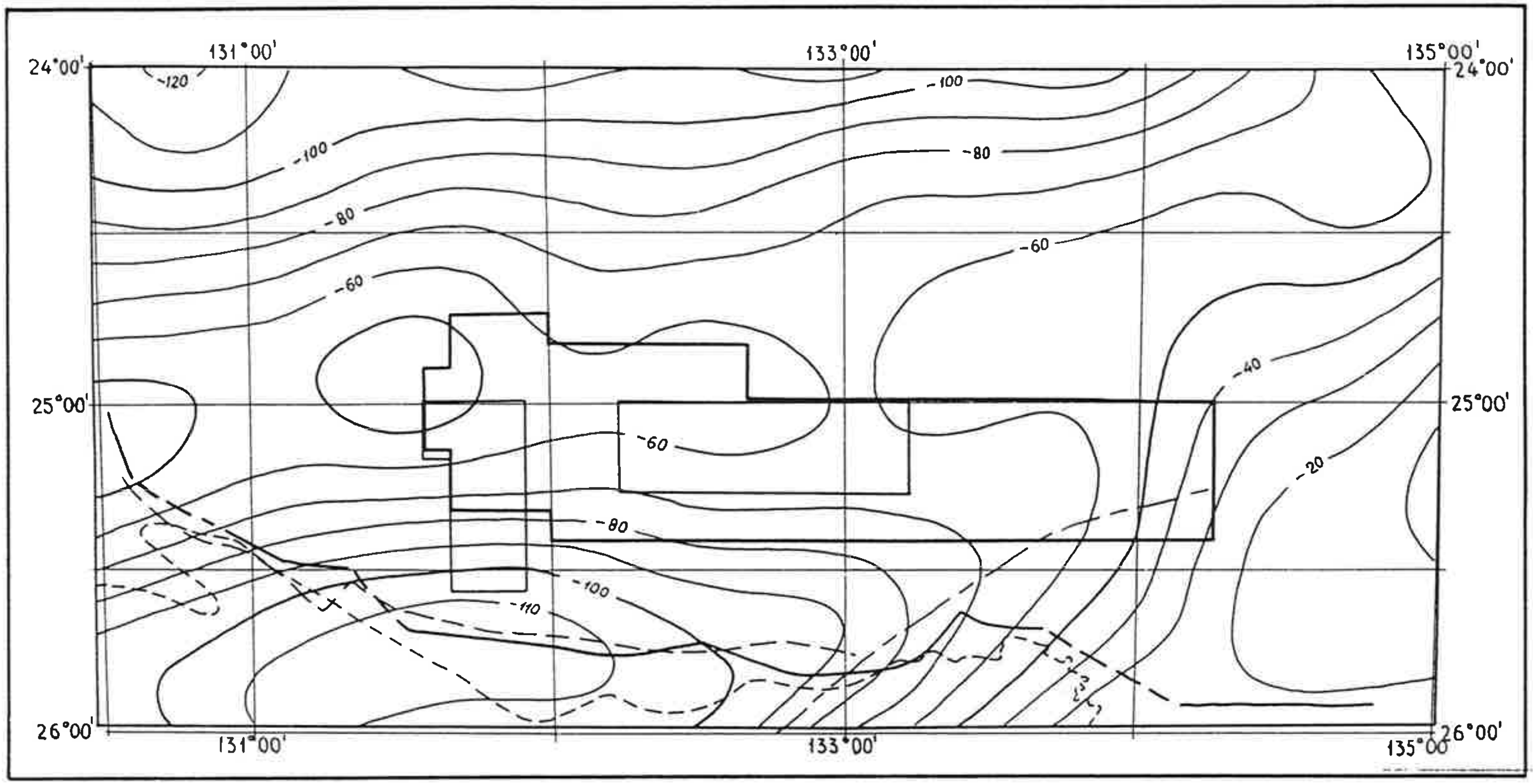

Figure 1 - Regional gravity field

it is reasonable to consider only a few likely interpretations.

The first one consists in natural variation of density of platform cover rocks. With its average thickness of 5-6 km (as following from aeromagnetic data) and relative variations of gravity field of 8-12 mGal rock density variations over the whole thickness of the platform cover are from 0.03 to 0.06 gm/cm^3 in adjacent strips of gravity anomalies. These variations are not excessive with respect to particular units of the platform cover especially to saliniferous ones but with respect to the whole strata of sedimentary rocks it would mean either through succession of sedimentation tendencies or strikingly natural effect of late tectonic movements resulting in band-like desintegration of rocks.

The second possible interpretation consists in presence of density inhomogeneities of the basement. Such inhomogeneities are very often the main causes of gravity anomalies in many regions of the world. But in our case abrupt unconformity of gravity and magnetic anomalies along the strike in the most part of the territory is an obstacle for interpretation of this kind.

The third probable cause for strips of gravity anomalies is crystalline-basement surface relief. If basement density is larger than average density of platform cover rocks, then the appearance of elongated positive and negative anomalies above uplifts and depressions of basement surface, respectively, is quite possible. But there are two circumstances under which it is impossible to use this interpretation as such : 1) modeling shows that anomalies caused by basement surface relief are insufficiently great to compensate local anomalies ; 2) analysis of numerous data on other regions indicates that good conformity between local anomalies and basement surface relief is a comparatively rare phenomenon.

The forth and,to our mind, most probable interpretation consists in combined use of factors causing anomalies. First of all this is due to basement surface relief. Other factors associated with folding features including correction for special plastic properties of saliniferous horizons result in general decrease in density of platform cover rocks above depressions of basement surface relief and density increase above uplifts.

Multivariant modeling has been carried out on a series of meridional profiles crossing the whole territory under investigation to test validity of the last variant of local anomaly interpretation. In addition modeling on three geologic sections has been carried out, in which platform cover models are given in a rather complicated form.

In a number of model variants density of platform cover units is assumed in accord with generalized data given by R.J. Schroder and Gorter in 1984. The data prove to be quite acceptable with the exception of rock density in the Bitter Springs Formation (2.85 gm/cm^3). Though in the average density value salt beds are left out of account, still it seems to be overestimated.(Fig. 2).

By modeling it has been recognized one very important circumstance being that density increments which are realized in the process of approximating calculated field to primary one poorly depend on initial density values. Otherwise, models of very wide range appear to be equivalent in this respect. It means that when interpreting under conditions of unchanged surface and density of basement one can use very simple methods to correct initial density model for the platform cover distinguishing, if necessary, those units whose density could change stronger.

Salt tectonics occurrences are of special interest on the territory. In this respect two negative gravity anomalies draw our attention. One of them centered at coordinates of 24°43' S 132°30'E is matched with rounded positive structure of the platform cover. This circumstance in combination with anomaly position within the limits of probable elongated negative structure allows us to propose without any risk that saline dome is a source of discussed anomaly with amplitude of more than 6 mGal. Salt thickness in it is less than 300 meters.

Anomaly very similar to that above but more intense is located on the area of concession EP-26. Coordinates of its center are 25°06' S 133°23' E, amplitude is more than 8 mGal. There are strong reasons to consider this anomaly caused by saline dome where salt thickness exceeds 400 m.

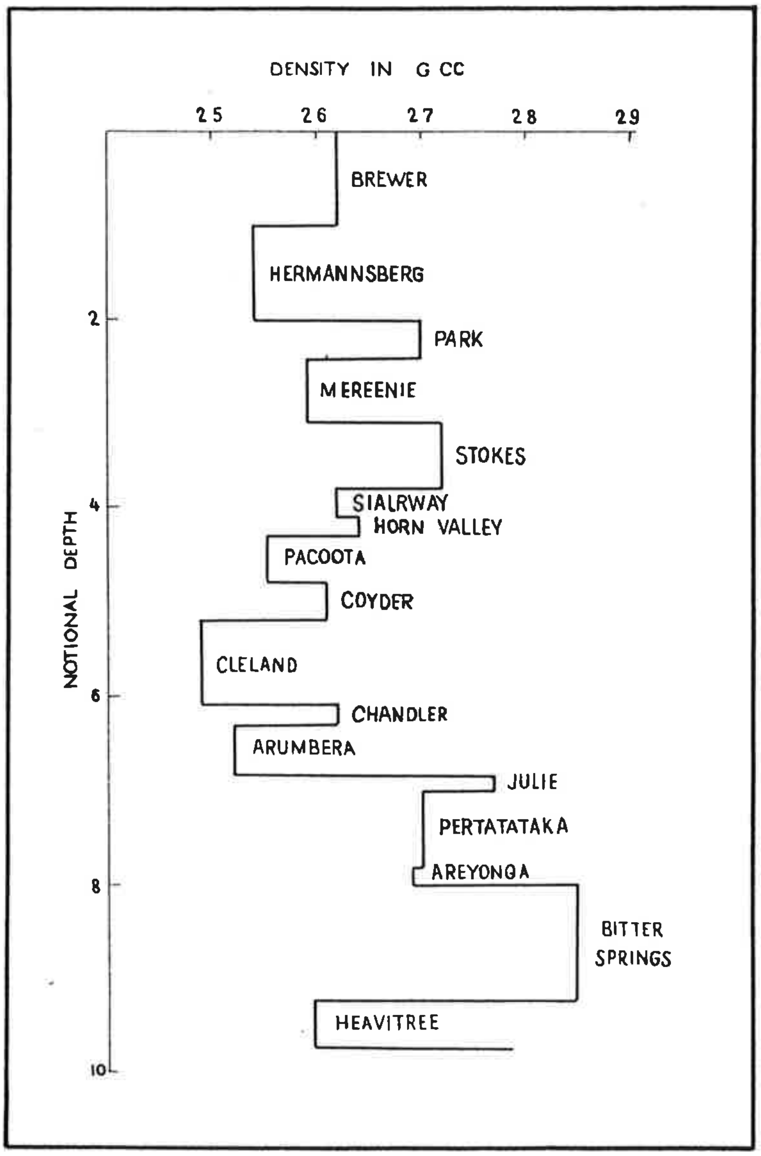

Figure 2 - Plot of Amadeus Basin formation density variations

3.2. Aeromagnetic survey

At first we'll characterize interpretation of small-scale aeromagnetic data. Their use will entail great difficulties. Even brief analysis shows the magnetic anomalies are caused by no less than three types of sources. The first type is shallow magnetized bodies causing intense noise to study the basement here and there. These bodies can be supposed to be various and in particular are composed of dikes or, more probably, of trapp sills (Bladon & Davies, 1982). They mainly occur in the south-west part of the territory. The second type of bodies is represented by magnetized ojects situated near the basement surface. The third type of magnetic anomaly sources is large magnetic inhomogeneities of the basement. They cause noise that is more difficult to be eliminated from total magnetic field.

Other difficulties are directly connected with small scale of aeromagnetic survey. It prevents from effective separation of total magnetic field into components, from choice of proper magnetic anomalies to estimate basement depth, and from valuable application of modeling.

The above difficulties have been overcome to a certain extent and main results are given in Fig.3-5 and Plate 2 .

Magnetic field associated with large magnetic inhomogeneities of the basement is of comparatively complicated structure (Fig. 3). On general irregular pattern one regular pair of conjugate anomalies (positive and negative) is distinguished, which mainly has a northeast trend, but in the northeast corner of the pattern it changes into sublatitudinal one. Magnetic field structure practically has no compatible elements with structure of regional gravitational field.

Fig.4,5 covering the most part of the area of Fig. 3 illustrates magnetic anomalies whose sources are supposed to be near the basement surface. Here one can observe two main anomaly orientations, i.e. sublatitudinal one on the south and north of the figure and submeridional one on the west. The former conforms to general strike of gravity anomalies, the latter

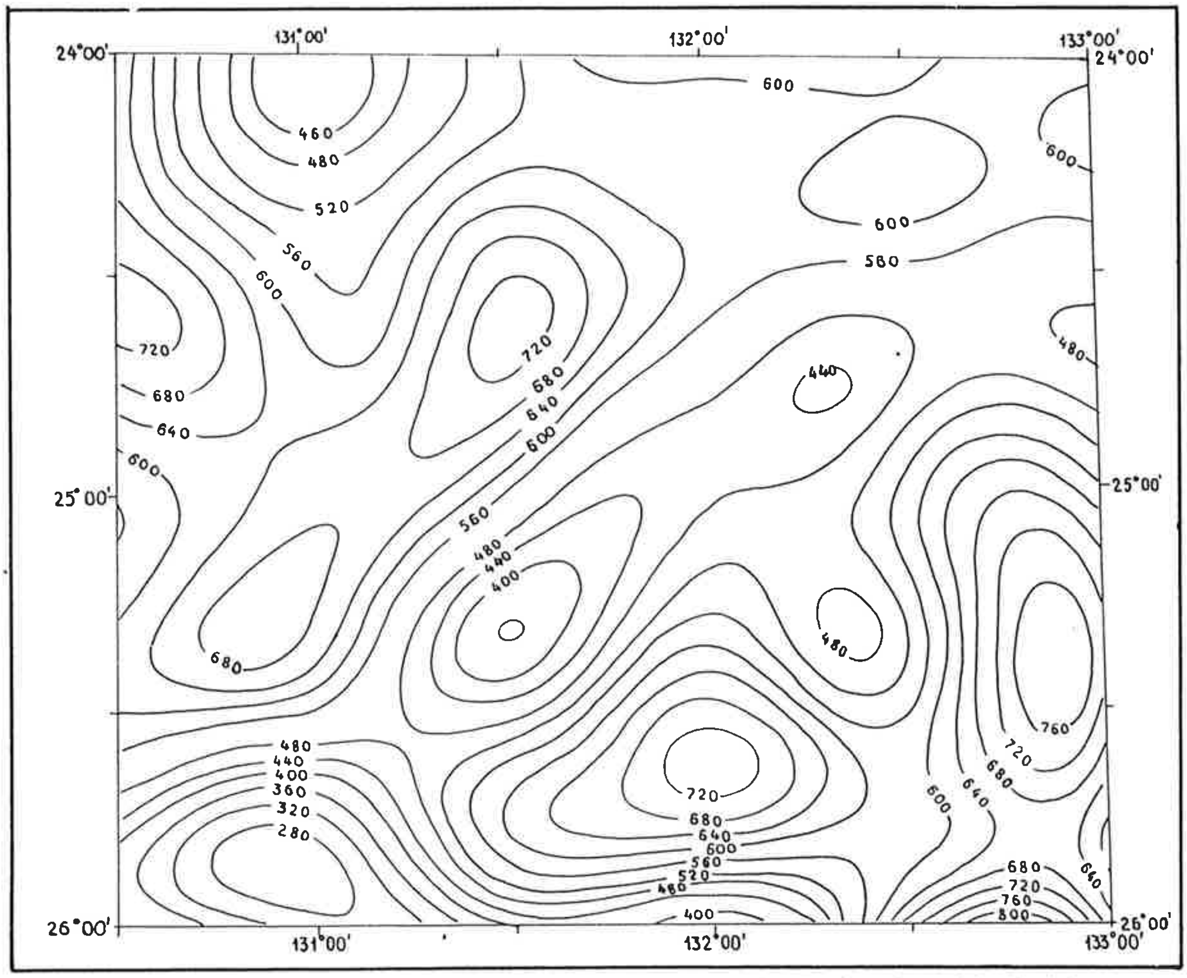

Figure 3 – Magnetic field caused by large magnetic inhomogeneities of basement

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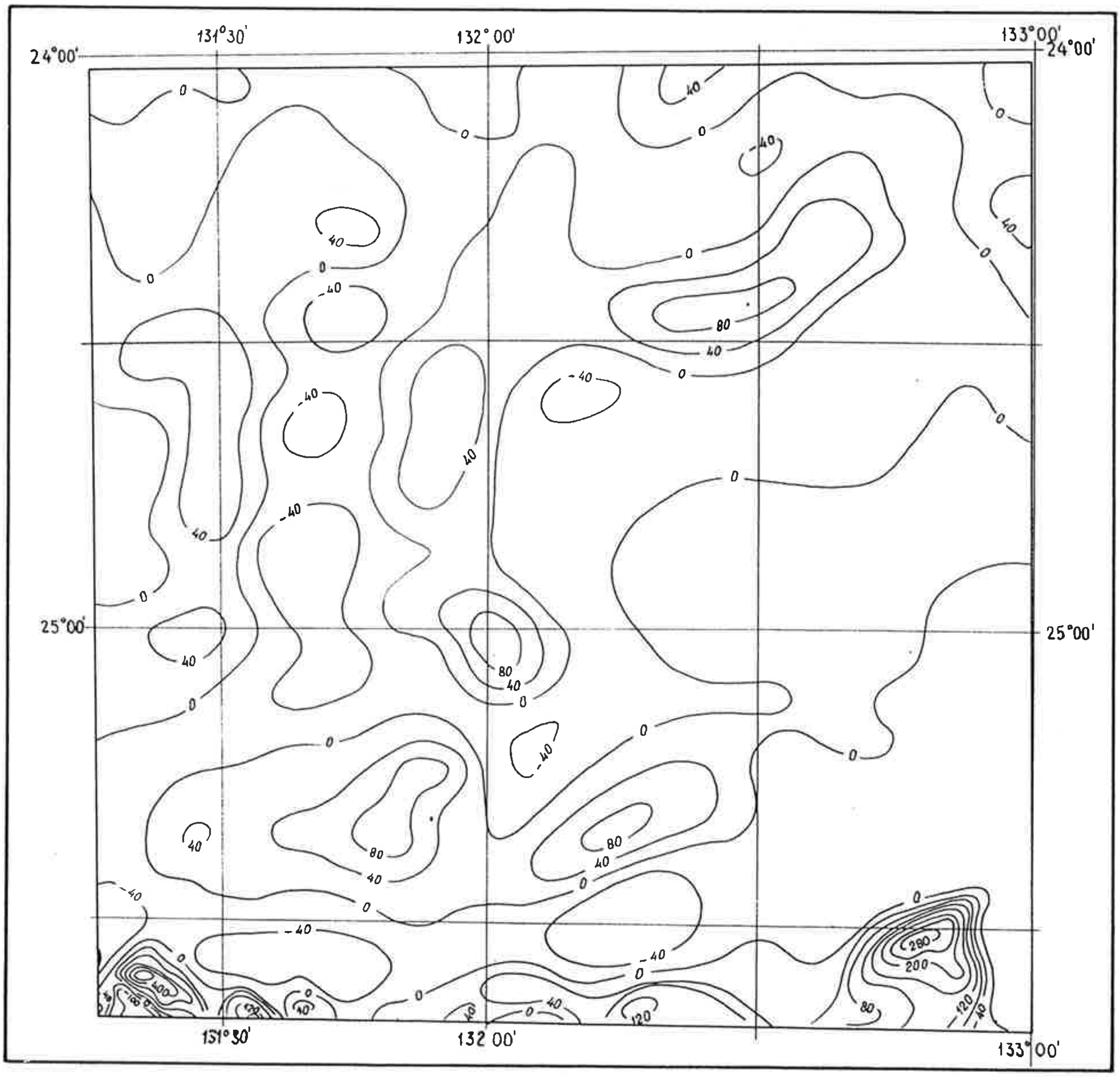

Figure 4 - Magnetic field of sources located near to basement surface (small-scale survey area). Variant 1

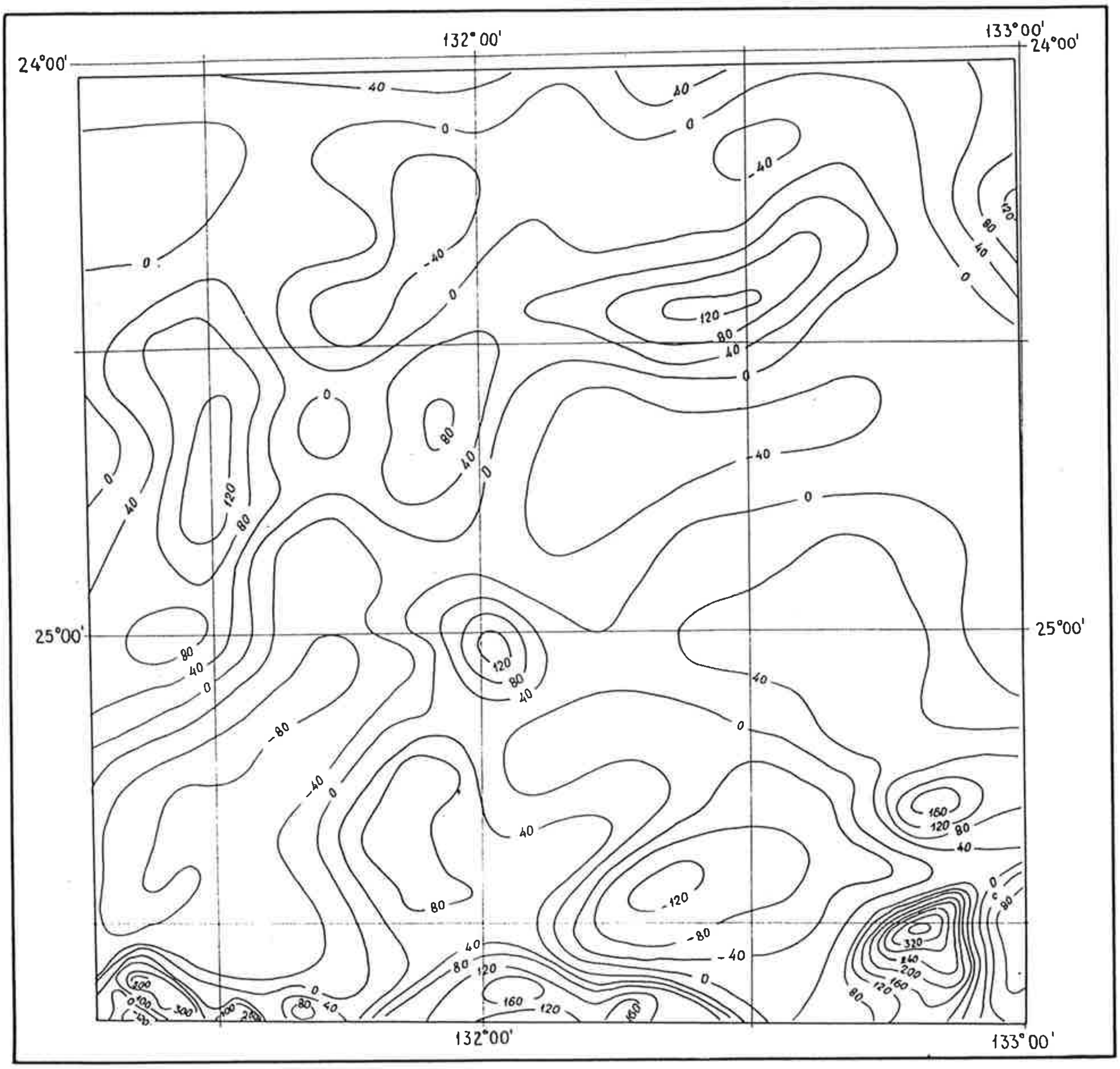

Figure 5 - Magnetic field of sources located near to basement surface (small-scale survey area). Variant 2

is normal to it. One should note that one of the areas for detailed aeromagnetic survey is located in the region of latitudinal strikes of magnetic anomalies and the second is in that of submeridional ones.

In determining magnetic anomaly source depths models whose magnetization is close to be homogeneous have been used. Apparent inhomogeneously magnetized models yield very wide range of depths with admissible error of magnetic field selection. Plate 2 shows results of depth calculations.

As well as in all cases of using aeromagnetic data to study basement surface relief network of magnetic anomaly source depths appeared to be considerably irregular. In such cases there are great difficulties to draw isodepth lines. Usually any of formalisms used proves to be insufficiently good. In connection with this and the above proper density model of the platform cover there appeared an idea to test aeromagnetic and gravity data coincidence. The test has shown that such a coincidence is possible in the case of quite probable and admissible errors in both methods. In other words, one has determined consistency of aeromagnetic data in terms of depths of magnetic anomaly sources and gravity data represented as local anomalies.

Stated circumstances have been considered in full measure in mapping basement surface isodepths (Plate 2).

It is interesting to compare our data to those obtained previously (Young & Shelley, 1977). In general, quite a satisfactory conformity is observed. But still there are cases of considerable (about 30%) discrepancies. They are most probably explained by the fact that in the present work two components associated with both near-surface sources of magnetic anomalies and large magnetic inhomogeneities of basement have been eliminated from the total magnetic field. Effect of the latter is more considerable, therefore, cases of significant discrepancies are observed when more previously calculated depth is much greater than that obtained in the present work. To have a possibility to compare discussed data they are plotted on the map of basement surface isodepths. Error values estimated by depth comparison, determined by various methods and authors can not be regarded as quite an objective criterion of reliable aeromagnetic interpretation. Indirect indicators of interpretation quality are usually based on conformity of different methods. As stated above consistency of aeromagnetic and gravity data has been determined. Undoubtedly this is a good criterion but insufficient for quantitative estimation of depth results. Refraction and reflection data could serve as a control of higher level. But refraction method has not been used on the territory, and CDP profiles are not enough to estimate aeromagnetic data.

One of the important circumstances making us consider quality of interpreting aeromagnetic data consists in existence of apparent discrepancies between calculated depths of basement and total thickness of Proterozoic units of the platform cover. The latter are exposed in the interval 100-110 km wide in the middle part of the territory. With the Proterozoic about 3 km thick (Schroder & Gorter, 1984) basement depth in the studied interval ranges from 3.5 to 8.5 km. Such inconsistency is possible due to some reasons : 1) undetermined significant variations in the Proterozoic thickness within the limits of the territory ; 2) platform cover thickness increases irregularly due to intense dislocations including overthrusts and thrusts ; 3) there is a systematic error in determinations of basement depths. The present state of geological and geophysical knowledge of the territory does not give reasons to reject any of the enumerated causes. Their effects are quite possible.

So far as concerns the first and the third reasons one can compare the Amadeus Basin with the Siberian Platform. In its southeast part very sharp variations in the Upper Proterozoic thickness are recorded, and on the south there has been established 30-50% systematic increase in basement depths determined on the basis of aeromagnetic data. Let us proceed to results of interpreting large-scale aeromagnetic data.

As stated above magnetic field in the western area of the large-scale survey is very complicated. Therefore, to delineate anomalies suitable for determination of basement depth total magnetic field has been separated into regional (Fig.6) and local components. All depths falling within the contour of

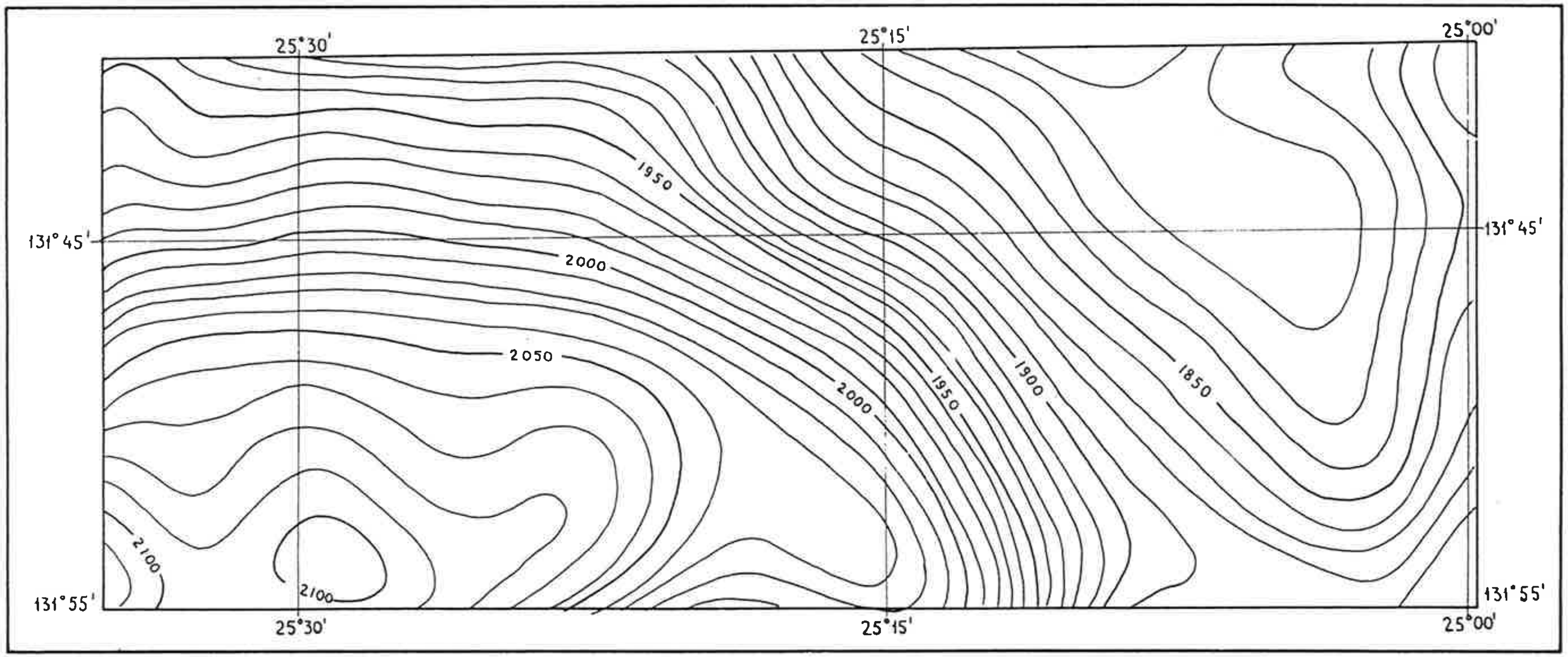

Figure 6 - Magnetic field of sources located near to basement surface
(western area of detailed survey)

the western area are determined from data of the aeromagnetic survey at a scale of 1:50,000. They are consistent with both general distribution pattern of basement depths and local gravity anomalies. By means of some operations for separating fields weak magnetic anomalies caused by targets being within the limits of the platform cover (Plate 2) have been revealed in the western area. About fifty source depths have been determined by these anomalies. Comparison of the depths with local gravity anomalies has shown that there is a connection between them which is illustrated in Fig. 7b . Correlation coefficient is relatively small, 0.6 , but meaningful.

The possibility to detect intervening interface in the platform cover and its correlatability with local gravity anomalies is of great importance to confirm accepted conception of combined interpretation of aeromagnetic and gravity data. The confirmation, first of all, is qualitative in character. This is not less important than quantitative correspondences. Relatively small variations in intervening horizon depths ranging from 1.6 to 2.45 km attract our attention against a background of basement depth variations from 4.8 to 6.4 km. On this basis one can draw a conclusion about intervening interface being less dislocated as compared to dislocations along basement surface, and certainly to the exposed ones.

Within the limits of the eastern area of detailed aeromagnetic survey magnetic field significantly differs from observed one on the west. Here such intense and numerous anomalies caused by near-surface sources are absent. But regional field caused by large magnetic inhomogeneities of the basement also is a great interference. After eliminating relatively weak high-frequency and low-frequency components from total magnetic field we obtained magnetic field caused by sources located near the basement surface (Fig. 8). A number of basement depths (Plate 2) evidencing to elevation of its surface in the northern part of the detailed area under consideration has been calculated by this field.

As on the western area we have succeeded in distinguishing an interesting class of intervening anomalies on the basis of

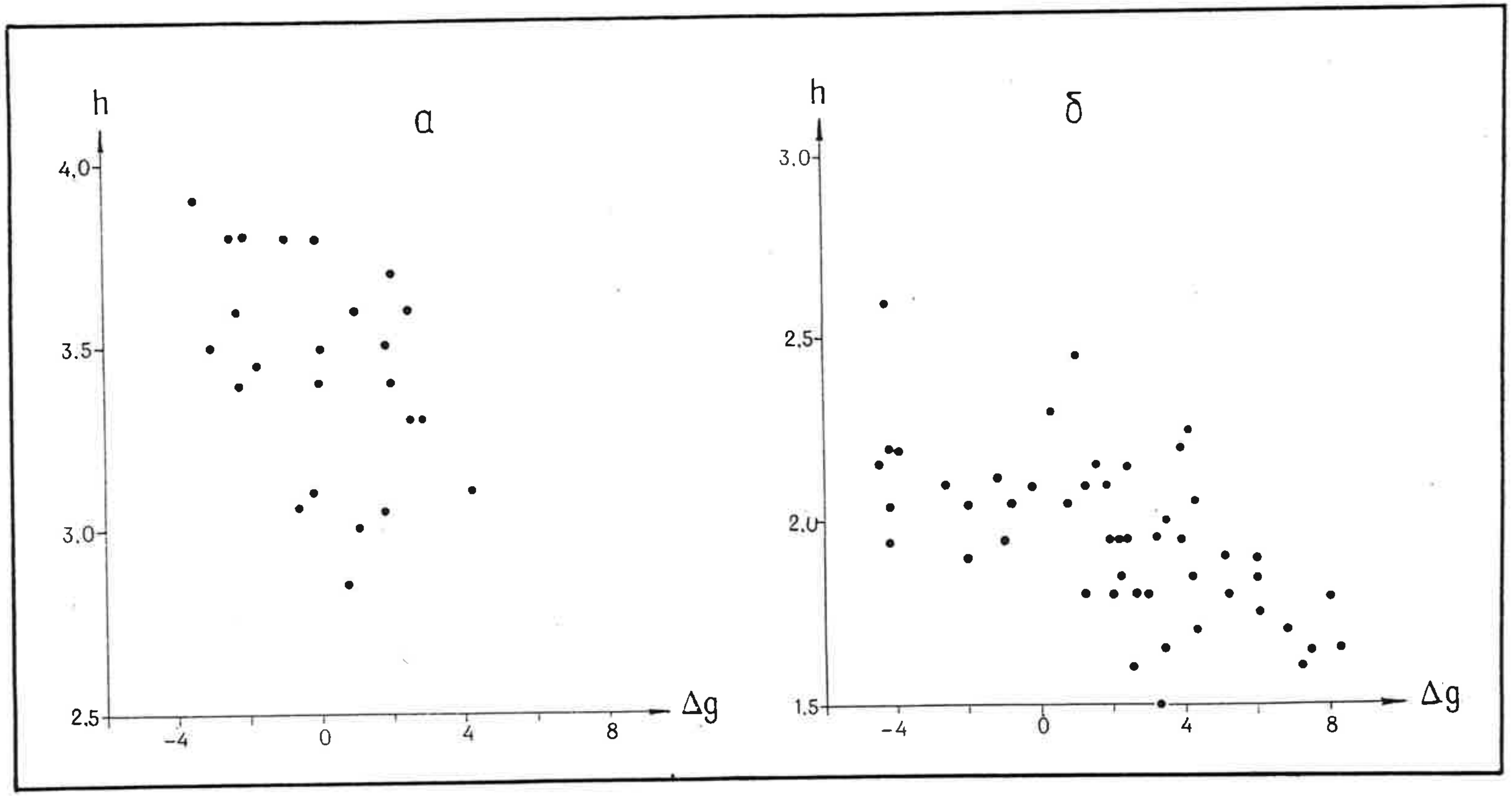

Figure 7 - Relation of local gravity anomalies to depth of magnetic anomaly intermediate sources: a) eastern area, b) vestern area

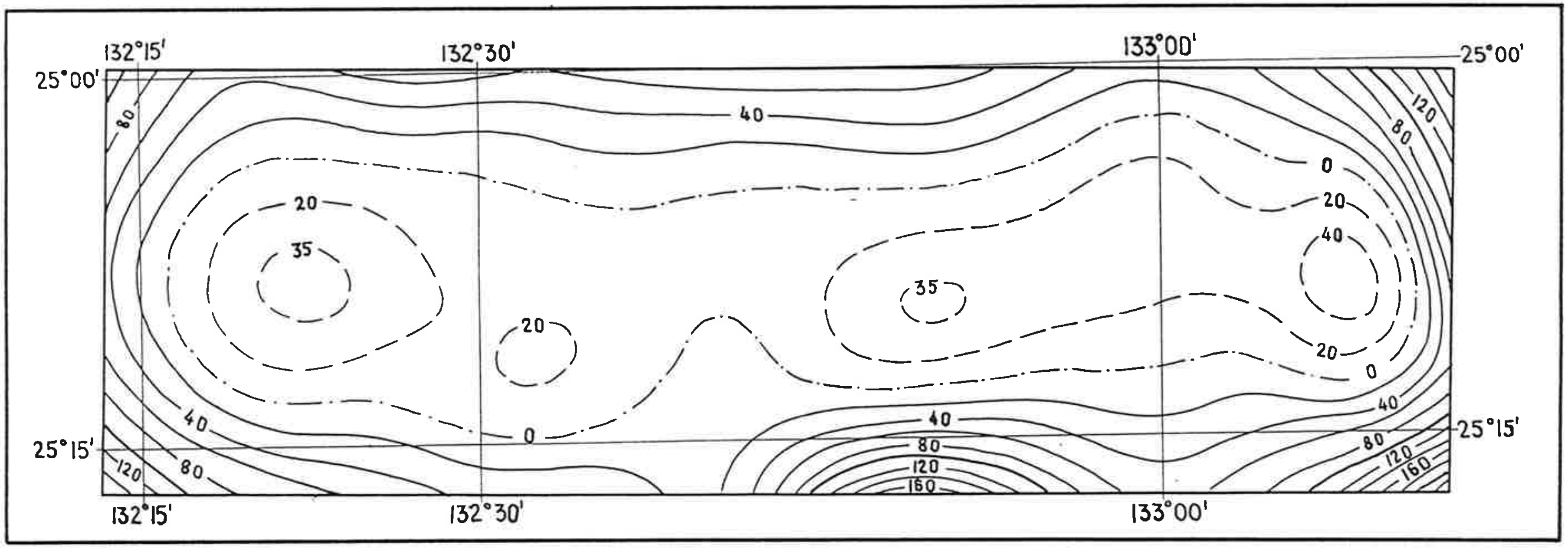

Figure 8 - Magnetic field of sources located near to basement surface (eastern area of detailed survey)

aeromagnetic data the same attempt has been fulfilled on the eastern area. It has resulted in calculation of 22 depths between basement surface and day surface (Plate 2). These depths ranging from 2.85 to 3.9 km correlate with local gravity anomalies. Here, correlation coefficient is 0.4 and it is significant(Fig. 7a). In this way accepted conception of combined interpretation of aeromagnetic and gravity data is confirmed once more.

3.3. Seismic survey

Reflection survey was carried out on the territory of concession EP-26 and adjacent areas in 1964-65 and 1982 . Previous work was necessitated by choice and preparation of deep drilling site and based on the analysis of features of aeromagnetic and gravity fields. In 1964-65 regional seismic profiles were laid out and an area on line 1 was detailed. The total length of profiles is 375 km. As a consequence an anticlinal structure was disclosed with well Erldunda 1 drilled in the arched portion of it.

In 1982 seismic investigations were concentrated on three areas. The first of them is located southwest of well Erldunda 1 and consists of eight profiles interconnected and intersected with previous ones. This group of profiles gives the most complete information about structure of reflecting horizons confined to the top of the Bitter Springs Formation and sandstone stratum in the Winnal Formation. The second area located in the extreme west of concession EP-26 comprises four profiles forming broken line of north - northeast strike. This area is not connected with other profiles and characterized by very poor quality of obtained data. Separate fragments of profiles where we have succeeded in identifying reflecting horizons make less than 30% of their total length. The third area consists of a single submeridional profile and is located half way along two areas characterized above. In the north the profile intersects the sublatitudinal profile studied in 1964-65 .

Carried out seismic survey resulted in constructing schematic structural maps by reflecting horizons compared to the top of the Bitter Springs Formation and sandstone stratum inside the Winnal Formation. Analysis of these maps allows us to draw conclusions as follows :

- inside the Late Proterozoic rock mass fault and thrust dislocations are developed. Southwest blocks are uplifted and thrusted along the overwhelming majority of faults that testifies to lateral pressure of the Musgrave Block ;

- simplification of structural pattern (reduction in linearity, contrast, dislocation amplitudes) in direction from west to east is outlined rather distinctively. In particular, in the region of intersecting W-82-10 and sublatitudinal profiles amplitude of the thrust mapped with respect to the Bitter Springs Formation exceeds 1.5 km, and directly north of the thrust rock rise is approximately from 4.0 to 1.0 km in the distance of 10 km, i.e. gradient of inclination reaches 300 m/km. Eastwards at the Erldunda 1 site it is mapped rather isometric uplift (15 x 20 km) with amplitude of about 0.5 km. Farther east along sublatitudinal profile the amplitude of dislocations decreases still more, their subsequent applanation takes place;

- structural maps based on both reflecting horizons also contain definite information about unconformable surface between Upper Proterozoic and Paleozoic rock masses. Elements of this surface hypsometry are observed in approaching the top of the Bitter Springs Formation and sandstones of the Winnal Formation;

- conclusions based on the analysis of structural maps are of probabilistic character due to evident insufficiency of volume of seismic prospecting.

On the whole the Amadeus Basin may be conventionally divided into several zones due to distribution of different-type dislocations on its surface. The most intense dislocations with widely varied orientations are developed on the extreme north-east of the Basin. To the west along its northern margin there ia a rather wide zone (up to 100 km) of relatively major simple folds, mainly composed of the Paleozoic rocks which form essentially a single major syncline, from the south-eastern flank of which elongated anticlines subsiding towards the west are branched. These are separated by the wider daughter synclines. Up the east the Late Proterozoic, if exposed, with more complex dislocations are fixed.

On the south the described zone of Paleozoic folds is surrounded by low-angle arc of isolated elements of small narrow anticlines and more extensive synclines exposed from under the thin Cenozoic cover and composed of mainly Late Proterozoic and partly Cambrian-Ordovician rocks. Intensity of these arc dislocations is similar to that of anticline cores in the northern zone. This suggests a wide development if intensive dislocations of the Late Proterozoic under less complex structures of Paleozoic horizons within this zone.

Such a pronounced stratigraphic confinement of dislocations with varied intensity is typical of the southern Siberian Platform, for example. Comparative analysis of structural patterns of its Vendian-Cambrian sediments shows that salt-bearing members are dislocated more intensively than not only underlying but often overlying strata. The latter seem to envelop disharmonic folding of salt-bearing members reflecting effect of horizontal tectonic stresses subnormal to its strike. Therefore, under such conditions dislocation intensity of exposed rocks is determined rather by the depth of the present erosional truncation predominant over the surveyed area than by some lateral tectonic zonation.

On the east of the arcuate belt of intensive dislocations a field of structures with chaotic orientations is isolated along strike of the southeastern zone of the Basin mentioned above. In the central and western parts sublatitudinal orientation subparallel to common boundaries of the whole line is dominant. On the extreme south of the latter a chain of saline lakes is traced in an arcuate manner from the Amadeus on the west to the set of small lakes on the east, where a field of the upper Paleozoic gently dipping to the north and bounded by the Finke River valley in the east and north is differentiated. On the southeast the field is bounded by the Black Hill ridge, reflecting north-eastern portion of the buried boundary of the old Musgrave Mann Block.

As shown in Section 3 (see Plate 2), basement lies at the greatest depth (up to absolute depths of -7-8 km) in the northwestern Amadeus Basin. Within the concession area absolute depths of the basement surface vary from -3.0-3.5 to 5.5-6.0 km. The Late Proterozoic and partly Cambrian-Ordovician units appear to prevail among pre-Mesozoic exposures; their total thickness does not seem to exceed 2.5-3.0 km. Hence, their existence at the surface is not consistent with the basement-surface depths of occurence stated above. Only certain structural deformations can be responsible for such a combination, i.e. section twinning of the platform cover due to thrusting and overthrusting, elevation resulted from plastic salt movement, significant rise of relatively narrow basement blocks at various combinations of the above-named mechanisms.

Available geological-geophysical data do not allow to give preference to any of these mechanisms. Concrete folds, excluding major ones in the northern zone, do not practically correspond with residual local anomalies of the observed gravity field. At the same time in the western and central Amadeus Basin the latter, as it was already outlined (see Sect.3), have distinct arcuate east-west orientation corresponding to predominant strike of the platform-cover structures. In this respect, much attention should be paid to above-stated (see Sect. 3) coincidence typical of salt domes in relation to isometric elevation of the platform cover with local negative anomaly of the residual gravity field (see meridian intersection at 132°30'E 24°43'S).

Described peculiarities of the platform cover structure and crystalline basement surface in the Amadeus Basin show that its tectonic model has inavitably probabilistic-alternative nature judging from the present state of knowledge. First of all it refers to explanation of the dislocated Late Proterozoic exposures (up to the Bitter Springs Formation) with the basement depth of over 3-4 km. Prevalent orientation of the platform cover dislocations subparallel to the basin boundaries seemed to form under the compression. However, a widely spread notion about the initiation of successive pressure and thrusting from the south (at Proterozoic-Paleozoic boundary), and then from the north (during Devonian) does not fully correspond to manifestations of structure asymmetry. Firstly, within the basin practically symmetric dislocations are widely distributed; secondly, at its northern boundary there are anticlines (e.g. Gardiner) composed of the Late Proterozoic-Paleozoic and thrusted northwards.

Hence, linear dislocations are most likely resulted from rock crumpling induced by the closure of rigid blocks at the northern and southern limits of the basin. This mechanism of dislocation formation appears to be in conformity with orientation of basement lows and highs subparallel to the basin boundaries. These lows and highs may be caused by surface warping because of bilateral compression. Formation of disharmonic folding within salt-bearing strata is also consistent with this idea. The process is thought to arise from both injection of plastic sediments and, partly, section twinning resulted from the cover overthrusting. Geological-geophysical profiles along AB, CD and EF lines (Plate 3) appear to support these suggestions.

Though linear dislocation prevailed, some areas were probably favourable for the formation of typical salt-dome highs. Strong predominance of salts in their cores resulted in relatively local isometric residual anomalies of the gravity field.

Axes of major linear structures are roughly stated to be parallel both to each other and to the Musgrave and Arunta Blocks in the Amadeus Basin. Zone of modern saline lakes appears to be also parallel to the above-mentioned elements and covers an area from the Amadeus Lake in sublatitudinal direction towards the Erldunda Ridge and further eastward. This fact makes one to ponder over causes of lake formation, their possible relation with buried structural pattern of the salt-bearing Bitter Springs Formation.

This has a point of special interest, namely subsurface occurence of the Bitter Springs (Map of the Amadeus Basin Gravity Ridge, 1989) of elongated shape along the lake trend within the area of the Amadeus Lake and its vicinity. The Bitter Springs structure in the rest saline-lake zone is poorly studied. A certain contribution to this problem is made by analysis of reflectors from seismic profiles four times dissecting the lake zone across strike (Plate 4). All intersections suggest development of mainly positive structures on the Bitter Springs top immediately under the lake zone. This is shown in W 82-11 and 12 profiles recording reflectors to be elevated towards the lakes. W 82-06 profiles and the Erldunda 1 well area show anticlinal flexure above lakes but at depths of about 1 km. W 82-10 profile pattern is more complex. Here a thrust is mapped at the southern limit of the lake zone, along which southern block is elevated along the Bitter Springs top to the depth of about 1 km. Provided the thrust is upwarped towards the north, one should expect its projection at the day surface to be close to the central lake zone. All these suggest that saline-lake zone is above anticlines along the Bitter Springs top. Major linear dislocation can exist there and be complicated by a set of minor folds and, sometimes, fractures.

In accordance with marked regularity it should be studied whether there are similar relations with old Cenozoic evaporites found in Quaternary gypsum and travertines. These occur mainly in the saline-lake zone. Branches from the zone, isolated exposures also show some relation with subsurface occurence of the Bitter Springs. This is observed within the area penetrated by the BMR 3, 3A, 3B Lake Amadeus wells, at the northern edge of the W 82-10 profile, in the central W 82-13 profile, at the intersection of W 82-02 and 03 profiles.

It should be noted that the Tertiary calcareous units also tend to occur in fields with salt lakes, gypsum and travertines. Probably combination of these sedimants marks areas of relatively uplifted surface of the Bitter Springs.

Relations of evaporite formation with the Bitter Springs positive structures may be explained by saliferous sediments invasion into the zone of subsurface leaching . Salt dissolution and transport upward the surface were accompanied by concurrent subsidence of the overlying rocks above the leached strata and, as a result, by formation of topographic depressions. Within the latter limestones and calcareous terrigenous rocks (Tertiary) were deposited at first, and then gypsum and travertines (Quaternary), and at last saline lakes were formed.

Relation of the Cenozoic evaporite localization with the Bitter Springs structural pattern allows to extend our knowledge about the model of sedimentary strata within the study area. In particular the Bitter Springs dislocations are proved to be of pending nature in zone with widely developed evaporites, because it is confined to the southern flank of the Angas Downs Gravity Ridge.

The zone discussed is not probably an important target for petroleum exploration, because the E-1 well in uplift arch considered to be the most promising fails to yield positive results. The probable cause of this is that there are major uplifts joining the Angas Downs Gravity Ridge system between evaporite-formation zone and main hydrocarbon flow migrating from the north.

In terms of the model proposed the eastern Amadeus Basin is worth notice because it differs from the rest part of the area in more lateral heterogeneity of dislocations. This region is characterized by narrow zone of intensive dislocations in the northern part and increasing complexity of these in the southern one coeval with the expansion of the Paleozoic (most likely Late Proterozoic) rocks with simple structure. This may be explained by existence of the basin of relatively rigid basement block without significant warping resulted in stress increase due to the bringing together the crystalline Arunta and Musgrave Blocks.

As for fractures, they prevail in the western and central Amadeus Basin in the form of faults subparallel to its northern and southern limits. In the platform cover fractures of reversed fault-thrust type are widely developed while within the basement faults with subvertical surfaces and longitudinal vertical and horizontal displacements are possible. As it has been shown in Section 3, the latter have mainly NE or NW (on the east) trend and are fixed along dextral or sinistral movements of gravity-field residual anomalies. Such shearing, however, has an indirect reflection within the platform cover.

On the whole spatial distribution of faults within the Amadeus Basin is consistent with the model of periodic bilateral compession between its northern and southern rims. Two stages of intensive compression (orogeny) took place during structural history of the Basin, i.e. the Peterman Ranges and Alice Springs. Before and during period between these orogenies the Basin area experienced mainly tensile stresses with intensive downwarping and sedimentation firstly at the southern margin, and then at the northern one. Axis of the reesent downwarping is traced by the chain of saline lakes as if it occurs between axes of old downwarpings of the Amadeus Basin area.

5. CONCLUSION AND RECOMMENDATIONS

Complex interpretation of geological-geophysical data carried out by a group of specialists from NPO "Sibgeo" has been completed with the results one portion of which confirms previous information about the tectonics of the platform cover and basement-surface topography within the area; the other part is characterized by considerable novelty. But all results are combined to indicate petroleum prospects within the EP-26 concession.

The most important result lies in two major basement highs found within the study area. The first one at the western boundary of the EP-26 concession covers an area of about 770 km^2 (from isohypse of basement surface being-4.5). The second high is more large covering 3 300 km^2 (from the same isohypse) and adjacent to the concession northern boundary. Presence of uplifts directly arises from data interpretation of both small-scale (gravimetric and aeromagnetic) and large-scale aeromagnetic surveys. Interpretation of the latter allows to differentiate not only necessary occurence depths of magnetic anomaly sources at the basement-surface level, but also sources with intermediate position. Calculated depths of occurence of these sources show statistically apparent correlation with local gravity anomalies that proves existence of considering uplifts qualitatively (directly) and quantitatively (indirectly).

Besides, the stated statistical correlation allows to regard some highs of gravity field within uplifts as possible isolated positive structures along lower horizons of the platform cover. This suggests areas of two anomalies to be the most interesting. One of them is at the extreme western boundary of the concession (25°03'S 131°36'E), the other lies 23 km (towards NW) from the Erldunda-1 well (25°075'S 133°03'E).

Judging by structural peculiarities uplift at the western margin of the concession is more favourable for hydrocarbon accumulation. The deepest depressions in the Amadeus Basin which could accumulate large hydrocarbon volumes adjoin to this very uplift on the northwest. Within shallow horizons this uplift corresponds to system of different-sign dislocations with complex morphology. Submeridional divide is an indirect indication of deep major uplift and results in a wide break within saline lake chain.

The second uplift stretching for 130 km along the northern margin of the concession area has the greatest prospects in its eastern part, where two isolated gravity anomalies occur. Further north there is a deep (below absolute marks - 5.5 km) major depression, separated by gradient zone of subsidence found from seismic survey within the Erldunda Ridge. On the uplift itself the basement surface may occur at absolute marks of -3.0-3.5 km. Asymmetric linear anticline with steep flanks (the northern flank with 54-80° dip up to overturn, the southern one with 38-60° angles of dip) is recorded in surface horizons of the northern part of basement high. The Stairway Formation sandstones at depth of 1.0-1.5 km exposed within the hanging wall of the thrust may appear to be hydrocarbon reservoir sealed by fracture surface. Moreover, reservoir properties can be improved in carbonate rocks of the salt-bearing Bitter Springs Formation due to additional fracturing in fault zone.

As it was already mentioned salt domes can be sources of two local intensive negative gravity anomalies. One of the former is situated within the EP-26 concession area (25°06'S 133°23' E) and may be regarded as possible target. But before exploration detailed gravimetric (scale is 1:200,000) and seismic surveys are to be made at least in two profiles normal to each other.

Special emphasis should be drawn to one segment of the western part of concession within rigid basement block at the Finke River meander. On space images the sector is shown as light elliptical spot with relatively dark band outside. Geographically the oval northern limit is at the intersection of meridian (134°E 25°S). The oval is elongated (120 km) to the west-south-west with width of about 60 km. Upper Paleozoic rocks are exposed on its southeast gently subsiding northwards with

1-4° dips of minor dislocation sides. The oval described is thought to reflect buried major uplift of the Late Proterozoic with relatively simple structure. Penetration depth of the latter is not to exceed 600-700 km in its central portion judging by drilling data from the Mt. Charlotte 1 well 10 km to the north from the uplift contour line. Detailed aeromagnetic survey over the western concession area is needed, as well as intersection of seismic profiles trending NE and NW. The latter transect the predicted uplift along its long and short axes.

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Note Re: Plans of Report 303900

Originals are in drafting of:

Plate 1, Residual gravity map 1:500 000
Plate 2, Magnetics and gravity 1:500 000
Plate 3, Geological sections 1:250 000
Plate 4, Bitter Springs map 1:500 000
Figure 1, Regional gravity A4
Figure 2, Formation density variations A4
Figure 3, Magnetic inhomogenetics A4
Figure 4, Magnetics map A4
Figure 5, Magnetics maps A4
Figure 6, Magnetics maps A4
Figure 7, Relation of gravity to magnetics A4
Figure 8, Magnetics map A4

Plus 3 density section maps. These 3 maps and plates 1 - 4 (coloured versions) are also in the seismic hanging rack downstairs.

22 JUN 1990

Contract No 589/1423602

PRELIMINARY REPORT

of the Engineering type work for the compound processing and interpretation of aeromagnetic and gravity data in the Amadeus Basin
(for the period of April, 22 to May, 21,1990)

Alternative regional geological sections are constructed across the Amadeus Basin with the cover thickness reduction by 1-2 km. In the zone of saline lakes the main watershed between regional slopes to east and west is recognized to tend towards the western part of the concession area. Supposition is made on the confinement of this turn of day surface relief to deep horizon uplift sedimentary mantle which is quite conformable with the basement surface relief constructed from the results of potential interpretation. By analogy with the southern Siberian Platform where an increased dislocation of salt strata has been identified relatively overlying and particularly underlying deposits,the conclusion is made that the zone of Proterozoic minor folding in the Amadeus Basin represents an outcrop of the same dislocated intrasalt stratum with marked simplification of host rock structural pattern.

It is established that depth distribution of basement occurrence calculated from aeromagnetic survey data, as a whole, is in agreement with local gravity anomaly distribution. The main conclusion is that basement uplifts correspond as a rule to positive gravity anomalies, and subsidence to negative ones. This conclusion is substantiated by magnetic anomaly interpretation for the areas of detailed aeromagnetic surveys in the central part of the concession area and in the western one. It is revealed that gravity prospecting and aeromagnetic survey data are conformable not only as a whole but in some details. It is important that this statement is relied on the results of depth calculations from relatively weak magnetic anomalies, the sources of which are within the sedimentary cover at depths from 1.6 to 3.9 km.

Head of Geophysical Department,
NPO Sibgeo

G.G. Rempel

ОТЧЕТ

по контракту №589/I423602/90010 "Выполнение работ типа "ИНЖИНИРИНГ по комплексной обработке и интерпретации аэромагнитных и гравитационных данных в бассейне AMADEUS

Построены альтернативные региональные геологические разрезы через бассейн AMADEUS с сокращением мощности чехла на I–2 км. Установлено, что в зоне развития солёных озёр основной водораздел между региональными наклонами к востоку и западу тяготеет к западной части территории концессии. Сделано предположение о приуроченности этого перегиба поверхности рельефа дневной поверхности к поднятию глубинных горизонтов осадочного чехла, что вполне согласуется с рельефом поверхности фундамента, построенным по результатам интерпретации потенциальных полей. По аналогии с югом Сибирской платформы, где установлена повышенная дислоцированность соленосных толщ относительно перекрывающих и особенно подстилающих отложений, сделан вывод о том, что зона мелкой складчатости протерозойских пород в бассейне AMADEUS представляет собой выход на поверхность такой же дислоцированной внутрисолевой толщи с заметным упрощением структурного плана вмещающих пород.

Установлено, что распределение глубин залегания фундамента, вычисленных по данным аэромагнитной съемки, в целом согласуется с распределением локальных гравитационных аномалий. Основной вывод состоит в том, что положительным гравитационным аномалиям, как правило, соответствуют поднятия фундамента, а отрицательным-опускания. Этот вывод подкреплен интерпретацией магнитных аномалий на участках детальных аэромагнитных съемок в центральной части концессионной площади и в западной. Выяснено, что данные гравиразведки и аэромагнитной съемки согласуются не только в целом, но и в некоторых деталях. Важно то, что это утверждение опирается на результаты вычислений глубин, по относительно слабым магнитным аномалиям, источники которых находятся в пределах осадочного чехла на глубинах от I,6 до 3,9 км.

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Preliminary Report

of the engineering type work for the compound processing and interpretation of aeromagnetic and gravity data in the Amadeus Basin

(for the period from 22 March to 21 April, 1990)

Relation between salt lake chain and probable salt structures in the Bitter Springs Formation was analysed. For this purpose data obtained during seismic survey material processing from REAPAC programm complex were used. It appears that indications of salt lake chains and areas of Cenozoic evaporite distribution may serve as indications of uplifts across the Bitter Springs top.

Folding boundouis are specified in Amadeus. The conclusion is made that poorly deformed southern zone is formed primarily under the influence of the Petermann folding, the northern one is formed by the Alice Springs folding and the central zone is a result of both.

Analysis of gravity field local anomalies leads to a conclusion that dislocations along north-easternly, north-westernly and submeredianally directed faults were significant in formation of platform cover structures. Modelling helps to test hypothesis of relationship between local anomalies of gravitation and positive structures across the Bitter Springs top and to specify basement surface relief.

Head of Geophysical
Department

G.G.Rempel

14105/90

303900

ОТЧЕТ

по контракту №589/I423602/900I0 "Выполнение работ типа "ИНЖИНИРИНГ" по комплексной обработке и интерпретации аэромагнитных и гравитационных данных в бассейне AMADEUS (за период с 22 марта по 2I апреля I990 г.)

Проанализирована связь цепочки солёных озёр с вероятными соляными структурами в формации Bitter Springs. Для этих целей привлечены данные, полученные при обработке материалов сейсморазведки по комплексу программ РЕАПАК. Похоже на то, что признаками поднятий по кровле Bitter Springs могут быть цепочки соляных озер и участки распространения эвапоритовых кайнозойских отложений.

Уточнены границы складчатости в бассейне Amadeus. Сделан вывод о том, что слабодеформированная южная зона сформировалась главным образом под воздействием складчатости Petermann, северная образована складчатостью Alice Springs, а центральная зона - это результат воздействия обеих складчатостей.

Анализ локальных аномалий гравитационного поля позволяет сделать вывод о том, что при формировании структур платформенного чехла существенную роль сыграли сдвиги по разломам северо-восточного, северо-западного и субмеридионального направлений. С помощью моделирования проверяется гипотеза связи локальных аномалий силы тяжести с положительными структурами по кровле Bitter Springs и уточняется рельеф поверхности фундамента.

Заведующий отделом СНИИГГиМСа НПО "Сибгео", доктор геолого-минералогических наук — Г.Г.Ремпель

Contract No 589/1423602/90010

PRELIMINARY REPORT OF AEROMAGNETIC AND GRAVITY DATA INTERPRETATION IN AMADEUS BASIN

(January 22nd-February 21st, 1990)

The NPO "SIBGEO" staff engaged in the Contract works have analysed published and unpublished geological and geophysical data submitted to NPO by Pacific.

Three geological sections intersecting licence area meridionally were constructed. Specific plicative and disjunctive deformations reflected in geological map and remote sensing images were revealed. The attempts have been made to correlate these deformations with possible positive structures.

For estimation of aeromagnetic and gravity data interpretation a series of direct problems of magnetic and gravity surveys for simple and complex standard models was solved, the latter may serve as idealized target analogues, incorporated in the Amadeus basin basement.

Potential of formalized approach to determination of basement depth was estimitated in the first approximation.

Data on magnetic field measured in profiles was partially reproduced from magnetic tapes presented by the Pacific.

Magnetic field set in the grid 500 x 500 m was completely constructed. There was established that possibility of full value utilization of magnetic data in some profiles is small.

Head of Gravity
and Magnetic Department,
NPO "Sibgeo"

Dr. Genrikh G.Rempel