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Integrated interpretation of seismic, gravity, magnetic and magneto-telluric data in geologically complex thrust belt areas of Manabum, Arunachal Pradesh

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ABSTRACT
Subsurface heterogeneity delineation in the geologically complex and logistically hostile terrain of the Assam–Arakan basin near fore deep of Himalayan foot hills is one of the key factors for hydrocarbon exploration among the Geoscientists. The area of study primarily falls close to the foot hills of Himalaya i.e. fore deep region in the North–East and partly in Belt of Schuppen (thrust belt) to the south-east, facing the Upper Assam foreland shelf in India. In such a complex mountainous and thrusted terrain, the seismic method has its own limitation to map the deeper geological basement configuration, because energy transmission is very meager and most part of the energies engrossed at boulder-sandstone formation. To overcome this problem it is always recommended to utilize some passive geophysical methods to supplement some value added constraints information to seismic data. Oil India Limited (OIL) decided to acquire ground Gravity-Magnetic (GM) as well as Magneto-Telluric (MT) data acquisition simultaneously in the fringe of Seismic lines where few profiles fall on the vicinity area to map the deeper subsurface information and also to make out the potentially hydrocarbon prospect zone. Additional quantitative spectral analysis technique has been used to map the top sedimentary layer and basement structure. This paper describes the correlation between GM, MT and Seismic data to map the different sedimentary layers and the basement configuration.

INTRODUCTION

Northeast India is situated with the junction of Burmese arc to the east and the Himalayan Arc to the north. This area is seismically very active and also have experienced with many major earthquakes greater than magnitude 7.0 in Richter scale. The highest magnitude was recorded in 1950 with magnitude 8.7. There are several minor earthquakes and microseismic events existing till now in this area. This activity causes with the collisions of Indian Plate and the Eurasian Plate. (Kayal 1998; Monlar & Tapponnier 1975 and Sarmah 1999). The advancement of the Indian Plate with the recent study is 40 mm/yr northward (Paul et al., 2001) and its Eurasian Plate is under-thrusting of the eastern Himalaya along the Main Boundary Thrust. Indo-Burma Fold and the thrust belt activity overthrust the Indian continental basement creating shallow focus as well as deep focus earthquakes (Chen & Monlar 1990). The Main Boundary Thrust and the Mishmi-Sagaing Fault are the northern and the eastern boundaries of the Indian Plate. The Brahmaputra River initially flows towards south and then westwards course north of the Manabum study area. The geological resettlement in this area is very active and causing changes elevation, thrusting, folding in the past and present.

The area comprises geologically extremely complex and logistically difficult in nature. Data acquisition itself a challenging job yet and is part of dense forest, marshland, with elevated anticline and syncline geological complexities and is situated in the foothill of Himalayan belt. The top subsurface is exposed with boulder bed and anticline sandstone hill. This paper describes the depth of the subsurface horizon namely Top Namasang, Top Girujan, Intra-Girujan, Probable Tipam and near Basement in such complex areas have been estimated during integrated interpretation.

In such a complex mountainous and thrusted terrain, the seismic method has its own limitation to map the basement configuration, because energy penetration is very poor and most part of the energies absorbed at boulder-sandstone formations at the top subsurface in this area energy does not reflect back to the subsurface due to deep folded and faulted structures. To overcome this problem, it is always recommended to utilize some passive geophysical methods to supplement and extract some value added constraints information to seismic data. Hence, Oil India Limited (OIL) decided to acquire ground GM and MT data acquisition simultaneously in the periphery of seismic lines where few profiles fall on the vicinity area to map the subsurface information and also to identify the potentially hydrocarbon prospect zone.

The Gravity data was collected with the joint effort of National Geophysical Research institute (NGRI) and OIL using Lacoste-Romberg Gravimeter (Model G) with an accuracy of 0.01 mGal covering total 2000 gravity observations at spacing of 0.05 km to 1.0 km interval as per availability of tracks and approach. This data was collected with a great difficulty where the ground elevation varies from 250 meters to 800 meters which fall in the periphery of seismic lines.

GENERAL GEOLOGY OF THE AREA

The Manabum area falls in the eastern part of the Assam-Arakan basin, the junction of the east-west folding of Naga hills and the northwest-southeast folding parallel to Mishmi hills. These folding movements are the results of massive tectonic activity during the Miocene-Pliocene and is geologically complex with thrusting and subsurface folding structures. The location map and the other different geological formations are listed in Fig. 1. The present prospective area partly falls in the close proximity of the foothills of lesser Himalaya, where the basement depth is approximately varying from 5000 m to 8000 m. The traps are expected within the faulted anticlines in tertiary succession of Supra-Thrust and Sub-Thrust Oligocene and Miocene prospects in the belt of Schuppen. Hydrocarbon has been encountered in deep-seated structures associated in thrust as an average depth of 5500m. The basin is existed in the early Cretaceous when Indian plate separated by Indo-Australian-Antarctic plate, forming several horst and graben features. The formation of subduction plate is due to drifting of northwest of Indian Plate and the Burmese Plate causing formation of Indo-Burmese trench towards the eastern part of Assam.

The structural trend of Manabum exhibits anticlines and divided into two parts those are NW-SE trending South Manabum anticline and NNW-SSE trending North Manabum anticline. This is due to the abrupt changes of the Mishmi Thrust that is responsible for the generation of the north Manabum fold and the associated thrust faults NW-SE trending south Manabum anticline.

In this paper an attempt has been made to interpret using different passive methods as GM and MT. Mostly five horizons are selected from the interpretation and correlated with the Kumchai well data. Basically top Namsang and top Girujan have been concealed from Kumchai well data using dT and RHOB with the help of synthetic seismogram. Similarly Intra-Girujan has also been identified based on the Kumchai well data. Other deeper horizons like probable Tipam and basement are mapped based on the seismic and GM-MT data.

SEISMIC DATA ACQUISITION AND INTERPRETATION

Seismic data acquisition has been carried out in the geologically complex areas of Manabum and its surroundings. The topographical view with selected 2D seismic survey line of Manabum area is shown in the Fig.2. The elevation is varying up to 800 meter with steep slope. Two - way travel time of acquired 2D seismic data with monitor record is also shown in Fig. 3. For our study, we have selected three seismic lines viz. MBM-01, MBM-06 and MBM-37 for this integrated study using GM and MT data and are superimposed over the seismic lines Fig. 2.

Top Namsang horizon was picked on a maximum. This was identified when impedance increased from lower to higher while passing from Dhekiajuli formation to the sandy Namsang formation. It clearly weakened the higher amplitude characteristics of the reflection and continuity of reflection is not fixed. top Girujan was picked as a minimum and the impedance characteristics expected to negative while passing through Namsang formation to the inter bedded sand and shale formation of the Girujan clay formation. These horizons are correlated with the Kumchai well log data. Intra Girujan was picked as a maximum and appeared as a high amplitude continuous reflection. The continuity variation is marked due to inter bedded shale-sand lithological variations. The probable Tipam horizons picked as a high amplitude package at the deepest well penetration and about the basement package of reflections. The Barail group comprised with other drilled fields in the Schuppen Belt to underlain the Girujan formation. This is basically coal bearing with weak coal thrusted fault

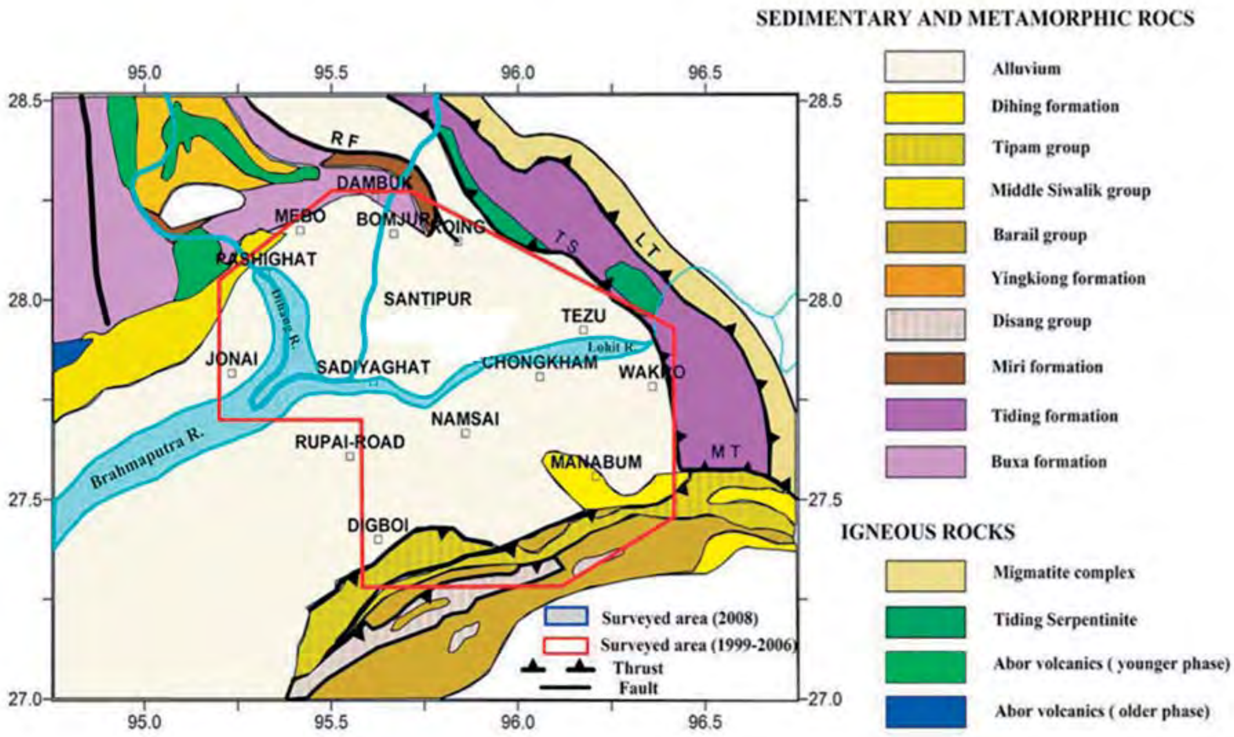


Figure 1. Location map shows the geology of the area and the adjacent area. The different geological formations are listed here.

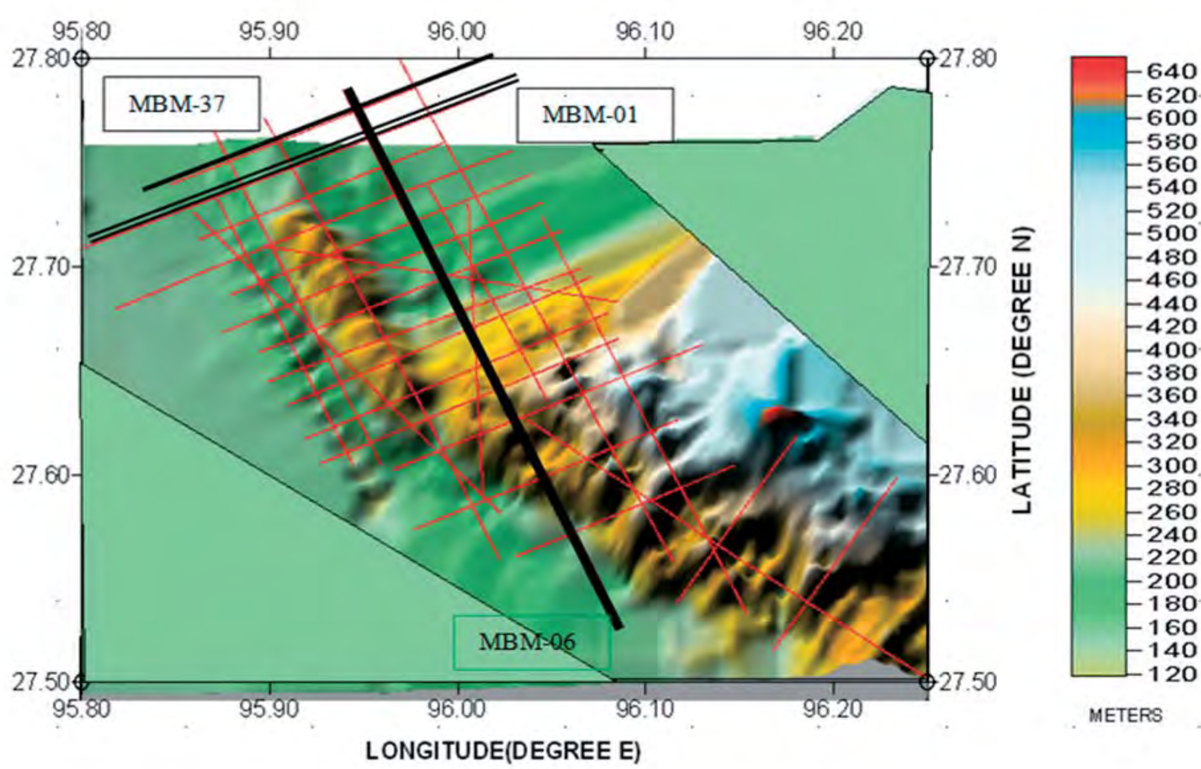


Figure 2. Topographical view of the area. Colour bar shows the elevation. Seismic lines are superimposed over the working area.

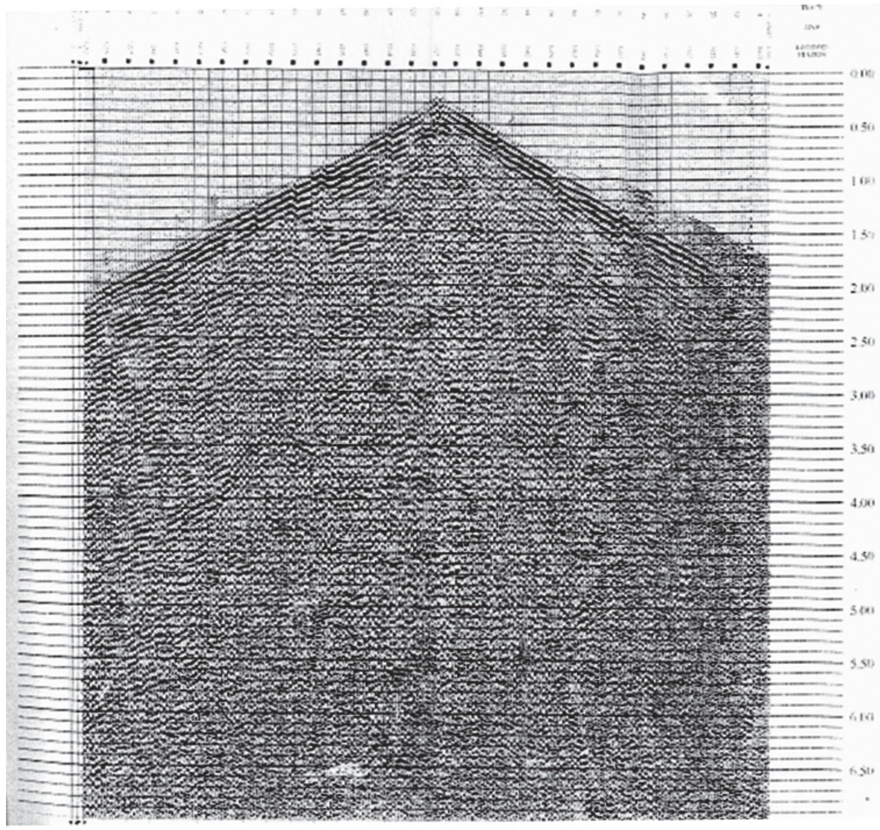


Figure 3. Two way travel time seismic 2D monitor record with 240 channels are displayed.

and fold beds. The near basement was on a maximum with its positive low amplitude sediments to high impedance basement. The deepest reflection has been faulty marked with continuous reflection. This depth was cleared against the MT data for basement depth.

Manabum folds are asymmetric and are steeply dipping. The cone of the South Manabum anticline is described by Pathak, Chaudhury & Hazarika (2002) and Srinivasan (2005) and they suggested that the youngest rocks in the Manabum anticline are Miocene age. The preliminary seismic depth sections have been summarized here for MBM-01, MBM-06 and MBM-37 in the Table 1.

GRAVITY–MAGNETIC AND MAGNETO-TELLURIC SURVEY

The Gravity-Magnetic data was collected with the joint effort of NGRI and OIL using Lacoste and Romberg Gravimeter (Model G) with an accuracy of 0.01 mGal covering total 2000 gravity observations at spacing of 0.05 km to 1.0 km interval as per availability of tracks and approach. Data was collected with a great difficulty as in the study area the ground elevation varies from 250 meters to 800 meters which fall in the periphery of seismic lines and it is passing through the close proximity of the area. The preliminary interpretation carried by the MT survey observed roughly 55-120 Ohm/m, 22-55 Ohm/m and 6-20 Ohm/m for Alluviam/ Dhekiajuli, Namsang and Basement formations. MT data has been integrated over the seismic and GM data and prepared a depth section with reference to seismic lines. The details interpretation is explained in the relevant sections in this paper.

QUALITATIVE AND QUANTITATIVE INTERPRETATION

Gravity modeling generally used density variation where as magnetic used susceptibility contrast to map basement depth. Apart from this Gravity, Magnetic and MT data help as constraints to mark correctly the subsurface structures with seismic data. In this study we have selected three seismic lines MBM-01, MBM-06 and MBM-37 for the integrated study. To understand the subsurface geology in the

Table 1. The different depth sections of the preliminary interpreted seismic lines. The Interval velocities are also incorporated against the formations. (TN: Top Namsang; TG: Top Girujan; IG: Intra Girujan; PT: Probable Tipam and NTB : near to Basement).

Different Formations	Interval Velocity m/s	Depth for Profiles in km Profile -01	Depth for Profiles in km Profile -06	Depth for Profiles in km Profile -37
TN	2660	2.25-2.00	1.5-2.0	2.0-2.3
TG	3222	2.8-2.2	2.7-2.5	2.6-2.9
IG	3900	3.2-2.9	3.5-2.9	3.2-3.8
PT	4200	3.6-3.9	3.8-3.8	3.7-3.7
NTB	5500	4.7-5.3	4.7-5.4	4.7--

vicinity of the Manabum area, both GM and MT are jointly carried out over the seismic data. Using qualitative analysis, it looks for enhancement of the gridded gravity and magnetic data whereas in the case of quantitative analysis it is jointly involved GM, MT and seismic modelling. Integration of these results map the basement as deeper upto 9 Km in the study area. An integrated approach using GM, MT, Seismic and three seismic sections have been used to investigate the structural interest in this area.

PROFILE INTERPRETATION ALONG THE SEISMIC 2D LINE- MBM-01

A preliminary interpreted seismic section along the line MBM-01 is shown in Fig. 4 and the Integrated modeling using GM, MT and seismic data has been shown in Fig. 5. The details of the free air gravity anomaly map of the study area are shown in Fig. 6 and Total magnetic anomaly map is shown in Fig. 7. Depth estimation is carried out using magnetic data that there are some noisy magnetic data at the end of the profile for interpretation. Both the gravity and magnetic data show meager coverage and hence MT data shows the better constraints in this case for identifying basement configuration. It has been marked that line-projected (red symbols) are the available control points for correlation. MT data is more responsible for the basement contribution as the resistive information is more contrast and it less correlates to the shallower subsurface information. The sedimentary section modelled with the gravity data and it correlates to seismic section. Using integrated approach different depth sections are shown in Fig. 5.

During modelling, the density contrast has been used as 2.35 g/cm^3 for the sedimentary layers as the close proximity of Kumchai well-1. Also during well data analysis, the variations of the sedimentary layers are very less and hence densities are almost same for the other sedimentary layers. This is clear through the spectral analysis carried for different locations and while plotting Log of Amplitude versus wave number (Fig.13), two slopes are clearly remarketed for two depth contrast.

The magnetic susceptibility is generally considered 100 micro CGS for all sedimentary layers marked as yellow and orange layers in Fig.5. Magnetic susceptibilities are varying in between 1000 to 3000 micro CGS unit for basement configuration. For the entire sedimentary layer, the densities are used 2.350 g/cm^3 for the Top Namsang, Top Girujan, Mid Girujan, below Mid Girujan. For basement configuration, density contrast has been considered as 2.750 g/cm^3.

Using the existing dataset, it can be possible to provide the best suitable model to obtain a thrusted structure. As the area is logistically very tough and some time it is not possible to get data from the required location, however every possibilities have been attempted for collecting regular grid data to map the subsurface heterogeneities.

PROFILE INTERPRETATION ALONG THE SEISMIC 2D LINE -MBM-06

The Seismic line MBM-06 is passing over the North Manabum anticlinal belt and the trend is NW-SE direction. The preliminary interpretation is shown in

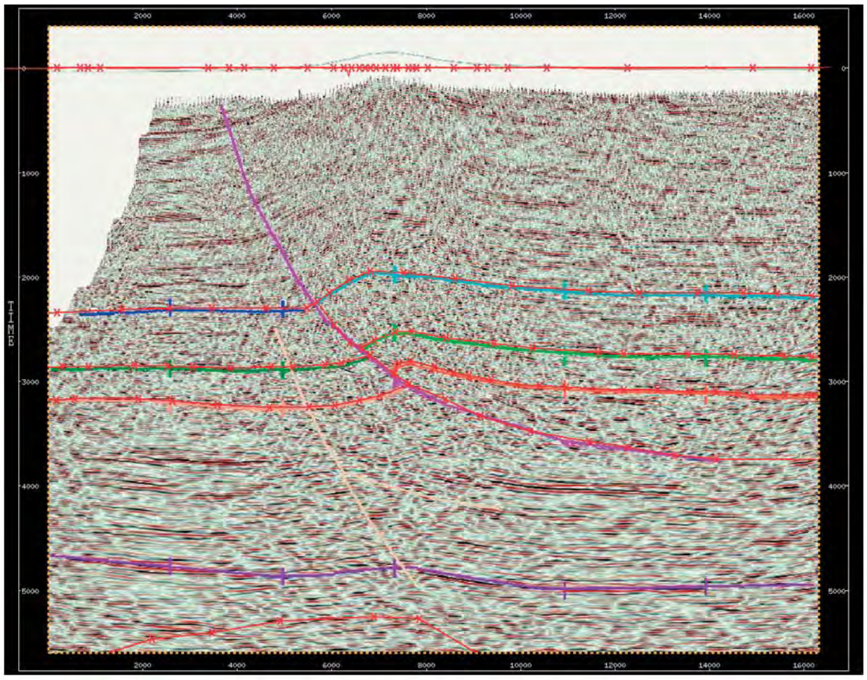


Figure 4. Preliminary Seismic interpretation on Line no MBM-01

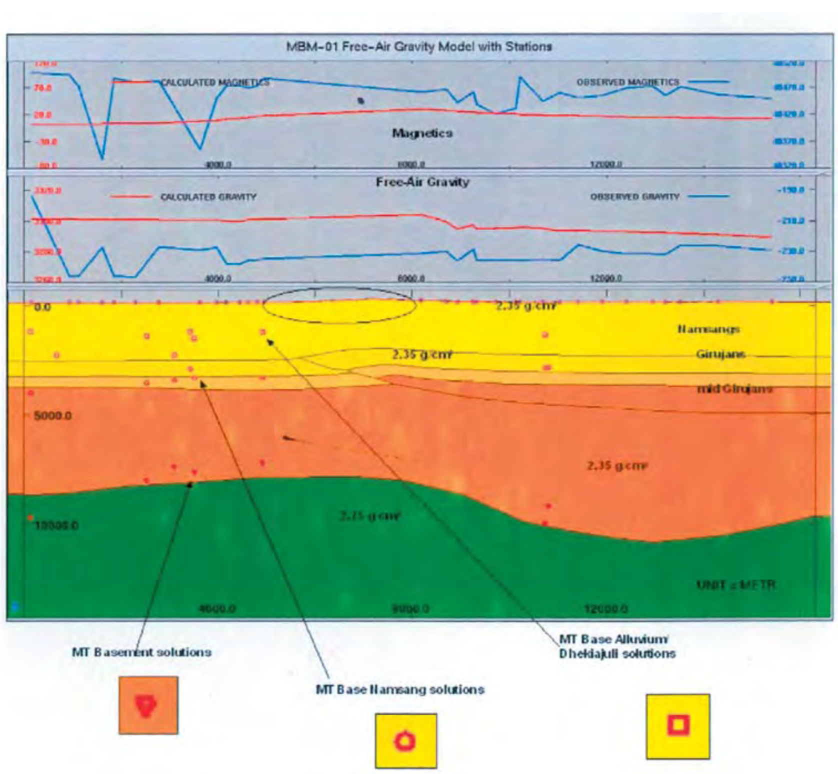


Figure 5. Integrated modeling using Gravity, Magnetic, Magneto-Telluric and 2-D Seismic data on Line no: MBM-01. Magnetotelluric data projected up to 2 km from the line in red symbols and circled area of no gravity and magnetic stations.

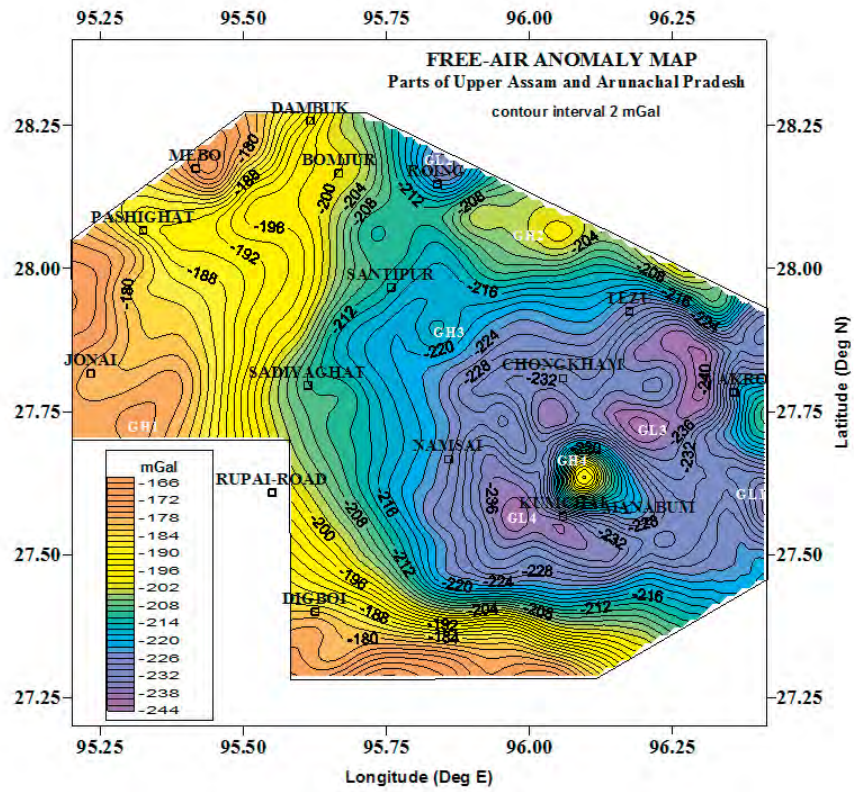


Figure. 6. The free air gravity anomaly map of the survey area.

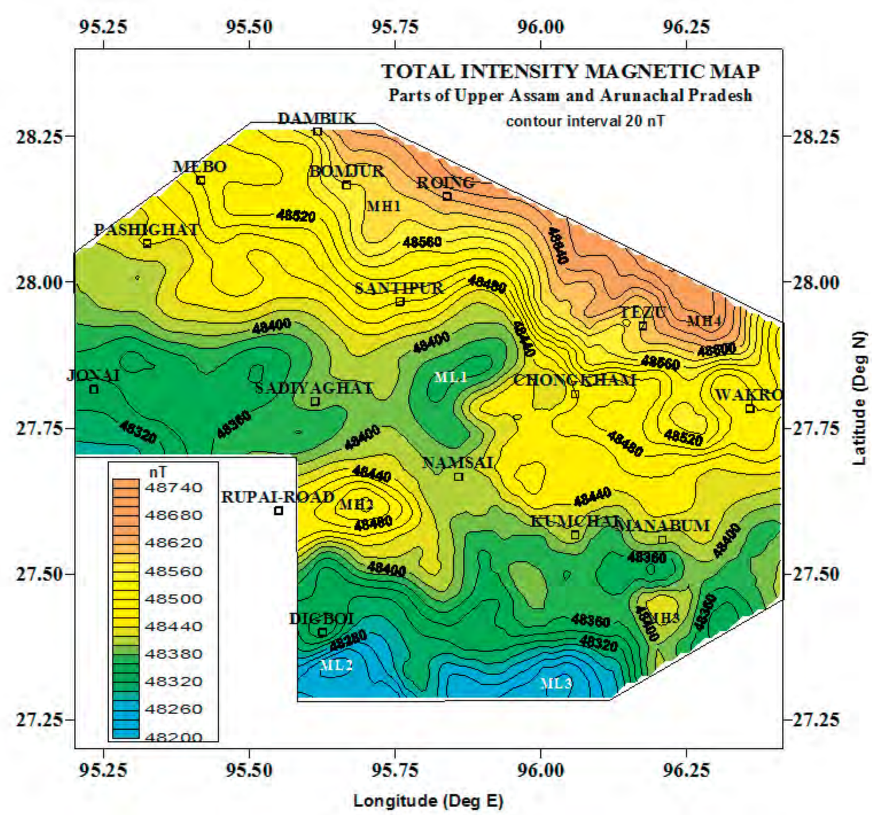


Figure 7. Total Magnetic Intensity map of the survey area.

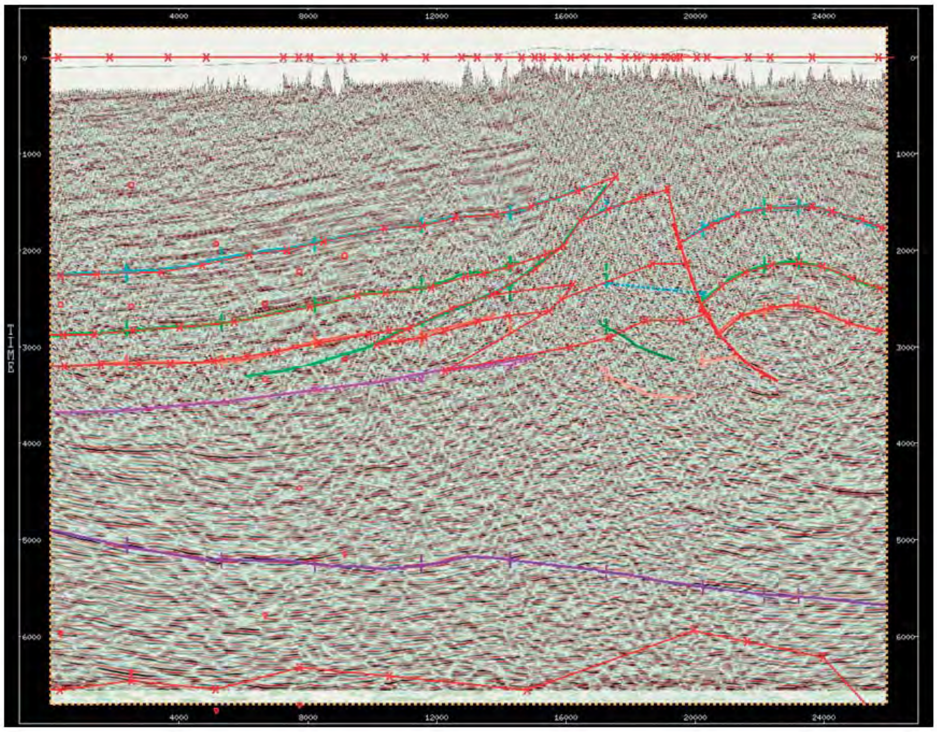


Figure 8. Preliminary of Seismic Interpretation on Line no MBM-06.

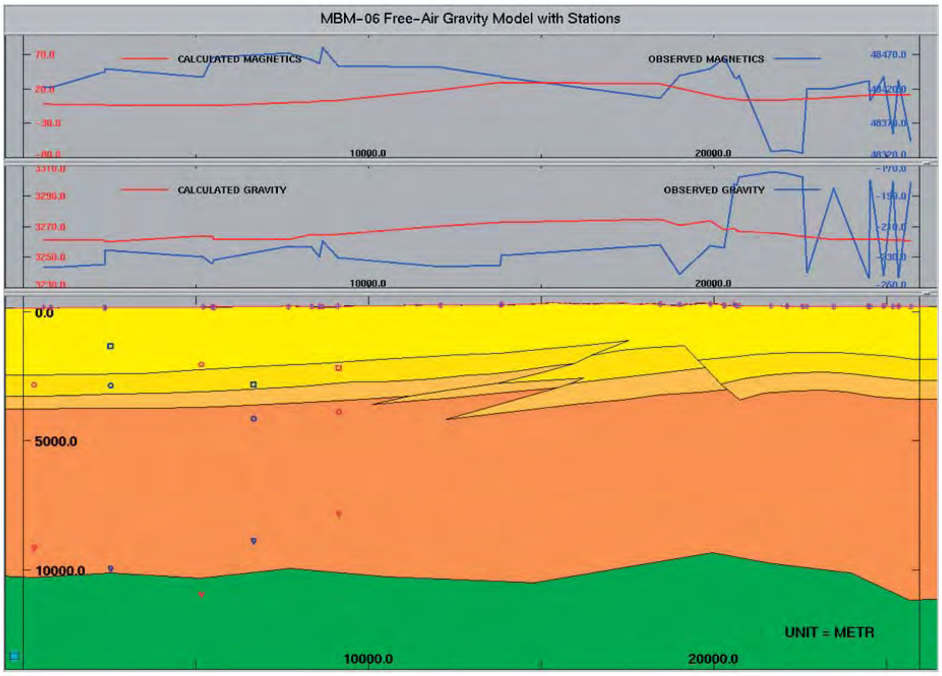


Figure 9. Integrated modeling using Gravity, Magnetic, Magneto-Telluric and 2-D Seismic data on Line no: MBM-06. It has been observed that gravity and magnetic stations are irregular and marked gravity scale upto 80 mGal. MT data has been projected upto 600m from the line in red symbols.

Fig. 8. The gravity and magnetic observed anomaly and the calculated anomalies are shown in the Fig. 9. The MT data is also correlated to this profile as a constant depth for the basement configuration. Both the profiles are more undulating nature and the central part of the profile folded and thrusted structure and is lack of GM data. Here free air gravity anomaly has been taken for modelling because Bouguer gravity anomaly has more undulating and more complex. Apart from this it shows that there is lack of gravity and magnetic data over the interpreted thrust structure. In addition MT data is also indicated less dataset in the southeast end of the line where basement is unconstrained. The gravity and magnetic data are less correlated at the end of the profile.

For gravity data interpretation we have used densities 2.350 g/cm^3 for the Top Namsang, Top Girujan, Mid Girujan, Below Mid Girujan and 2.750 g/cm^3 for the density contrast of the Basement (Fig. 9).

PROFILE INTERPRETATION ALONG THE SEISMIC 2D LINE- MBM-37

This seismic line MBM-37 is parallel to MBM-01 and shows some structural information by correlating with GM and MT data. Although the coverage of the gravity and magnetic data across this profile are poor over the central part of the profile which also reflects from the MT data. Free air gravity station across the thrust describes a 50 mGal anomaly and shows a basement high in the central locality. The seismic data is constrainted by MT data points with less density contrast for the sediments.

The preliminary seismic interpretation section is shown in Fig. 10. For gravity data interpretation we have used densities 2.350 g/cm^3 for the Top Namsang, Top Girujan, Mid Girujan, below Mid Girujan simultaneously and 2.750 g/cm^3 for the density contrast of the Basement (Fig.11).

In nut shell sub surface geology can be divided into five different formations which are explained in Table 1 where the density data has been taken from Kumchai well is close proximity of the area. Several iterative models using GM, MT and Seismic data have been generated to get a realistic solution for the subsurface structure. Many models are generated using GM and MT data constrained to Seismic and Seismic data to GM and MT. It is possible to generate an acceptable model out of many ambiguous models using integrated studies.

SPECTRAL ANALYSIS IN AND AROUND THE SEISMIC LINES IN THIS AREA

Spectral analysis using statistical approach carried out using the methodology developed by the author (Ghosh 1995) in the acquired gravity data has been considered as an additional information. Gravity data is analysed and interpreted over the selected profiles. Two depths sections are obtained basically observed as top sedimentary layer and basement when plotted through Log of Amplitude Spectrum versus Wave number. Spectral analysis could not map the intermittent sedimentary layer as there is no density contrast in between the layers. Basement depth calculated using spectral analysis over the few more profile with different locations of the area (Fig. 12) and the depths calculated are varying from 6.2 km to 7.3 km (Fig 13).

We have used Bouguer gravity data rather than free air gravity anomaly for spectral analysis part because it works on the statistical approach. Six different gravity profiles are drawn over the Bouguer Gravity map for averaging the basement depth. Four profiles are parallel to the seismic line MBM-01 and two profiles are parallel to MBM-06. Lengths of the profiles are 70 km. Gravity profiles are elongated and collected more gravity data for statistical approach for better interpretation. Profile GB-GB′ is the closest profile over the seismic profile MBM-06 and Profile GC-GC′ is the closed to the seismic profile MBM-01. Two clear slopes are identified through analysis and reflects two clear depths contrast from the spectral analysis. This can be seen by plotting Log of Amplitude versus Wave number. It is also observed that the top sedimentary layer is varying 1.71 to 2.27 km although for basement it is varying between 6.24 km to 7.7 km.

SUMMARY & CONCLUSIONS

The qualitative and quantitative analysis show the basement as well as different subsurface configuration as marked in the Fig. 5, Fig. 9, Fig. 11 and Fig 13. The data validation for GM and MT are not as per expected, though a tentative model has been proposed based on the existing data. In the same case MT data helps to the mark against the 2-D seismic line and are able to map the basement. Although data collection is very difficult and option are always open to acquired a close grid data for better enhancement

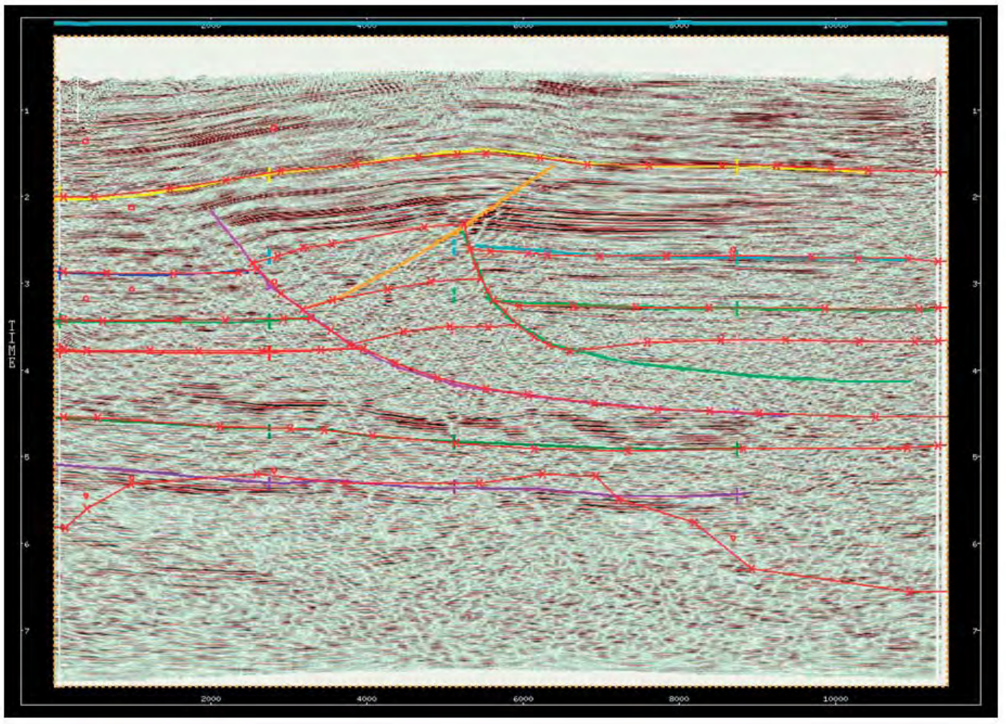


Figure 10. Preliminary Seismic interpretation on Line no MBM-37.

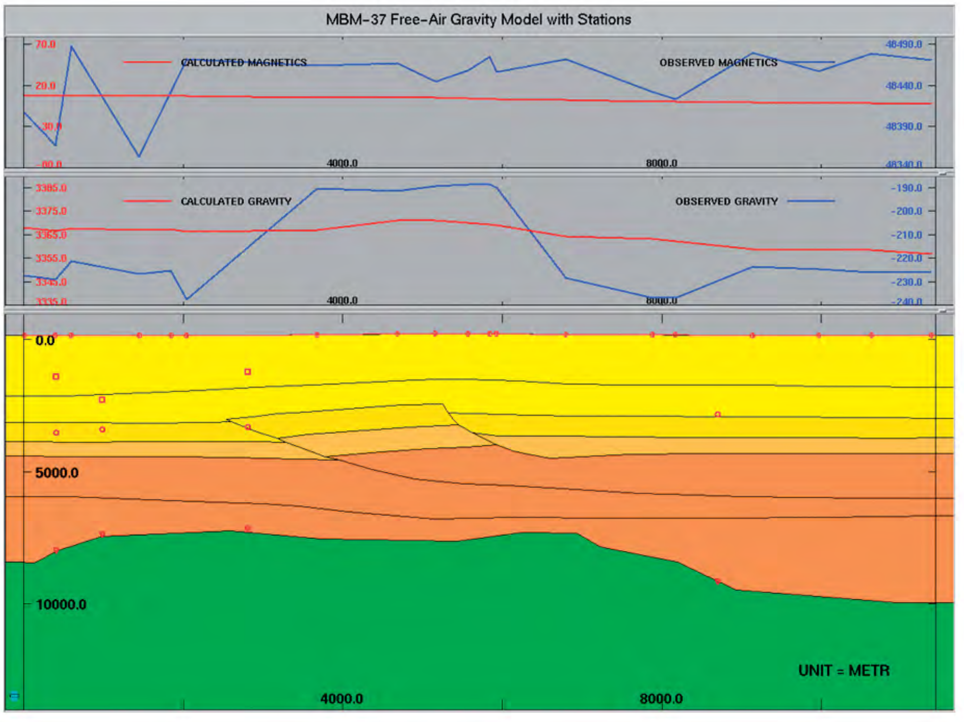


Figure 11. Integrated modeling using Gravity, Magnetic, Magneto-Telluric and 2-D Seismic data on Line no : MBM-37. Gravity scale is varying upto 55 mGal and MT is upto 800 ohm-m from line in the red symbol. The distributions of gravity and magnetic stations have a poor grid.

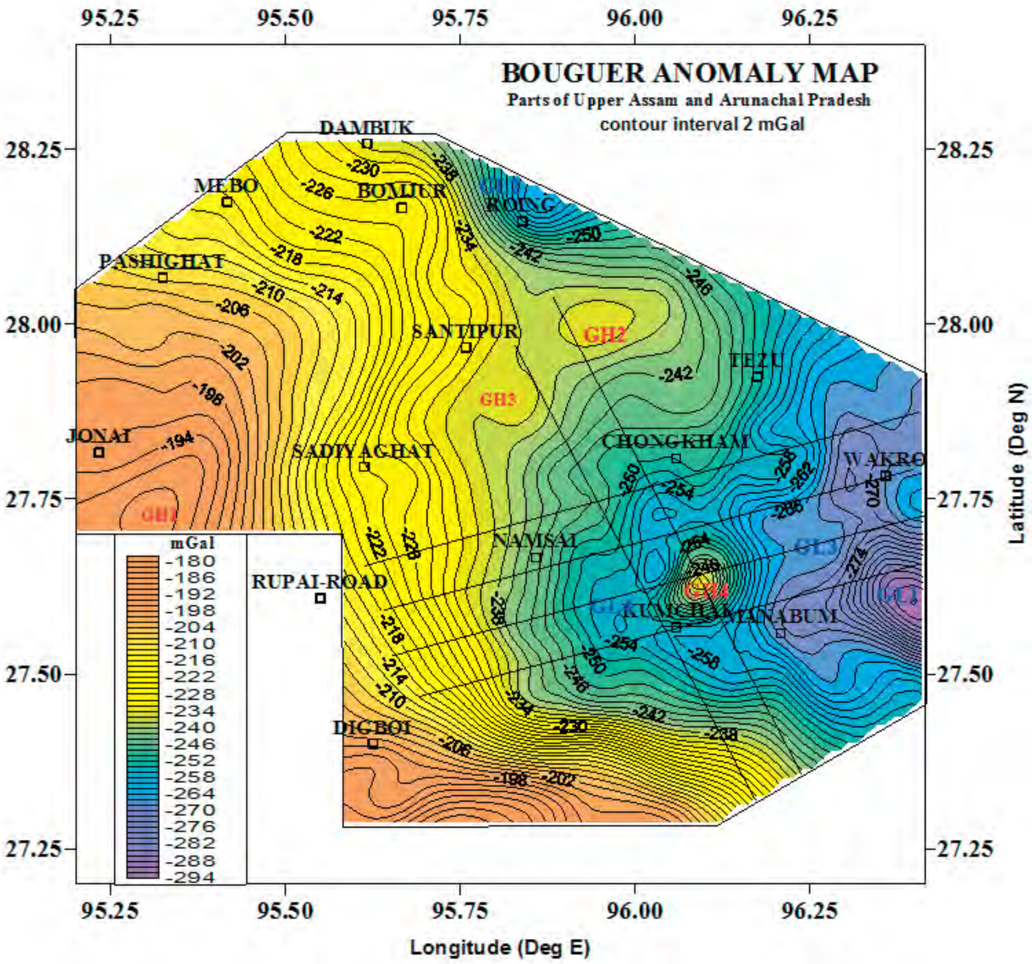
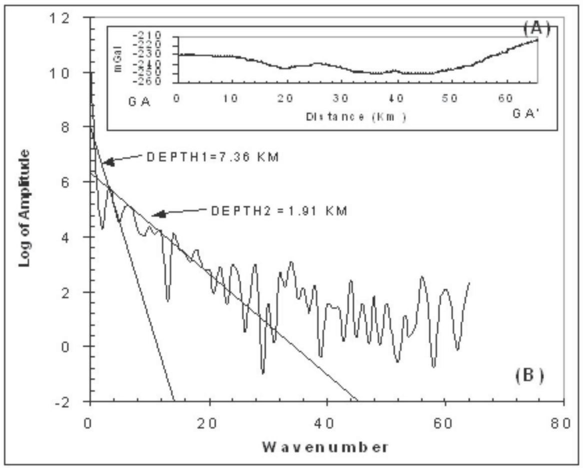


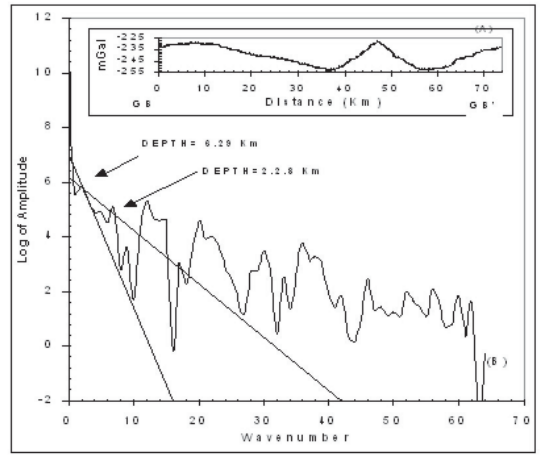
Figure 12. Bouguer gravity anomaly map and the position along the study area.

of the subsurface structure. It is further suggested to collect the GM data with closer grid to get a superior consequence. However using reasonable structural constraints from GM, MT, seismic and well data, an attempt has been made to map the basement structure.

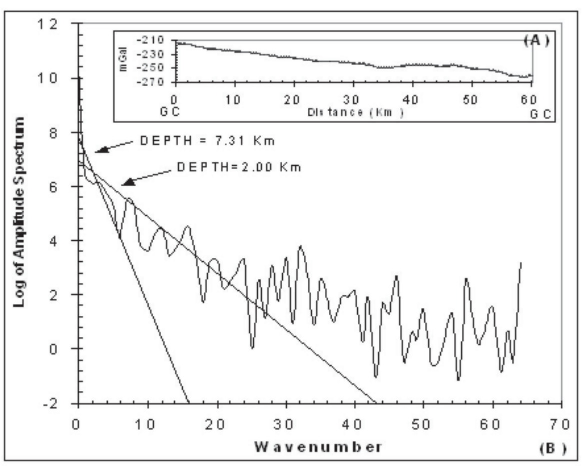
Spectral analysis of the six elongated gravity profiles have been interpreted at different locations using own developed software by the authors (Ghosh, 1995). This method works with the concept of statistical approach and gives anticipated results in longer profile length and results obtained are very promising despite poor coverage of available gravity data. Using this technique, the average calculated depths of the Namsang formation and top of the Basement configuration are varying from 1.71 km to 2.27 km and 6.4 km to 7.36 km respectively which are well matching with the interpreted seismic data. It is important to note that the present technique is failed to give any information on the sedimentary structure between to integrate Girujan and Tipam interface which can be seen on the seismic section, because the density contrast is not significant to map the difference. The different sections with 2-D spectral analysis are shown in Fig. 13. For GM modeling following densities are used as above Namsang 2.350 g/cm^3, above Girujan 2.350 g/cm^3, above mid Girujan 2.350 g/cm^3 and below mid Girujan 2.350 g/cm^3. The basement is taken as 2.750 g/cm^3. Finally using spectral analysis only two depths are calculated due to homogeneous density between the various sediments.



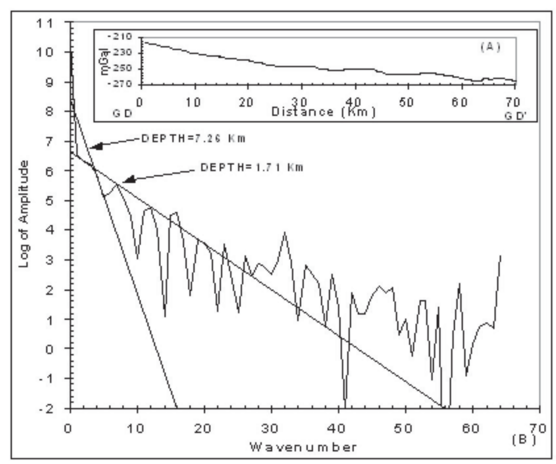
Profile GA-GA'



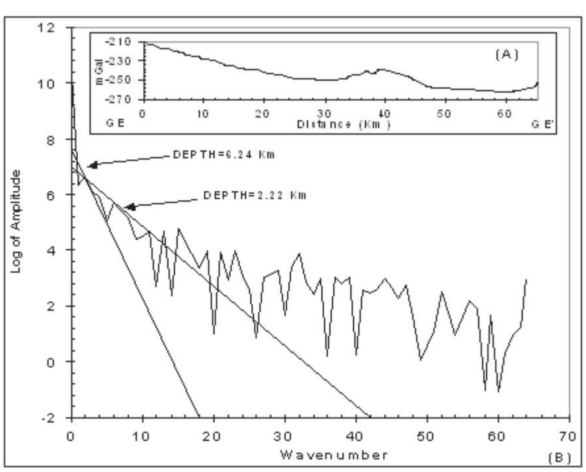
Profile GB-GB'



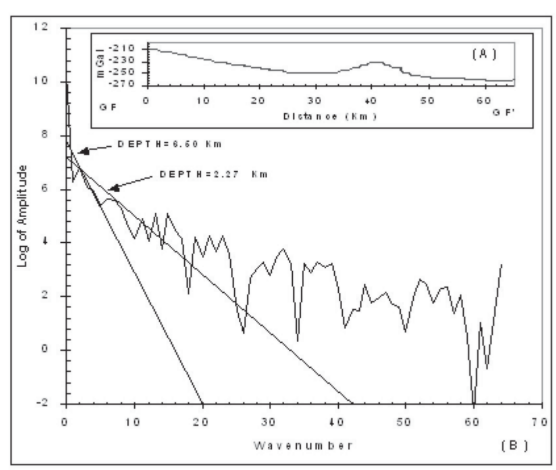
Profile GC-GC'



Profile GD-GD'



Profile GE-GE'



Profile GF-GF'

Figure 13. Plot shows the Log of Amplitude versus Wave number of the Spectral analysis of 2D gravity data. From the interpretation, it shows two clear slopes referred to two depths as Namsang and Basement.

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REFERENCES

Chen, W.P. & Monlar, P., 1990. Source parameters of earthquakes and intraplate deformation beneath the Shilong Plateau and the Northern Indo-Burman ranges, J. Geophys. Res., 95, (no. B8), 12527-12552.

Ghosh, G.K., 1995. Statistical Interpretation of gravity data using two dimensional structure, M.Tech. Dissertation, Unpublished Report, Indian School of Mines, Dhanbad, India.

Kayal, J.R., 1998. Seismicity of northeast India and surroundings- development over the past 100 years, J. Geophys,19 (1), 9-34.

Monlar, P. & Tapponnier, P., 1975. Cenozoic tectonics of Asia; effects of a continental collision, Science, 189, 419-426.

Pathak, R.K., Chaudhury, S. & Hazarika, N.R., 2002. Techno-economic report of Manabum area, Internal report for Oil India. Unpublished.

Paul, J., Burgmann,R., Gaur, V.K., Bilham, R., Larson, K., Ananda, M.B., Jade, S., Mukul, M., Anupam, T.S., Satyal,, G. & Kumar, D., 2001. The motion and active deformation of India. Geophys., Res. Lett., 28, 647-651.

Sarmah,, S.K., 1999. The probability of occurrence of high magnitude earthquake on northeastern India. J. Geophysics, 20 (3), 129-135.

Srinivasan, V., 2005. Geological mapping of 'Belt of Schuppen' using aerial photographs and remote sensing data.

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