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Comparative Analysis of Magnetic and Gravity Depth Estimates in the Lower Benue Trough, Southeastern Nigeria: Implications for Basin Architecture and Hydrocarbon Prospectivity

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ABSTRACT

This study compares six magnetic- and gravity-derived source-depth products across the Lower Benue Trough, southeastern Nigeria, to assess their implications for regional basin architecture. The products comprise magnetic Source Parameter Imaging (SPI), magnetic spectral top and centroid depths, gravity SPI, and shallow- and deep-source gravity estimates. The reported ranges are 0.16–2.55 km, 0.29–3.72 km, 1.84–5.95 km, approximately 1.6 km to more than 13 km, 5.0–6.2 km, and 2.4–2.9 km, respectively. The gravity compilation described in the doctoral study draws on legacy ground observations reported by Cratchley and Jones (1965), Adighije (1981), and Ofoegbu (1985a), together with WGM2012 and Scripps regional gravity products. The principal cross-method result is that the gravity deep-source product places its greatest estimates around Afikpo toward Ugep, whereas magnetic centroid estimates indicate deeper magnetic-source ensembles around Nkalagu and Okigwe. The gravity shallow-source map shows a different pattern, with its deepest mapped values concentrated north of Nkalagu toward the area west of Abakaliki and in a western-central zone; Ugep is comparatively shallow on that product. These are interpreted source-depth estimates, not independently validated sediment–basement depths. No seismic or well calibration is included. The results provide comparative constraints on basin architecture but do not independently establish sediment thickness, source-rock maturity, or functioning hydrocarbon kitchens.

INTRODUCTION

Constraining subsurface depth architecture is central to sedimentary-basin analysis and petroleum-system evaluation. Burial depth influences source-rock temperature and maturation, but depth alone does not determine whether a hydrocarbon kitchen exists. Source-rock richness and kerogen type, burial and thermal history, heat flow, timing, and preservation must also be assessed. In frontier basins with limited well control, gravity and magnetic data provide regional constraints on density- and susceptibility-contrast sources and can help identify areas for more detailed investigation.

The Lower Benue Trough in southeastern Nigeria has a complex tectonostratigraphic history involving Early Cretaceous rifting, sedimentation, and later deformation and inversion. Recent studies have applied aeromagnetic depth analysis and integrated potential-field methods to investigate basement geometry and structural trends in the Benue Trough (Ekwok et al., 2021; Ibe et al., 2022; Osinowo et al., 2023; Magbo & Ezeh, 2024; Yenne et al., 2025). A focused aeromagnetic study of Nkalagu and environs reported local structural trends and magnetic-source depths (Igbokwe et al., 2023). The authors' 2026 study addressed a broader multiscale integration framework for gravity and magnetic methods

(Igbokwe et al., 2026). The present paper has a different and narrower purpose: it compares six depth products already generated and documented in the doctoral study, rather than claiming a new joint inversion or newly processed integrated model. The specific gap addressed is the lack of a single, explicit comparison of the distinct source-depth measures and their spatial disagreements across the Udi–Nkalagu–Abakaliki–Okigwe–Afikpo–Ugep corridor. The products are treated as complementary, method-dependent constraints, not as interchangeable estimates of one interface.

The aim of this study is to compare the reported magnetic- and gravity-derived source-depth estimates across selected sectors of the Lower Benue Trough and evaluate what their convergences and disagreements imply for regional basin architecture and subsequent petroleum-system investigation.

The contribution is a comparative synthesis of six depth products documented in the doctoral study: magnetic SPI, magnetic spectral top depth, magnetic spectral centroid depth, gravity SPI, and separate gravity deep- and shallow-source maps. The paper does not claim that these products were newly processed for this article, nor does it calculate basin volume or map mature hydrocarbon kitchens. The comparison focuses on their reported ranges and spatial patterns, while recognizing that magnetic susceptibility contrasts and gravity density contrasts may represent different source populations and interfaces.

Geological setting

Regional geology

The Benue Trough is a northeast–southwest-trending Cretaceous sedimentary basin in Nigeria, commonly described in upper, middle, and lower segments. Its evolution is associated with rifting, subsidence, sedimentation, and later deformation. Gravity interpretation has long been used to examine the trough's regional structure and sedimentary fill (Adighije, 1981), while recent integrated gravity and aeromagnetic modelling continues to refine basement architecture and structural interpretations (Yenne et al., 2025).

Stratigraphy and burial history

The Lower Benue succession includes Albian units of the Asu River Group and younger Cretaceous formations, including the Eze-Aku and Awgu successions, with later deposits associated with post-Santonian basin evolution. The distribution, thickness, and thermal history of these units vary spatially. This study does not independently determine formation-specific burial depths or maturity; potential-field depth products require stratigraphic calibration.

Structural evolution

The basin has undergone Early Cretaceous extension and later Santonian deformation, including folding and inversion associated with the Abakaliki structural high. Faults and basement structures may influence basin geometry and sediment distribution. Potential-field depth patterns alone do not uniquely resolve individual faults, formations, or petroleum-system elements.

MATERIALS AND METHODS

Data sources and study coverage

The study covers latitudes 5°30′N–6°30′N and longitudes 7°00′E–8°30′E, including map sheets 301 (Udi), 302 (Nkalagu), 303 (Abakaliki), 312 (Okigwe), 313 (Afikpo), and 314 (Ugep). The doctoral study reports NGSA aeromagnetic data acquired during 2005–2010, with 500 m flight-line spacing, 2 km tie-line spacing, NW–SE flight direction, approximately 80 m terrain clearance, and a 100 m grid cell. The gravity compilation is described as combining digitized legacy ground-gravity observations from Cratchley and Jones (1965), Adighije (1981), and Ofoegbu (1985a), with regional gridded products from WGM2012 and the Scripps global marine gravity model. The thesis reports ground-station spacing of approximately 2–5 km; WGM2012 is described at 2-arc-minute grid spacing and the Scripps product at approximately 1-arc-minute resolution (Bonvalot et al., 2012; Sandwell et al., 2014). The exact survey dates of the legacy observations, coordinate reference system, grid interpolation method, and detailed station-by-station merging history are not specified in the source record and are not inferred here. The gravity workflow is described in the thesis in terms of a Total Bouguer Gravity Anomaly (TBGA) compilation, regional–residual separation, upward continuation, derivative enhancement, and source-depth interpretation. The six products compared are magnetic SPI (thesis Figure 4.8), magnetic spectral centroid depth (Figure 4.9), magnetic spectral top depth (Figure 4.10), gravity SPI (Figure 4.17), gravity deep-source estimates (Figure 4.18), and gravity shallow-source estimates (Figure 4.19).

Magnetic Source Parameter Imaging (SPI) estimates source depth from local-wavenumber behaviour of potential-field data (Thurston & Smith, 1997). The magnetic SPI map reports approximately 0.16–2.55 km. Spectral analysis estimates characteristic depths for source ensembles from slopes of radially averaged power spectra (Spector & Grant, 1970). The thesis reports magnetic spectral centroid depths of 1.84–5.95 km and top depths of 0.29–3.72 km. Top and centroid depths are distinct source-ensemble measures: the top estimate characterizes the shallower boundary of an ensemble, whereas the centroid represents its deeper characteristic level. Neither is automatically equivalent to sediment thickness or a single mapped basement

contact. The thesis does not preserve the exact spectral-window dimensions, overlap, wavenumber fitting intervals, or regression diagnostics; these parameters are therefore not assigned retrospectively.

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The gravity products are reported separately because they represent different source-depth measures. Gravity SPI solutions span approximately 1.6 km to more than 13 km; the thesis map uses negative metre values as its plotting convention, and the manuscript reports their positive depth magnitudes below the reference surface. The separate gravity deep-source map reports approximately 5.0–6.2 km, while the gravity shallow-source map reports approximately 2.414–2.915 km (rounded to 2.4–2.9 km). The thesis identifies the gravity compilation as a TBGA-based workflow and describes regional–residual separation and upward continuation at 0.5, 1, 2, 5, and 10 km. It also discusses local-wavenumber SPI and radially averaged spectral analysis. However, the source record does not unambiguously associate a complete algorithm configuration, structural index, spectral window, fitting interval, or software parameter set with each of the separate shallow- and deep-source map products. Accordingly, the manuscript retains the source labels and reported ranges without assigning undocumented settings or claiming a numerical uncertainty that was not calculated.

The products are compared by their reported ranges and mapped spatial patterns. Magnetic and gravity methods respond to different physical properties—magnetic susceptibility and density, respectively—and may sample different source populations. In addition, the aeromagnetic grid (100 m cell) and regional gravity compilation (including 1- and 2-arc-minute grids and legacy stations spaced approximately 2–5 km) have different nominal spatial supports. The comparison is therefore regional and interpretive, not a cell-by-cell statistical validation. No spatial correlation coefficient, error bound, or sensitivity statistic is reported because co-registered source grids and a common reference model were not available for independent calculation.

Comparison framework and interpretive limits

The products are compared by reported ranges, spatial patterns, and method sensitivity. Magnetic and gravity methods respond to different physical properties and may sample different source ensembles; agreement in broad spatial trends is corroborative, not proof that all methods image the same interface. No sediment-volume calculation is performed because a validated, continuous sediment-thickness surface and integration area have not been supplied.

Petroleum-system implications

Depth estimates are used only to identify candidate sectors for follow-up evaluation. No universal 5 km threshold is used to classify kitchens. Maturity depends on burial and thermal history, heat flow, source-rock richness and kerogen, among other factors. A kitchen interpretation requires independent source-rock and thermal-maturity evidence, ideally including well data, maturity indicators, geochemical measurements, and calibrated burial/thermal modelling.

RESULTS AND DISCUSSION

Magnetic depth estimates

Magnetic SPI

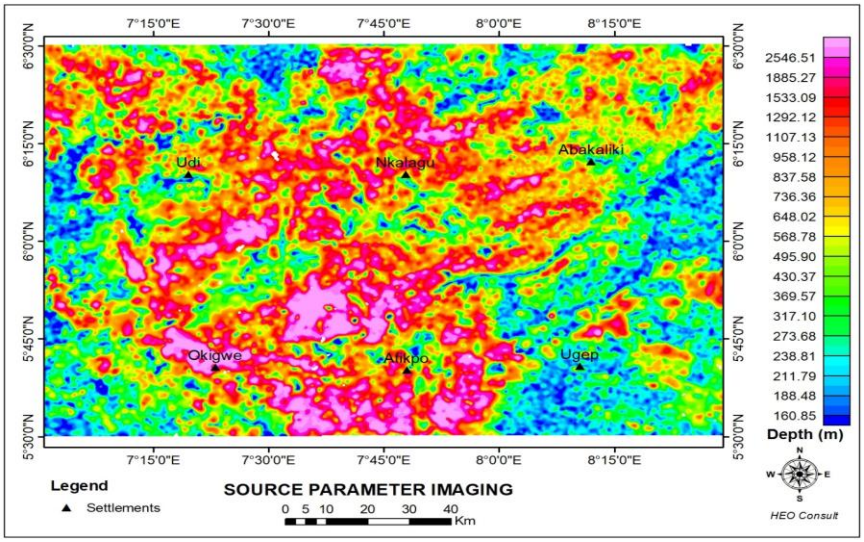


Figure 1:Magnetic Source Parameter Imaging (SPI) depth map of the study area (reproduced from the PhD thesis, Figure 4.8).

The magnetic SPI map reports depths of approximately 0.16–2.55 km. The thesis interpretation describes elevated values around parts of Nkalagu, locally exceeding 1.8 km and approaching 2.5 km, and locally deep estimates in Okigwe approaching 2.55 km. Extensive shallow values are reported around Ugep, approximately 0.16–0.7 km. These are source-depth indications, not direct measurements of sediment thickness.

Magnetic spectral centroid depth

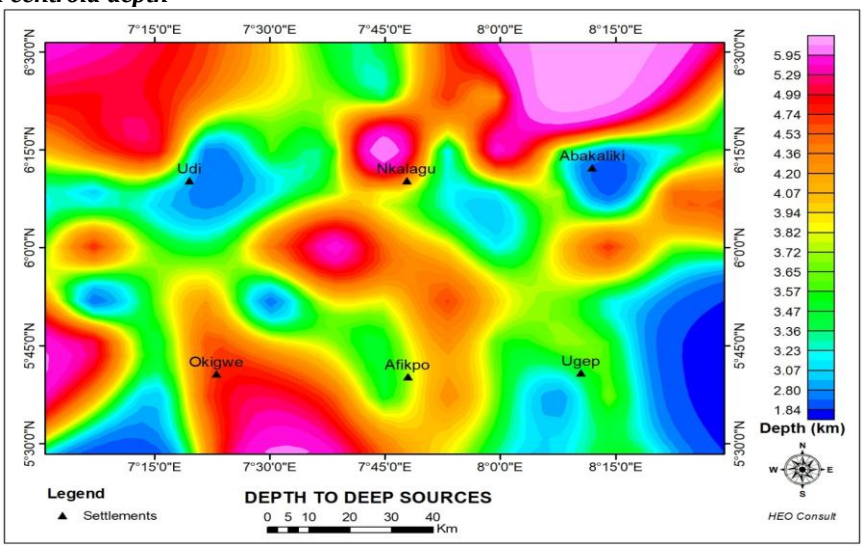


Figure 2: Magnetic spectral centroid-depth map of the study area (reproduced from the PhD thesis, Figure 4.9).

Centroid depths range from approximately 1.84 to 5.95 km. The thesis describes Udi values around 2.5–3.3 km; Nkalagu around 5.0–5.5 km; Abakaliki around 2.0–3.0 km; Okigwe locally approaching 5.95 km; Afikpo around 3.5–4.5 km; and Ugep around 2.5–3.5 km. These

are estimates for a deeper magnetic-source ensemble, not a confirmed sediment–basement contact.

Magnetic spectral top depth

The magnetic spectral top-depth product is shown in Figure 3.

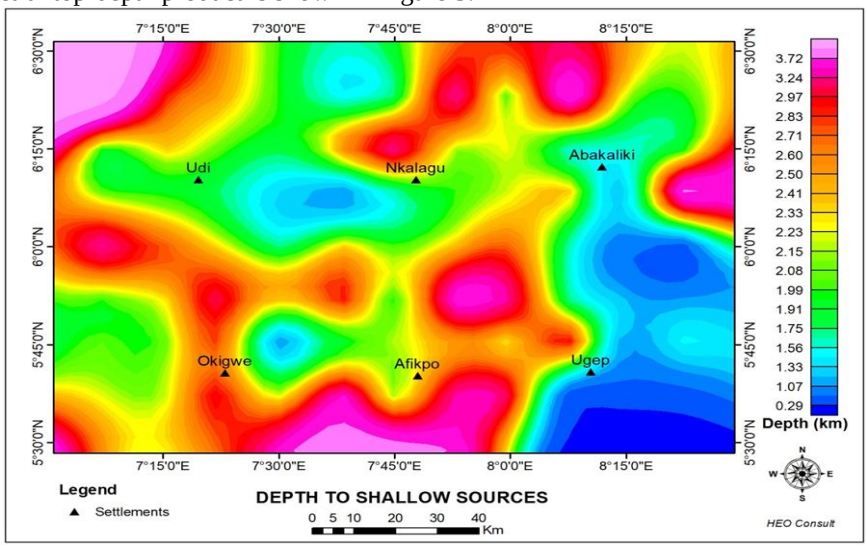


Figure 3: Magnetic spectral top-depth map of the study area (reproduced from the PhD thesis, Figure 4.10).

Top-depth estimates range from approximately 0.29 to 3.72 km. The thesis interpretation reports Udi around 1.8–2.2 km; Nkalagu around 1.8–2.3 km near the settlement, with deeper values to the north and northeast; Abakaliki around 1.0–1.8 km; Okigwe around 1.5–2.0 km with locally deeper areas to the south and southwest; Afikpo around 1.7–2.3 km; and Ugep around 0.3–1.3 km. Sector descriptions should be checked against the original grid and map before being interpreted as sediment thickness.

Gravity depth estimates

Gravity SPI

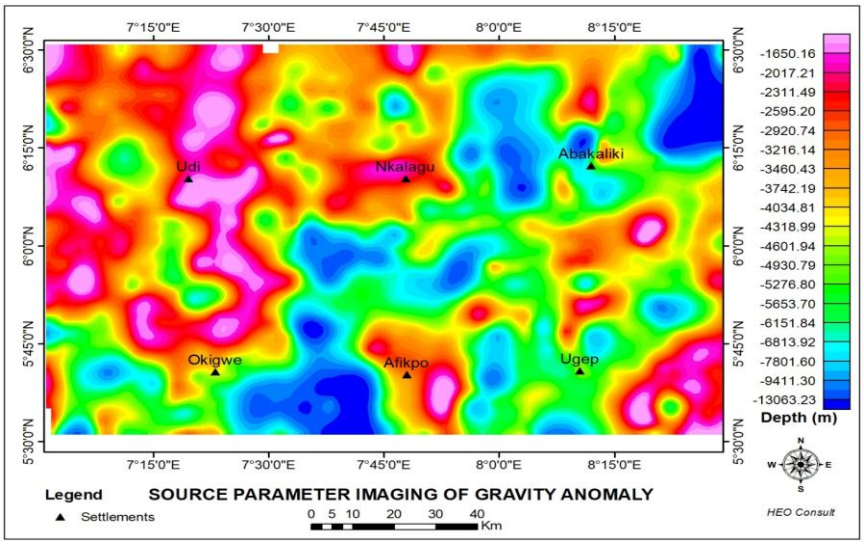


Figure 4: Gravity Source Parameter Imaging (SPI) depth map (reproduced from the PhD thesis, Figure 4.17).

Gravity SPI solutions span approximately 1.6 km to more than 13 km. Relatively shallow-to-intermediate solutions are described around western Udi (about 1.6–4 km), while deeper solutions occur southeast of Nkalagu toward Afikpo, exceeding 7 km and locally approaching 10–13 km. These very deep solutions require caution

and should not be equated directly with sediment thickness.

Gravity deep-source estimates

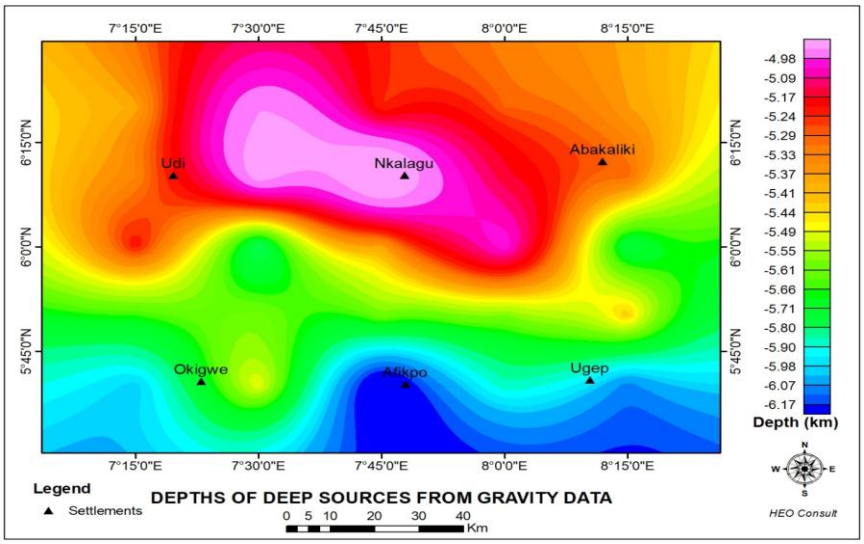


Figure 5: Gravity deep-source depth map (reproduced from the PhD thesis, Figure 4.18).

The gravity deep-source map reports approximately 5.0–6.2 km. The Udi–Nkalagu–Abakaliki region is described as around 5.0–5.4 km, while the deepest estimates occur around Afikpo and extend southeast toward Ugep, locally approaching 6.2 km. Geological meaning depends on the model assumptions and calibration.

Gravity shallow-source estimates

The gravity shallow-source product is shown in Figure 6.

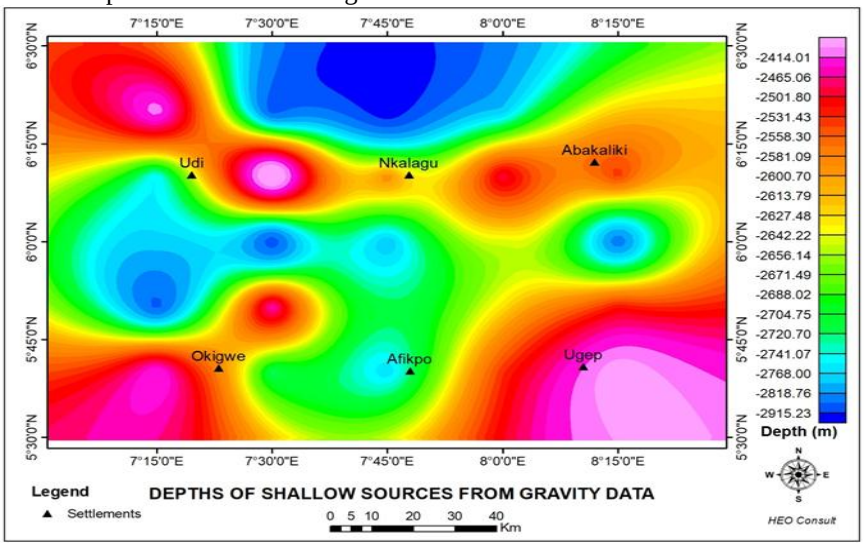


Figure 6: Gravity shallow-source depth map (reproduced from the PhD thesis, Figure 4.19).

The gravity shallow-source map spans approximately 2.414–2.915 km in depth magnitude. In the mapped colour scale, the most negative values (largest positive depth magnitudes) form a prominent northern-central zone north of Nkalagu extending toward the area west of Abakaliki, together with a western-central deep zone southwest of Udi and northwest of Okigwe. The map also shows local depth variation around the southern sectors. Afikpo is not unambiguously the sole or principal maximum on the map, and Ugep is comparatively shallow on the displayed scale. The thesis narrative contains differing sector descriptions for this

product; consequently, this article follows the spatial pattern visible in Figure 4.19 and does not assign exact sector maxima without the original numerical grid. The negative labels are a plotting convention; depths are discussed here as positive magnitudes below the reference surface. These gravity-source depths are not treated as direct measurements of sediment thickness.

Cross-method comparison

The six products do not identify one universal deepest sector. Magnetic centroid estimates indicate deep magnetic-source ensembles around Nkalagu and Okigwe, while the gravity deep-source product places its greatest reported depths around Afikpo and southeastward toward Ugep. The gravity shallow-source map differs: its most prominent deepest zones are north of Nkalagu toward west of Abakaliki and in the western-central area southwest of Udi/northwest of Okigwe. This is not a contradiction to be removed by forcing a single depocentre interpretation; it reflects the different physical contrasts and source ensembles represented by the products. The broad gravity SPI range, including solutions exceeding 13 km, is also distinct from the 5.0–6.2 km deep-source product and should not be substituted for it.

Table 1: Comparison of the six magnetic- and gravity-derived source-depth products.

Method / product	Reported depth range (km)	Interpretive note
Magnetic SPI	0.16–2.55	Local magnetic-source estimate; not automatically sediment thickness.
Magnetic spectral top	0.29–3.72	Estimate for shallower magnetic-source ensemble.
Magnetic spectral centroid	1.84–5.95	Estimate for deeper magnetic-source ensemble.
Gravity SPI	~1.6 to >13	Broad range; deepest solutions require calibration.
Gravity deep-source	5.0–6.2	Deep gravity-source estimate product.
Gravity shallow-source	2.4–2.9	Shallow gravity-source estimate product.

Sector comparison

Sector-level descriptions are restricted to patterns explicitly described in the thesis and visible in the reproduced maps. The reported overall ranges are traceable to the thesis depth products, but exact sector minima and maxima are not tabulated because the original numerical grids were not available for independent cell extraction. The map images support qualitative spatial comparison, not calculation of sector statistics or error bounds.

Implications for further petroleum-system evaluation

The depth products identify areas that may merit further investigation, but do not establish primary or secondary hydrocarbon kitchens. The gravity deep-source product identifies its greatest reported depths around Afikpo and toward Ugep; the gravity shallow-source map instead shows its strongest deep zones north of Nkalagu toward west of Abakaliki and in the western-central area. Magnetic centroid estimates indicate deeper magnetic-source ensembles around Nkalagu and Okigwe. These differences should be retained as method-dependent observations. They do not, by themselves, demonstrate a continuous sediment–basement surface or formation-specific burial depth.

No composite depth surface is presented because the magnetic centroid and gravity depth products represent different source ensembles and have not been calibrated to a common sediment–basement interface.

Discussion

Method differences and uncertainty

The methods produce a broad range of estimates because they respond to different physical properties, source geometries, and source ensembles. Magnetic SPI and magnetic spectral top-depth products characterize magnetic-source responses at shallower levels, whereas magnetic spectral centroid estimates represent a deeper characteristic level of magnetic-source ensembles. Gravity products respond to density contrasts and are influenced by regional-field treatment and source geometry. The gravity shallow-source and deep-source maps also show distinct spatial patterns. These products should therefore be interpreted as complementary

constraints rather than independent measurements of one common interface. The comparison is qualitative at sector scale because the original numerical grids were not available for co-registered extraction and statistical testing.

Broad spatial correspondence can support a regional geological interpretation, but it does not establish sediment thickness. The principal divergence is between deeper magnetic centroid estimates around Nkalagu and Okigwe, the deeper gravity deep-source estimates around Afikpo toward Ugep, and the separate gravity shallow-source pattern concentrated north of Nkalagu and in the western-central study area. The divergence is geophysically plausible because magnetic and gravity methods respond to susceptibility and density contrasts, respectively, and because their source populations, grid resolutions, and processing operators differ.

Implications for hydrocarbon prospectivity

The deepest estimated source-depth zones are candidates for additional petroleum-system evaluation, not confirmed kitchens. Recent work in the Lower Benue Trough also evaluates source-rock generative potential through geochemical proxies, reinforcing the need to combine structural and depth information with direct petroleum-system evidence (Madukwe et al., 2023). A 5 km depth threshold is not a universal maturity criterion. Temperature depends on geothermal gradient and heat-flow history, while maturity also depends on source-rock type, organic richness, burial duration, and tectonic or magmatic overprinting. Intrusive thermal effects should not be assigned to a sector without specific evidence. These potential-field results cannot demonstrate that the Asu River Group, Eze-Aku Formation, or Awgu Formation is mature at a particular location.

Follow-up work should combine seismic or other calibrated structural data with wells where available, formation-specific stratigraphic interpretation, source-rock geochemistry, maturity indicators, and burial/thermal modelling. These data are needed to test whether any mapped depth anomaly corresponds to an effective kitchen and to assess migration, charge, and preservation.

Comparison with previous studies

The present depth ranges should be interpreted alongside recent studies that use different datasets, spatial coverage, and depth-estimation workflows. For example, aeromagnetic analysis in the Middle Benue Basin reported depth-weighted sedimentary thicknesses up to 3.68 km (Osinowo et al., 2023), while a 2025 integrated gravity–aeromagnetic study modelled basement and deeper crustal interfaces across parts of the Middle and Lower Benue Trough (Yenne et al., 2025). Earlier work has also examined magnetic-source depths across parts of the Lower Benue Trough and adjoining areas (Ekwok et al., 2021; Ukwuteyinor and Ezeh, 2023). These studies are useful comparators but are not directly interchangeable with the present thesis maps because their study boundaries, datasets, and algorithms differ. The Nkalagu-focused study by Igbokwe et al. (2023) reported a two-layer magnetic-depth model, with average shallow and deep source depths of 1.041 km and 3.574 km, respectively, and a local sedimentary-thickness estimate of about 3.6 km. Its local scale, data treatment, and depth model differ from the six regional products examined here, so the values are contextual comparisons rather than direct validation of the present estimates.

Limitations

Potential-field depth interpretation is non-unique and depends on source geometry, physical-property contrasts, regional-field treatment, and processing assumptions. The thesis provides the source maps and broad processing workflow, but does not preserve all map-specific numerical settings needed to reproduce each spectral and gravity depth product exactly. The original numerical grids were not available for independent sector-by-sector extraction, uncertainty calculation, or sensitivity testing. No seismic or deep-well calibration is included to confirm a sediment–basement interface. Accordingly, the reported depths are interpreted as method-dependent source-depth estimates; no sediment volume, formation-specific burial depth, source-rock maturity, hydrocarbon generation, migration, or commercial accumulation is inferred from these products alone. Further evaluation should prioritize access to the original grids and processing projects, followed by co-registered sensitivity analysis and calibration against seismic, well, stratigraphic, geochemical, and thermal-maturity data.

CONCLUSION

The six magnetic and gravity products provide complementary but non-equivalent constraints on source-depth architecture across the Lower Benue Trough. The reported ranges are 0.16–2.55 km for magnetic SPI, 0.29–3.72 km for magnetic spectral top depth, 1.84–5.95 km for magnetic spectral centroid depth, approximately 1.6 km to more than 13 km for gravity SPI, 5.0–6.2 km for gravity deep-source estimates, and 2.4–2.9 km for gravity shallow-source estimates. The principal cross-method finding is that magnetic centroid estimates identify deeper source ensembles around Nkalagu and Okigwe, whereas the gravity deep-source product indicates its greatest estimates around Afikpo toward Ugep; the gravity shallow-source map has a distinct pattern, with prominent deeper zones north of Nkalagu and in the western-central area. These differences reflect the

distinct physical contrasts and source ensembles sampled by the methods and should not be collapsed into a single basement-depth interpretation. The principal uncertainty is the absence of complete map-specific processing parameters, original numerical grids for independent sector statistics, and seismic or well calibration. The results are therefore regional source-depth constraints rather than validated sediment-thickness or maturity estimates. Priority follow-up should include recovery of the original grids and processing projects, followed by co-registered sensitivity analysis and calibration with seismic, well, stratigraphic, geochemical, and thermal-maturity evidence.

REFERENCES

Adighije, C. I. (1981). A gravity interpretation of the Benue Trough, Nigeria. Tectonophysics, 79(1–2), 109–128. https://doi.org/10.1016/0040-1951(81)90235-3

Ibe, A. O., Emberga, T. T., & Opara, A. I. (2022). Basement depth re-valuation of anomalous magnetic bodies in the Lower and Middle Benue Trough using Euler deconvolution and spectral inversion techniques. World Journal of Advanced Research and Reviews, 14(2), 129–145. https://doi.org/10.30574/wjarr.2022.14.2.0356

Igbokwe, S. C., Agbodike, I. C., & Ejiogu, B. C. (2023). Structural and tectonic interpretation of Nkalagu and environs using high-resolution aeromagnetic data. *Austin Journal of Earth Science, 6*(1), Article 1028. https://doi.org/10.26420/austinjearthsci.2023.1028

Igbokwe, S. C., Igboekwe, M. U., Amos-Uhegbu, C., Ejiogu, B. C., Amakiri, S., & Nneji, G. E. (2026). Multiscale integration of gravity and magnetic methods for hydrocarbon exploration in frontier basins: A methodological framework and case study from the Lower Benue Trough, Nigeria. Communication in Physical Sciences, 13(11), 1759–1780. https://doi.org/10.4314/cps.v13i11.4

Madukwe, H. Y., Adegoke, A. K., Adeleye, M. A., & Aturamu, A. O. (2023). Paleo-productivity and petroleum source evaluation of the Nkporo and Awgu shales, Lower Benue Trough, Nigeria: Insight from inorganic geochemistry. Energy Geoscience, 4(3), Article 100161. https://doi.org/10.1016/j.engeos.2023.100161

Magbo, C. J., & Ezeh, C. C. (2024). Mapping of geological structures controlling mineralization in parts of the Lower Benue Trough, Nigeria, using high resolution aeromagnetic data. International Journal of Physical Sciences, 19(1), 1–11. https://doi.org/10.5897/IJPS2023.5047

Ekwok, S. E., Akpan, A. E., Ebong, D. E., & Eze, O. E. (2021). Assessment of depth to magnetic sources using high resolution aeromagnetic data of some parts of the Lower Benue Trough and adjoining areas, Southeast Nigeria. Advances in Space Research, 67(7), 2104–2119. https://doi.org/10.1016/j.asr.2021.01.007

Osinowo, O. O., Akanji, A. O., Sanuade, O. A., & Esho, O. O. (2023). Hydrocarbon potential evaluation of Middle Benue Basin, East Central Nigeria using high resolution aeromagnetic data. Results in Geophysical Sciences, 14, Article 100058. https://doi.org/10.1016/j.ringps.2023.100058

Spector, A., & Grant, F. S. (1970). Statistical models for interpreting aeromagnetic data. Geophysics, 35(2), 293–302. https://doi.org/10.1190/1.1440092

Thurston, J. B., & Smith, R. S. (1997). Automatic conversion of magnetic data to depth, dip, and susceptibility contrast using the SPI (TM) method. Geophysics, 62(3), 807–813. https://doi.org/10.1190/1.1444190

Ukwuteyinor, B. U., & Ezeh, C. C. (2023). Evaluation of depth to basement, heat flow, and lead-zinc mineralization from analysis of aeromagnetic data in some parts of Southern Benue Trough. Journal of Environment and Earth Science, 13(2), 51–59. https://doi.org/10.7176/JEES/13-2-06

Yenne, E. Y., Green, C., & Torvela, T. (2025). Modelling geologic features and structures in the Middle and Lower Benue Trough of Nigeria from gravity and aeromagnetic data sets. Journal of African Earth Sciences, 231, Article 105745. https://doi.org/10.1016/j.jafrearsci.2025.105745

Bonvalot, S., Balmino, G., Briais, A., Kuhn, M., Peyrefitte, A., Vales, N., Biancale, R., Gabalda, G., Moreaux, G., & Sarrailh, M. (2012). World Gravity Map 2012. Commission for the Geological Map of the World.

Cratchley, C. R., & Jones, G. P. (1965). An interpretation of the geology and gravity anomalies of the Benue Valley, Nigeria (Geophysical Paper No. 1). Overseas Geological Surveys.

Ofoegbu, C. O. (1985a). A review of the geology of the Benue Trough of Nigeria. Journal of African Earth Sciences, 3, 283–292. https://doi.org/10.1016/0899-5362(85)90001-6

Sandwell, D. T., Müller, R. D., Smith, W. H. F., Garcia, E., & Francis, R. (2014). New global marine gravity model from CryoSat-2 and Jason-1 reveals buried tectonic structure. Science, 346(6205), 65–67. https://doi.org/10.1126/science.1258213