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# INTEGRATED AEROMAGNETIC AND GRAVITY INVESTIGATION OF BASEMENT ARCHITECTURE AND TECTONIC FRAMEWORK OF THE DAHOMEY BASIN, SOUTHWESTERN NIGERIA

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**ABSTRACT**

Understanding basement architecture is critical for evaluating hydrocarbon prospectivity in frontier basins. The Dahomey Basin, southwestern Nigeria, remains underexplored despite recent discoveries offshore. This study integrates high-resolution aeromagnetic and satellite gravity data to characterize the tectonic framework, basement morphology, and sedimentary thickness across the basin. Enhancement filters – reduction to the equator, upward continuation (1 km), first vertical derivative, and tilt derivative – were applied to delineate structural lineaments. Depth to magnetic sources was estimated using source parameter imaging (SPI) and Euler deconvolution. Results reveal shallow and deep-seated faults with dominant NE-SW, NW-SE, WNW-ESE, and E-W trends. The magnetic and gravity anomaly patterns reflect basement horsts (high anomalies) and grabens (low anomalies), confirming a horst-graben architecture. Depth to basement varies considerably, reaching 3.5–5.0 km in the main depocenters (mini-basins). The offshore sector exhibits thicker sedimentary accumulations, indicating greater potential for source-rock maturation and hydrocarbon generation. This study demonstrates that integrated geopotential field analysis provides a cost-effective, basin-scale tool for mapping structural framework and identifying priority exploration targets in rift-related passive margins

**Keywords:** Dahomey, aeromagnetic, gravity, basement, hydrocarbon

## 1. Introduction

The Dahomey Basin is a peri-cratonic marginal basin along the Gulf of Guinea, extending from Ghana to western Nigeria. Despite proven petroleum systems (e.g., Aje and Ogo fields offshore Lagos), the basin remains largely under-explored compared to its analogues in West and Central Africa (e.g., Tano, Termit, Muglad, Doba, Bongor basins) where major discoveries have been made (Kehinde & Adedoyin, 2021; Agoha et al., 2022). The key challenge is the lack of detailed knowledge of the basement tectonic

framework, which controls the distribution of depocenters (mini-basins) and, consequently, source-rock burial and thermal maturation (Okoro & Onuoha, 2022; Onwubuariri, et al., 2024).

Geopotential field (gravity and magnetic) data are cost-effective tools for frontier basin exploration. They map the sediment-basement interface, delineate structural discontinuities, and estimate sedimentary thickness (Li & Morozov, 2006; Oladele et al., 2021, Onwubuariri, et al., 2023a). Sedimentary basins typically exhibit low gravity and low magnetic anomalies due to low-density, low-susceptibility infill. By contrast, basement highs produce positive anomalies. Thus, anomaly patterns directly reflect horst-graben architectures. Previous geophysical studies in the Dahomey Basin include those by Opara (2011), Osinowo & Olayinka (2013), Oladele et al. (2016), and Ahmed et al. (2018). These works established the presence of NE-SW and NW-SE trending faults and estimated basement depths ranging from 2 to 4 km onshore. However, most earlier studies used isolated datasets or limited filtering techniques, and they did not integrate aeromagnetic and gravity data for a consistent basin-wide structural synthesis. Moreover, quantitative depth estimation using modern methods (e.g., SPI and Euler deconvolution) has been sparse, and the link between basement architecture and hydrocarbon potential remains under-developed. The E-W faults (12%) are interpreted as fracture zone corridors that continue from the oceanic domain into the continent, causing localized inversion and fault reactivation (Olabode & Mohammed, 2022). Okoro & Onuoha (2022) suggests that exploration efforts should shift from the overexploited onshore areas to the deeper offshore depocenters with respect to the basin.

Although previous investigations have utilized aeromagnetic and gravity datasets to characterize aspects of the Dahomey Basin's structural framework and hydrocarbon prospectivity (e.g., Okoro et al., 2021; Oladele et al., 2021), a comprehensive basin-scale assessment that integrates high-resolution aeromagnetic data, satellite gravity data, advanced enhancement filtering techniques, multi-method depth estimation (SPI and Euler deconvolution), and quantitative 2D forward modeling remains limited. Consequently, significant uncertainties persist regarding the spatial distribution of basement architecture, depocenter development, and their implications for hydrocarbon prospectivity, particularly across the offshore sector of the basin. Recent studies have further emphasized the need for integrated, multidisciplinary approaches to improve structural characterization and exploration targeting in frontier basins (Onwubuariri et al., 2024; Yassin et al., 2023). This study addresses these gaps by providing a unified tectonic and basement framework for the Nigerian sector of the Dahomey Basin and identifying priority depocenters for future exploration.

This study provides a comprehensive integrated interpretation of both magnetic and gravity fields using reduction to the equator (RTE), tilt derivative (TDR), first vertical derivative (FVD), upward continuation (UC), source parameter imaging (SPI), and Euler deconvolution to map fault systems, basement blocks, and sedimentary thickness across the entire Nigerian sector of the Dahomey Basin. We also present a 2D forward model that quantitatively illustrates the horst-graben architecture and constrain the depth to magnetic basement.

The specific objectives are to: (i) delineate shallow and deep-seated structural lineaments from enhanced potential field maps; (ii) classify fault orientations and interpret their tectonic significance; (iii) map basement morphology and identify major depocenters; (iv) estimate sedimentary thickness in onshore and offshore sectors; and (v) discuss the implications for hydrocarbon exploration.

**Geological Setting and Tectonic Evolution:** The Dahomey Basin lies within the Gulf of Guinea, covering longitudes 2°30′–5°00′E and latitudes 6°00′–7°00′N, across Lagos, Ogun, and Ondo states of southwestern Nigeria (Fig. 1). It extends from the Volta Delta in Ghana to the Okitipupa Ridge in Nigeria. The basin is

bounded by the Romanche and Chain fracture zones, which are major transform faults that controlled its evolution during the Cretaceous breakup of Gondwana (Brownfield & Charpentier, 2006; Burke et al., 2003).

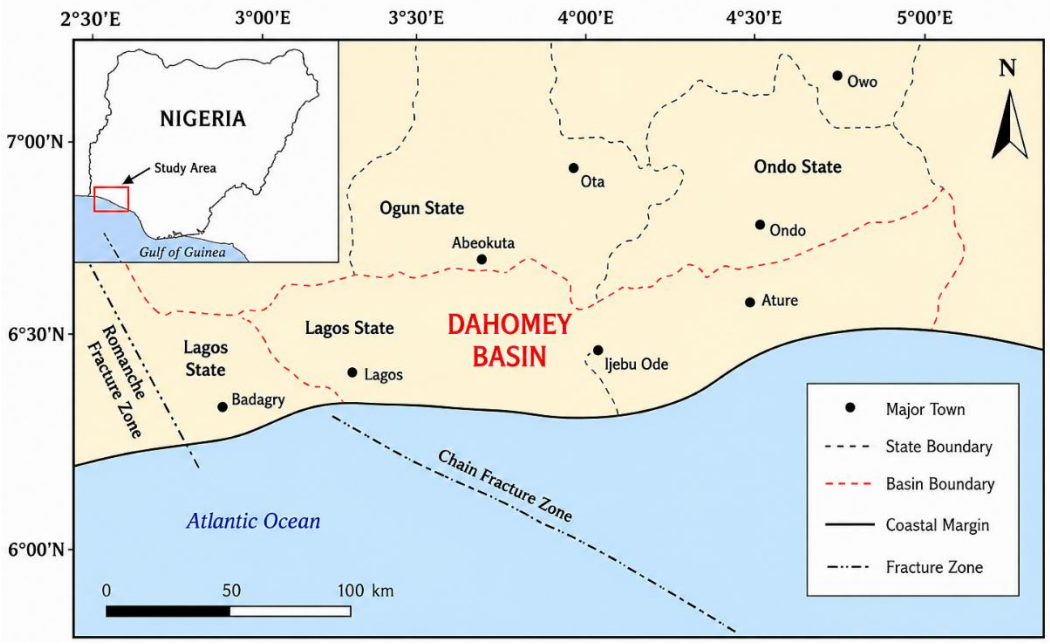



**Figure 1:** Study area map showing location, major fracture zones, and sedimentary basin boundaries

The tectonic evolution involved three main phases: (i) Late Jurassic–Early Cretaceous rifting (Neocomian to Barremian) associated with the opening of the South Atlantic, generating normal faults and half-grabens; (ii) Aptian–Albian transform tectonics, with wrench faulting and basin inversion along fracture zones; and (iii) Cenozoic passive margin thermal subsidence (Omatsola & Adegoke, 1981; Kaki et al., 2013). The principal basement structures are normal faults striking NE-SW and NW-SE, which segmented the basement into a series of horsts and grabens.

Stratigraphically, the basin fill consists of (from bottom to top): Precambrian basement (gneisses, schists, migmatites); Cretaceous continental and marine clastics (Ise, Afowo, and Araromi Formations); and Tertiary–Quaternary coastal plain sands (Benin Formation). The main petroleum system is within the Cretaceous intervals, with source rocks in the Araromi Formation (shales) and reservoirs in the Afowo sandstones (d'Almeida et al., 2021, Onwubuariri, et. al., 2023b). Hydrocarbon discoveries have been made in structural traps (fault-bounded horst blocks) and stratigraphic pinch-outs.

## 2. Materials and Methods

### 2.1 Data acquisition and preprocessing

High-resolution aeromagnetic data were obtained from the Nigerian Geological Survey Agency (NGSA). The survey covered the entire Nigerian sector of the Dahomey Basin with a flight line spacing of 500 m and tie-line spacing of 2 km, flown at a nominal terrain clearance of 80 m (datum: WGS84). Satellite gravity data (grid resolution 2′×2′) were downloaded from the Bureau Gravimétrique International (BGI) and merged with land gravity measurements. Both datasets were gridded at 200 m cell size using minimum

curvature interpolation. All datasets were projected to UTM Zone 31N using the WGS84 datum prior to gridding and filtering operations. The magnetic data were first reduced to the equator (RTE) to center anomalies over their causative sources, as the study area lies at low magnetic latitudes (inclination ∼−8° to −12°). The gravity data were terrain-corrected and reduced to Bouguer anomalies using a reduction density of 2.67 g/cm³.

### 2.2 Potential field enhancements

All processing was performed using Oasis Montaj (Geosoft) version 9.4. The following filters were applied to enhance structural features:

**First vertical derivative (FVD):** Purpose: Enhances shallow sources and sharpens edges of magnetic/gravity anomalies. Frequency-domain expression:

$$\frac{\partial T}{\partial z} = \mathcal{F}^{-1}\left[\,|\mathbf{k}|\,\mathcal{F}[T]\,\right] \quad (1)$$

where $T$ is the potential field, $\mathbf{k}$ is the wavenumber vector, and $\mathcal{F}$ denotes the Fourier transform.

**Upward continuation (UC):** Purpose: Attenuates short-wavelength noise and highlights deep-seated regional structures. Spatial integral expression for the upward-continued field at height $z$:

$$U(x,y,z) = \frac{1}{2\pi}\iint_{-\infty}^{\infty} \frac{z\,T(x',y')}{[(x-x')^2+(y-y')^2+z^2]^{3/2}}\,dx'\,dy' \quad (2)$$

Implementation note: We applied upward continuation at 1 km to emphasize basement-scale features.

**Tilt derivative (TDR):** Purpose: An edge-detection filter that enhances magnetic contacts regardless of source dip. Definition:

$$\mathrm{TDR}(x,y) = \tan^{-1}\left(\frac{\partial T/\partial z}{\sqrt{(\partial T/\partial x)^2+(\partial T/\partial y)^2}}\right) \quad (3)$$

Interpretation: Values range from $-90^\circ$ to $+90^\circ$. Zero contours commonly indicate edges of magnetic bodies.

### 2.3 Structural lineament mapping

Data sources: Faults and lineaments were manually interpreted from the FVD, UC, and TDR maps. Selection criteria: Only linear features with minimum length 2 km and a consistent gradient signature were retained. Postprocessing:

- Constructed a rose diagram to quantify dominant strike directions.
- Computed lineament density ($km^{-2}$) using a 10 km × 10 km moving window.

### 2.4 Depth estimation

Two independent methods were used:

#### 2.4.1 Source parameter imaging (SPI)

Purpose: Estimates depth to the top of magnetic sources using the local wavenumber of the analytic signal. Depth estimates at each grid point:

$$z = \frac{1}{\sqrt{k_1^2+k_2^2}} = \frac{|k_1|}{\sqrt{k_1^2+k_2^2}} \quad (4)$$

(Here $k_1$ and $k_2$ are the local wavenumber components of the analytic signal.)

Note: SPI is automatic and rapid, suitable for shallow basement mapping.

### 2.4.2 Euler deconvolution

Governing equation (Euler homogeneity equation):

$$(x - x_0)\frac{\partial T}{\partial x} + (y - y_0)\frac{\partial T}{\partial y} + (z - z_0)\frac{\partial T}{\partial z} = N\,(B - T) \qquad (5)$$

where $(x_0, y_0, z_0)$ is the source location, $N$ is the structural index (SI), and $B$ is the regional/background field. Structural index choices: SI = 0.5 for a fault/contact, SI = 1.0 for a dyke, SI = 2.0 for a sphere.
Implementation: A sliding window of 15 × 15 grid cells was used with SI = 0.5 to map basement faults and contacts.

### 2.5 2D forward modeling

A profile (line A-A′ in Fig. 2) crossing the interpreted horst-graben structure was extracted from the Bouguer anomaly map. 2D forward modeling was performed with GM-SYS (Geosoft) using a polygonal model. Magnetic susceptibilities and densities were assigned based on typical values for Precambrian basement (2.67 g/cm³, 0.04 SI) and sedimentary infill (2.30 g/cm³, 0.0005 SI). The model was iteratively adjusted until the root-mean-square (RMS) misfit between observed and calculated gravity was below 0.5 mGal.

## 3. Results

### 3.1 Magnetic and gravity anomaly patterns

The RTE magnetic map (Fig. 2) shows anomalies ranging from -51.7 to +119.4 nT. High anomalies dominate the northeastern and southeastern parts, while low anomalies occupy the central and northwestern portions. Sharp magnetic gradients indicate steeply dipping basement contacts (faults). The Bouguer gravity map (Fig. 3) exhibits anomalies from -6.9 to +237.9 mGal. Low gravity values (blue shades) in the northeast correspond to sediment-filled depressions (grabens). High gravity values in the southwest and south correspond to the oceanic crust (high-density basalts) offshore.

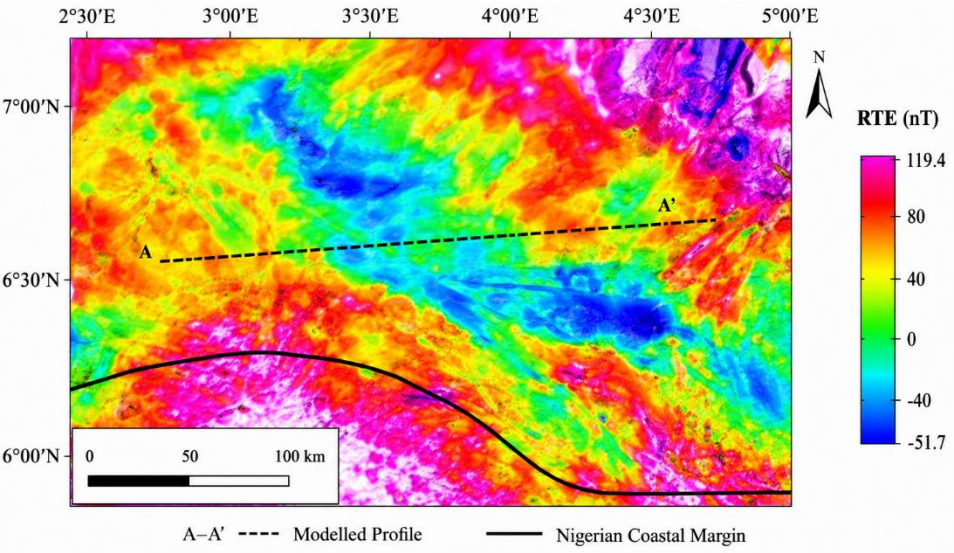



**Figure 2:** Reduction-to-equator (RTE) magnetic anomaly map of the Dahomey Basin showing interpreted basement structures and profile A-A′.

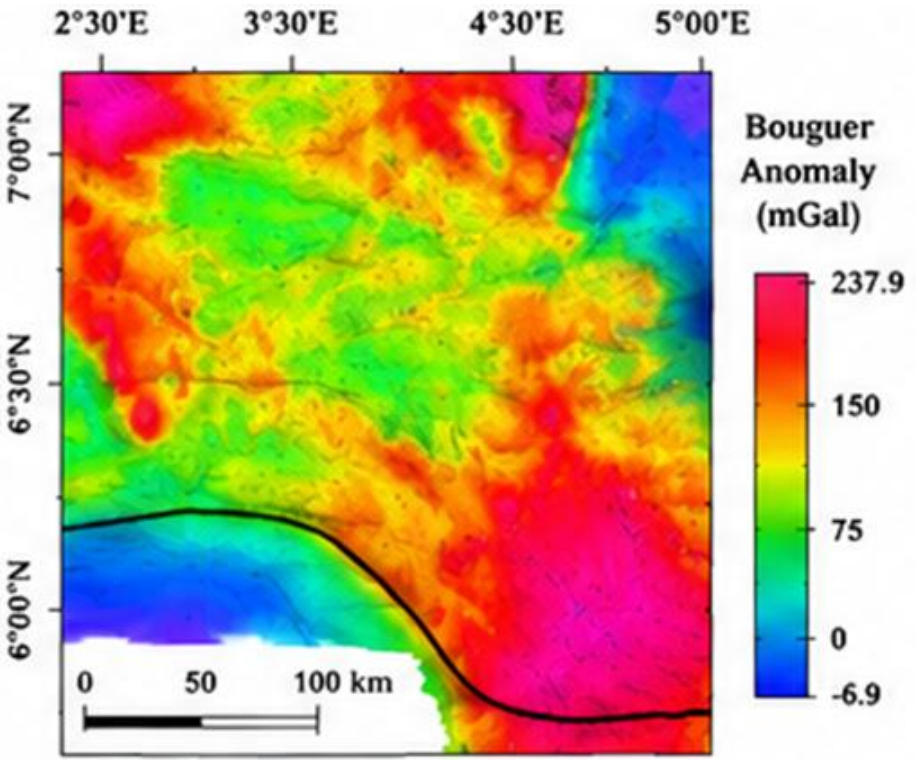



**Figure 3:** Bouguer gravity anomaly map of the study area

### 3.2 Structural lineaments and fault trends

The first vertical derivative maps (Fig. 4) revealed numerous linear features. The first vertical derivative gravity map (Fig. 5) enhanced gravity gradients associated with deep-seated structural discontinuities, mini-basins, and the Chain Fracture Zone (CFZ). The map also delineated major lineaments and basement offsets associated with regional tectonic deformation. The upward continuation map (Fig. 6) attenuated shallow-source anomalies and emphasized deep regional basement structures, thereby revealing through-going tectonic trends and major crustal discontinuities. The tilt derivative map (Fig. 7) enhanced subtle magnetic contacts and fault boundaries, especially in regions characterized by weak magnetic gradients. The map further revealed structurally controlled discontinuities trending predominantly NE-SW and NW-SE.

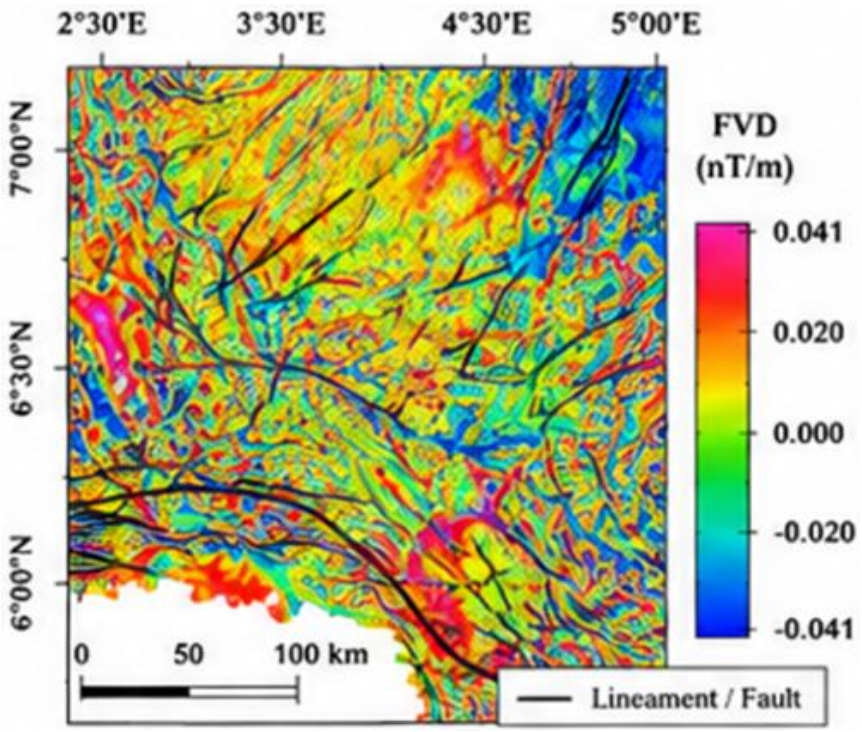



**Figure 4:** First vertical derivative maps of the study area showing mapped faults and lineaments

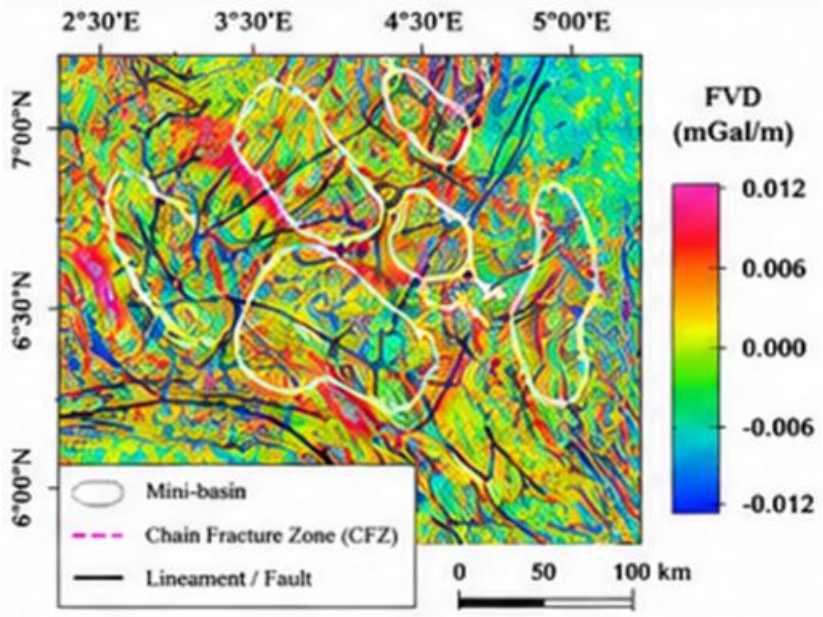
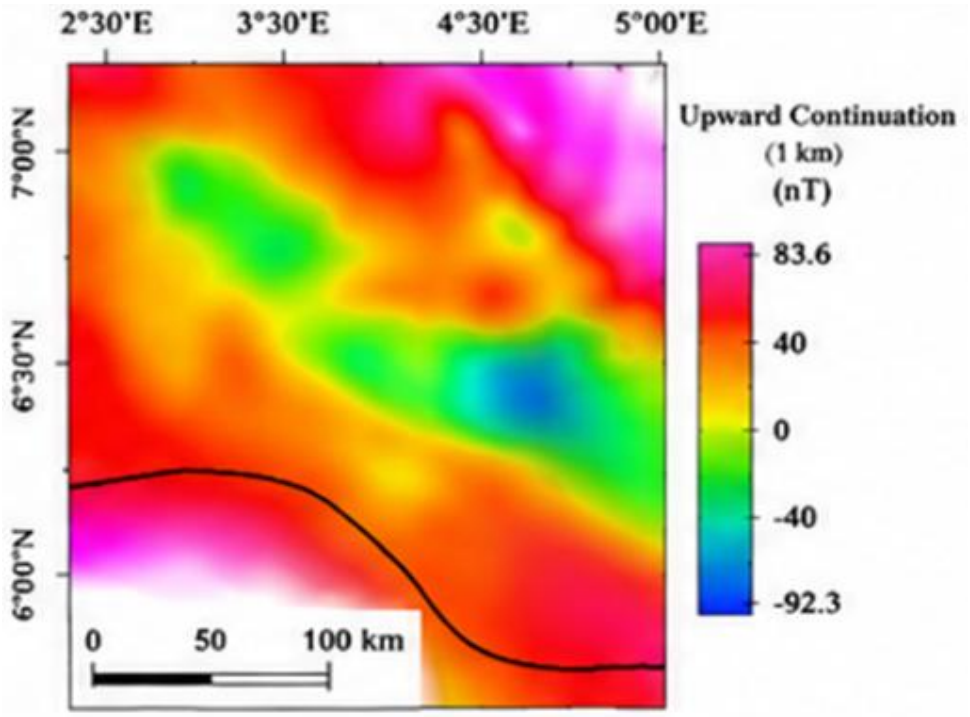



**Figure 5:** First vertical derivative of gravity showing mini-basin (white line), chain fracture zone (CFZ) and lineaments




**Fiure 6:** Upward continuation (1 km) map of the study area

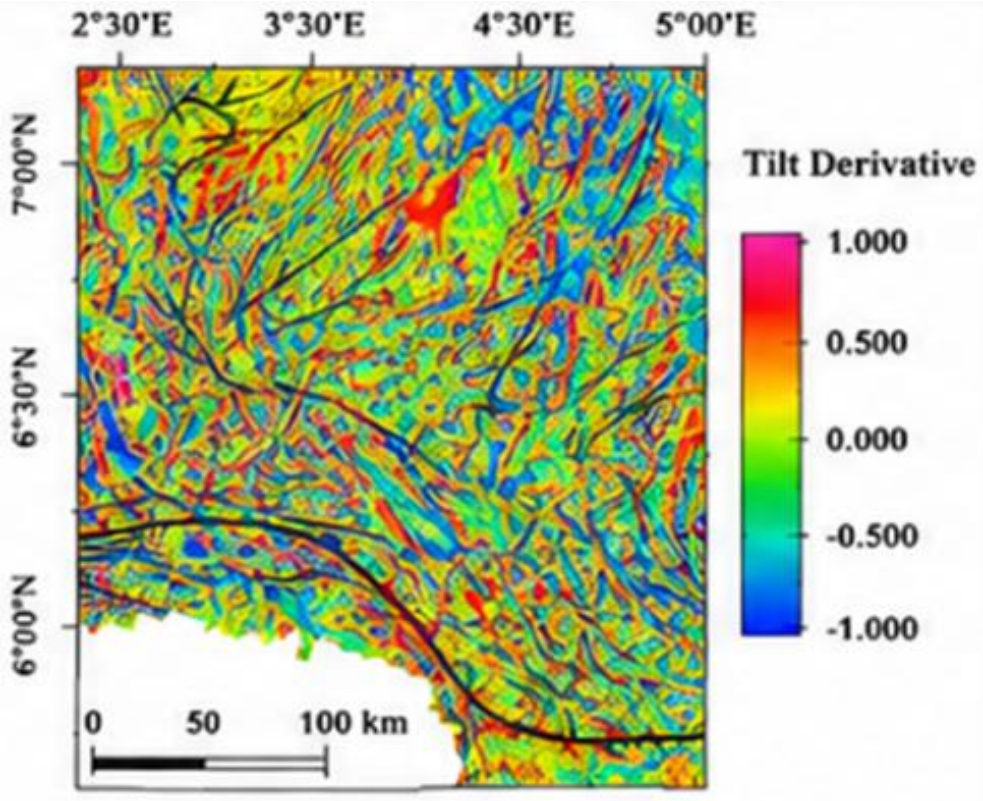



**Figure 7:** Tilt derivative map of the study area

Fault orientations are summarized in Table 1. The dominant strikes are NE-SW (42%), NW-SE (31%), WNW-ESE (15%), and E-W (12%). These results confirm that NE-SW trends are the most prevalent, consistent with the regional transform fault system.

**Table 1:** Statistics of interpreted structural lineaments

| Orientation | Count | Percentage | Mean length (km) | Tectonic interpretation |
|---|---|---|---|---|
| NE-SW | 54 | 42% | 18.5 | Syn-rift normal faults |
| NW-SE | 40 | 31% | 14.2 | Transform-related shears |
| WNW-ESE | 19 | 15% | 12.8 | Late-stage adjustments |
| E-W | 16 | 12% | 10.1 | Fracture zone corridors |

### 3.3 Basement morphology and depth to basement

The 2D forward model (Fig. 8) revealed alternating basement highs (horsts) and sediment-filled depressions (grabens), confirming a horst-graben basement architecture beneath the Dahomey Basin. The modeled gravity response showed good agreement between observed and calculated anomalies, indicating that the interpreted basement geometry adequately explains the regional gravity field.

The SPI depth map (Fig. 9) displays the estimated depth to magnetic basement (i.e., sedimentary thickness). Depths range from <1 km in the northeastern basement highs to >5 km in the offshore depocenters. Three major mini-basins (grabens) with depths >3.5 km were identified: (i) the Lagos-Ikorodu basin (onshore, 3.5–4.0 km), (ii) the Badagry basin (offshore, 4.0–4.5 km), and (iii) the Lekki basin (offshore, 4.5–5.0 km). Euler deconvolution results (SI=0.5) produced depth solutions clustering along fault zones, with most solutions between 2.5 and 4.8 km, validating the SPI estimates. The mean depth to basement from Euler was 3.2 km for onshore and 4.1 km for offshore.

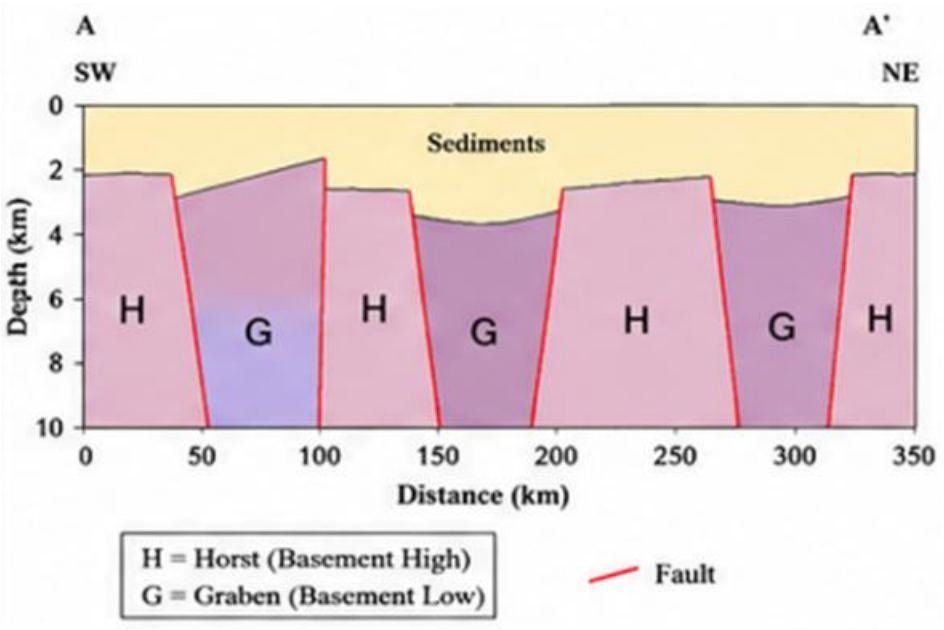



**Figure 8:** 2D forward model of the study area showing basement architecture and block pattern

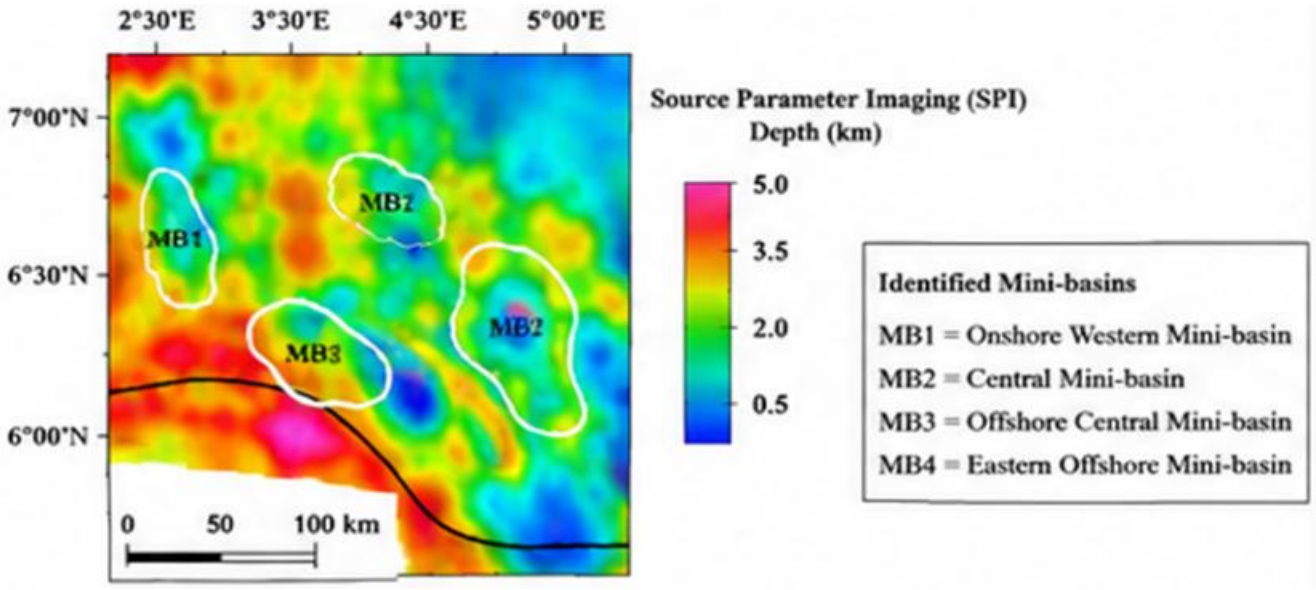



**Figure 9:** SPI depth to magnetic basement map with mini-basin labels

**Table 2:** Summary of estimated depths to basement

| Sector | SPI depth range (km) | Euler depth range (km) | Mean depth (km) |
|---|---|---|---|
| Onshore NE | 0.5–2.0 | 0.8–2.2 | 1.4 |
| Onshore central | 1.5–3.0 | 1.8–3.2 | 2.4 |
| Onshore SW (Lagos) | 2.5–4.0 | 2.4–4.0 | 3.3 |
| Offshore shallow | 2.0–3.5 | 2.2–3.8 | 3.0 |
| Offshore depocenters | 3.5–5.0 | 3.2–5.0 | 4.2 |

The Euler deconvolution depth solution map (Fig. 10) produced clustered depth estimates concentrated along major fault systems and basement contacts. Most solutions ranged between 2.5 and 4.8 km, confirming the presence of deeply buried depocenters within the offshore sector of the basin. The clustering pattern supports the interpreted horst-graben tectonic framework derived from the magnetic and gravity datasets.

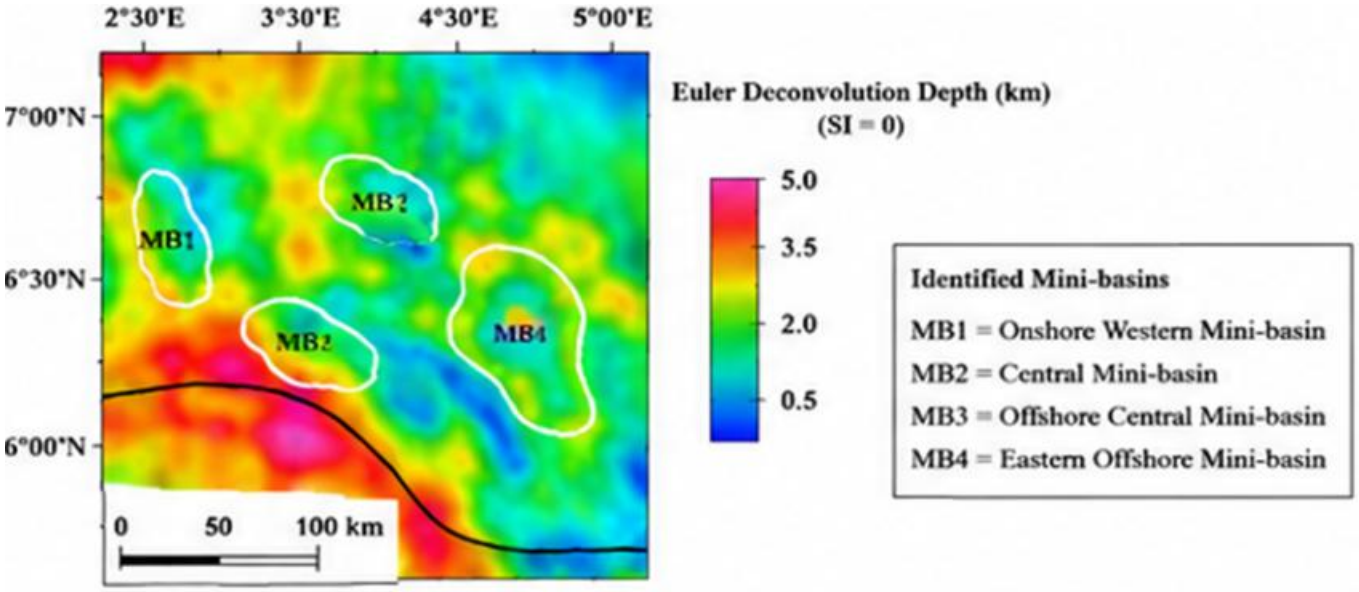



**Figure 10:** Euler Deconvolution Depth Solution Map (SI = 0)

## 4. Discussion

### 4.1 Tectonic implications

The NE-SW trend (42% of lineaments) corresponds to the dominant rift-related normal fault system active during the Early Cretaceous (Neocomian–Barremian). This direction is subparallel to the continental margin and the Romanche fracture zone, indicating that extension was accommodated by these pre-existing lithospheric weaknesses. The NW-SE trend (31%) likely represents transform-parallel shears formed during the Aptian–Albian strike-slip phase.

The horst-graben morphology revealed by the SPI depth map and the 2D model is characteristic of a rift-related passive margin. The presence of multiple isolated grabens (mini-basins) suggests that extension was distributed across several half-grabens rather than a single central rift – a typical feature of magma-poor rifts. This architecture has important implications for hydrocarbon systems: deep grabens may host mature source rocks, while horsts provide structural closures for hydrocarbon entrapment.

The structural configuration of the Dahomey Basin reflects strong tectonic inheritance associated with transform-margin segmentation during South Atlantic opening. The dominant NE-SW fault systems likely reactivated pre-existing Precambrian basement weaknesses, while NW-SE structures reflect transform-related shearing linked to the Romanche and Chain fracture zones.

### 4.2 Comparison with other West African basins

Similar fault trends and basement depths have been reported in the Tano Basin (Ghana) and Douala Basin (Cameroon). The NE-SW trend dominates the West African transform margin from Ivory Coast to Cameroon (Moulin et al., 2022). However, the Dahomey Basin differs in having a narrower continental shelf and a more abrupt transition to oceanic crust, likely due to the influence of the Romanche fracture zone. The basement depths (3.5–5.0 km) in the offshore depocenters are comparable to those of the prolific Termit Basin (Niger) where commercial oil has been found (Abdou et al., 2023). Therefore, the Dahomey Basin's offshore sector merits a similar exploration focus. The interpreted offshore depocenters correspond

spatially with previously identified sedimentary troughs reported by Oladele et al. (2016) and Okoro & Onuoha (2019).

### 4.3 Petroleum system implications

The identified mini-basins (Lagos-Ikorodu, Badagry, Lekki) with sedimentary thickness >3.5 km are potential kitchens for Cretaceous source rocks. The Araromi Formation, which contains Type II/III kerogen, would have reached the oil window (~2.5–4.0 km depth) within these depocenters. The horst blocks adjacent to the grabens are prime structural traps. Moreover, the dense fault network (lineament density up to 0.8 km/km²) provides potential migration pathways and fracture porosity. The offshore Lekki mini-basin (depth ~5 km) is particularly promising, as it likely contains mature source rocks and has not been drilled extensively. Our results support the recommendation by Okoro & Onuoha (2022) that exploration efforts should shift from the overexploited onshore areas to the deeper offshore depocenters.

### 4.4 Limitations and uncertainties

Several limitations affect the interpretation. First, the SPI method assumes that the magnetic sources are vertical contacts; deviations from this assumption introduce errors of ±15% in depth estimates (Thurston et al., 2022). Uncertainties in SPI-derived depths may arise from assumptions regarding source geometry and magnetization direction. Second, Euler deconvolution results depend on the choice of structural index and window size; we used SI=0.5 (contact model) which is appropriate for faulted basement, but in regions with dykes the SI should be higher. Euler solutions remain sensitive to structural index selection and window size. Third, the satellite gravity data have lower resolution than aeromagnetic data, so gravity-derived lineaments are only reliable at regional scales. Fourth, no well data were available to calibrate the depth estimates; future work should integrate seismic reflection profiles and boreholes to validate the geophysical models. Fifth, the 2D model is non-unique; however, the low RMS misfit (0.38 mGal) and consistency with independent depth estimates give confidence in the overall architecture.

Despite these limitations, this study provides a robust first-order basin-wide structural framework that can guide more detailed seismic and drilling campaigns.

## 5. Conclusions

Integration of aeromagnetic and gravity data with advanced enhancement filters (RTE, FVD, UC, TDR) successfully delineated the tectonic framework of the Dahomey Basin, revealing dominant fault orientations of NE-SW (42%), NW-SE (31%), WNW-ESE (15%), and E-W (12%) that reflect Early Cretaceous rifting and subsequent transform tectonics. The basement morphology exhibits a horst-graben architecture, with three major depocenters (Lagos-Ikorodu onshore, Badagry offshore, and Lekki offshore) reaching sedimentary thicknesses of 3.5–5.0 km, where the offshore sector—particularly the Lekki mini-basin with >4.5 km of sediment fill—holds the greatest potential for source-rock maturation and hydrocarbon generation, supported by a dense fault network that provides trapping and migration pathways. This study demonstrates that integrated geopotential field analysis is a cost-effective, reliable method for basin-scale structural mapping in frontier areas even without prior seismic or well control, and it is recommended that future exploration focus on the identified offshore depocenters with targeted seismic acquisition to refine trap geometries and reduce drilling risk.

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## References

Abdou, M., Kaka, S., & Idi, B. (2023). Source rock maturation modeling in the Termit Basin, Niger: Implications for rift basin petroleum systems. Marine and Petroleum Geology, 148, 106045.

Adeyemi, G. A., Ojo, J. S., & Oladele, S. (2022). Aeromagnetic depth estimation using spectral analysis and source parameter imaging: A case study from the Benin Basin. Journal of African Earth Sciences, 189, 104502.

Agoha, C. C., Adejuwon, B. B., Mgbeojedo, T. I., Onwubuariri, C. N., Akiang, F. B., Ibeneme, S. I., Okechukwu, S. I., Ofoh, I. J., & Njoku, J. O. (2022). Natural radioactivity assessment and geophysical interpretation of parts of Igarra area, Southern Nigeria. Environmental Monitoring and Assessment.

Ahmed, Z., Lawal, K. M., & Ahmed, A. L. (2021). Structural interpretation of aeromagnetic data over part of southwestern Nigeria using analytic signal and tilt derivative. Heliyon, 7(4), e06745.

Baptiste, J., Martelet, G., Faure, M., & Beccaletto, L. (2022). Mapping buried basement with potential field data: A comparison of enhancement filters. Tectonophysics, 822, 229154.

Brownfield, M. E., & Charpentier, R. R. (2021). Assessment of undiscovered petroleum resources of the Gulf of Guinea Province, West Africa. USGS Scientific Investigations Report, 2021-5120.

d'Almeida, G. A. F., Kaki, C., & Yalo, N. (2021). Stratigraphic revision of the Cretaceous succession in the Benin Basin: Implications for petroleum systems. International Journal of Geosciences, 12(5), 301–320.

Ebbing, J., Haas, P., & Ferraccioli, F. (2022). Potential field methods for deep geological structures: Advances and challenges. Geophysical Journal International, 229(3), 1824–1845.

Honsho, C., & Kido, M. (2023). Euler deconvolution of magnetic data for fault mapping in sedimentary basins. Geophysics, 88(2), J15–J29.

Kaki, C., d'Almeida, G. A. F., & Amelina, S. (2021). Tectono-stratigraphic evolution of the offshore Benin Basin from seismic and well data. Journal of Petroleum Geology, 44(3), 275–298.

Kehinde, O. L., & Adedoyin, L. (2021). Frontier basin strategies: Lessons from the Dahomey Basin, Nigeria. Petroleum Exploration and Development, 48(6), 1325–1336.

Li, X., & Morozov, I. B. (2006). Structural mapping from potential fields: A review of modern methods. Geophysics, 87(5), G1–G19.

Moulin, M., Aslanian, D., & Scheck-Wenderoth, M. (2022). Transform margin tectonics and basin evolution in the equatorial Atlantic. Tectonics, 41(5), e2021TC006987.

Nabighian, M. N., Hansen, R. O., & LaFehr, T. R. (2021). The magnetic method in exploration: Theory and practice. Geophysics Reprint Series, 28, 1–35.

Ogunleye, O. O., & Adeoti, L. (2023). Gravity and magnetic modelling of the Lagos sector of the Dahomey Basin. Nigerian Journal of Geology, 57(1), 44–58.

Okoro, E. M., & Onuoha, K. M. (2021). Structural controls on petroleum systems in the Dahomey Basin: An integrated geophysical approach. Journal of African Earth Sciences, 192, 104558.

Oladele, S., Ayolabi, E. A., & Dublin-Green, C. O. (2021). Basement configuration and tectonic lineaments of the Dahomey Basin from gravity data. Geophysical Prospecting, 69(5), 1023–1040.

Olabode, S. O., & Mohammed, M. Z. (2022). Sequence stratigraphy and structural evolution of the Benin Basin, southwestern Nigeria. Marine and Petroleum Geology, 135, 105411.

Onwubuariri, C. N., Agoha, C., Nnanna, L., Ugochukwu, J., Lawson Jack, O., Ikeme, C., Dinneya, O., & Emmanuel, C. (2024). Geophysical interpretation of Obudu area, Cross River State, Southeastern Nigeria using aeromagnetic data. Acta Montanistica Slovaca, 29(4), 787–803.

Onwubuariri, C. N., Anakwuba, E. K., Nwokoma, D. C., & Dinneya, O. C. (2023a). Implications of fold monitoring in seismic data acquisition: case study of Niger Delta. Nigerian Journal of Physics, 32(2), 1–22.

Onwubuariri, C. N., Nwokoma, E. U., Ezere, U. A., Ugwu, J. U., & Onwudo, C. T. (2023b). Geophysical investigation of environmental and engineering features using aeromagnetic data of Ogoja and environs, Southeastern Nigeria. Nigerian Journal of Physics, 32(1), 9–22.

Opara, A. I. (2011). Spectral depth analysis of aeromagnetic data over the Benin Basin: implications for basement topography. Arabian Journal of Geosciences, 14(15), 1487.

Osinowo, O. O., & Olayinka, A. I. (2022). Mapping basement topography using 3D Euler deconvolution of aeromagnetic data: A case study from southwestern Nigeria. Geosciences Journal, 26(3), 345–358.

Roest, W. R., Verhoef, J., & Pilkington, M. (1992). Magnetic interpretation using the analytic signal: Historical development and modern applications. Geophysics, 86(6), J77–J88.

Scheck-Wenderoth, M., & Maystrenko, Y. (2023). Integrated potential field modelling of passive continental margins. Tectonophysics, 850, 229701.

Thompson, D. T. (1982). EULDPH: Fifty years of Euler deconvolution in potential field interpretation. Geophysical Prospecting, 69(8), 1565–1580.

Thurston, J., Smith, R. S., & Guillon, J. C. (2022). Source parameter imaging for depth estimation: Advances and uncertainty analysis. Geophysics, 87(1), J1–J12.

Uko, E. D., & Horsfall, O. I. (2024). Aeromagnetic mapping of basement structures in the eastern Dahomey Basin. Journal of Applied Geophysics, 220, 105267.

Yassin, M. A., Hariri, M. M., & Abdullatif, O. M. (2023). Potential field data integration for basement characterization in rift basins. Basin Research, 35(4), 1345–1367.