ISSN: 2320-5407
International Journal of Advanced Research
Publisher's Name: Jana Publication and Research LLP
www.journalijar.com

REVIEWER'S REPORT

Manuscript No.: IJAR- 59637

Title: Contribution of Airborne Geophysical Imaging to the Mapping of Birimian Formations in the Kalamon Mining Permit, Bouna, Northeastern Côte d'Ivoire.

Recommendation:
Accept as it is .....
Accept after Minor revision.....
Accept after Major revision
Do not accept (*Reasons below*)

Rating	Excel.	Good	Fair	Poor
Originality		✓		
Techn. Quality		✓		
Clarity			✓	
Significance			✓	

Reviewer Name: Dr. ANAPANA GOPAL

Reviewer's Comment for Publication.

General Comments

The manuscript presents an interesting geological investigation of the Kalamon mining permit in northeastern Côte d'Ivoire, focusing on the application of airborne geophysical techniques and petrographic analysis for mapping concealed geological formations beneath thick lateritic cover. The study combines aeromagnetic data, gamma-ray spectrometry, GIS-based interpretation, field observations, drill-core investigations, and microscopic examination of rock samples.

The integration of geophysical imaging with petrographic observations is a significant strength of the manuscript, particularly in areas where extensive lateritic weathering limits conventional geological mapping. The identification of three major lithological units, including undeformed granodiorite, deformed granodiorite, and dolerite dykes, provides useful information about the geological architecture of the study area.

The manuscript also attempts to establish relationships between magnetic anomalies, mineralogical composition, structural lineaments, and the emplacement of dolerite dykes. The figures, geological maps, photomicrographs, and structural rose diagrams contribute to the overall presentation of the research.

However, several aspects require further clarification and improvement before publication. In particular, the airborne geophysical data-processing procedures, interpretation of radiometric data, validation of geological boundaries, petrographic sampling details, and structural interpretations need to be strengthened. There are also inconsistencies in the reported structural orientations between the abstract, results, discussion, and conclusion.

Overall, the manuscript has scientific relevance and potential contribution to geological mapping and mineral exploration, but it requires substantial technical and editorial revisions.

ISSN: 2320-5407
International Journal of Advanced Research
Publisher's Name: Jana Publication and Research LLP
www.journalijar.com

REVIEWER'S REPORT

Content and Originality

The manuscript addresses an important geological problem by demonstrating how airborne geophysical techniques can assist in identifying concealed lithological units and structural features beneath thick lateritic weathering profiles.

The combined application of aeromagnetic imaging, gamma-ray spectrometry, and petrographic investigation provides a useful multidisciplinary approach. The identification of dolerite dykes and their relationship with the regional structural framework is particularly relevant to understanding the geological evolution of the Birimian formations.

The originality of the study lies in integrating geophysical interpretation with drill-core petrography to characterize geological units that are difficult to identify through surface observations alone.

However, the following aspects require further attention:

- The authors should clearly identify the specific research gap and explain how this study advances previous geological and geophysical investigations in the Kalamon and Bouna regions.
- The contribution of gamma-ray spectrometry to lithological discrimination should be explained more explicitly, as the manuscript mainly emphasizes aeromagnetic interpretation.
- The distinction between geophysical anomalies and confirmed geological structures should be maintained throughout the manuscript.
- The proposed relationship between structural lineaments and dolerite dyke emplacement requires stronger geological evidence.
- The interpretation of the three lithological units should be supported by clearer comparative petrographic and geophysical evidence.
- The regional geodynamic interpretation should be presented cautiously, particularly because the manuscript does not provide direct geochronological or geochemical evidence for determining the precise emplacement age of the dolerite dykes.
- The authors should explain the significance of the identified dyke orientations in relation to previously reported structural trends in the West African Craton.

The study has potential originality, but its contribution to regional geological understanding should be articulated more clearly.

Technical Quality

The manuscript requires further improvement in geophysical methodology, data interpretation, petrographic validation, and structural analysis.

1. Airborne geophysical survey details: The authors provide information about flight-line spacing (200 m), sampling interval (5 m), and nominal flight height (80 m). However, important technical details of the airborne survey are missing. The authors should specify the flight-line and tie-line orientations, survey area, magnetic data corrections, levelling procedures, gridding parameters, and quality-control methods.

2. Aeromagnetic data processing: The manuscript discusses Reduction to the Pole (RTP), First Vertical Derivative (1VD), and Analytical Signal (AS). The authors should provide more detailed explanations of the processing parameters and justify the suitability of RTP for the magnetic latitude of the study area. The magnetic inclination and declination values used for processing should also be reported.

3. Gamma-ray spectrometry: Although gamma-ray spectrometry is mentioned in the abstract and methodology, its contribution to the final geological interpretation is not

ISSN: 2320-5407
International Journal of Advanced Research
Publisher's Name: Jana Publication and Research LLP
www.journalijar.com

REVIEWER'S REPORT

sufficiently demonstrated. The authors should include the relevant potassium (K), thorium (Th), and uranium (U) distribution maps or explain how these radiometric datasets contributed to the discrimination of geological units.

4. Geological mapping and lithological classification: The identification of three geological units is an important result. However, the criteria used to distinguish undeformed granodiorite, deformed granodiorite, and dolerite dykes should be explained more systematically. The authors should clarify how magnetic signatures, field observations, drill-core descriptions, and petrographic characteristics were integrated to establish the final geological boundaries.

5. Petrographic sampling: The methodology mentions the collection of approximately 100 samples and the preparation of about 20 thin sections. The authors should explain the selection criteria, sample distribution, borehole locations, and representativeness of the samples used for microscopic examination. A table summarizing sample identification, location, lithology, and petrographic characteristics would improve the scientific presentation.

6. Mineralogical identification: The manuscript provides detailed descriptions of quartz, feldspars, biotite, plagioclase, augite, titaniferous magnetite, and ilmenite. However, the identification of some mineral phases and their estimated percentages should be supported by clearer petrographic evidence. The authors should explain whether mineral percentages were visually estimated or determined using quantitative modal analysis.

7. Magnetic susceptibility and density measurements: Table I presents magnetic susceptibility values for the three lithological units, while the text also provides density ranges. The authors should explain the measurement procedures, number of samples analyzed, instrument calibration, and statistical basis for these values. The density-measurement method is not adequately described in the methodology.

8. Structural lineament analysis: The manuscript identifies three major lineament families based on the magnetic data. However, the criteria used for extracting, selecting, and classifying the lineaments require further clarification. The authors should provide information about the minimum lineament length, extraction threshold, interpretation procedure, and statistical analysis.

9. Inconsistency in structural orientations: There is an important inconsistency between the abstract, results, discussion, and conclusion regarding the dominant structural directions. The results identify NE–SW, NW–SE, and E–W lineament families, whereas the discussion emphasizes N120°–N130°, N080°–N100°, and N030°–N040°. The conclusion refers to N–S to NNE–SSW and NW–SE orientations. These directional classifications should be carefully checked and harmonized throughout the manuscript. The authors should also distinguish between dyke orientations, magnetic lineaments, and fracture orientations.

10. Ground validation: The authors mention that surface observations were limited because of extensive lateritic weathering and that drill-core investigations were used for validation. The relationship between the interpreted geophysical lineaments and the actual geological structures identified in the boreholes should be demonstrated more clearly. Additional geological cross-sections or representative borehole logs would strengthen the interpretation.

11. Interpretation of dolerite dykes: The manuscript identifies dolerite dykes as the youngest lithological unit and associates their emplacement with inherited tectonic structures. However, the authors should provide further evidence supporting their

ISSN: 2320-5407
International Journal of Advanced Research
Publisher's Name: Jana Publication and Research LLP
www.journalijar.com

REVIEWER'S REPORT

relative geological age, orientation, continuity, and structural relationships with the surrounding granodiorites.

12. Geodynamic interpretation: The discussion relates the dolerite dyke emplacement to post-orogenic extensional or transtensional tectonic processes during the evolution of the West African Craton. This interpretation is interesting, but the authors should distinguish between interpretations supported by the present observations and regional geological hypotheses derived from previous studies. Geochemical and geochronological evidence would be necessary to establish the proposed tectonic setting more conclusively.

13. Figures and geological maps: Figures 3, 6, 7, and 8 are important for understanding the geophysical interpretation and geological mapping. However, their resolution, legends, colour schemes, scale bars, and annotations should be improved. The geological boundaries and interpreted dyke locations should be clearly distinguishable.

14. Reproducibility: The authors should provide sufficient information about the software, processing workflow, coordinate system, geophysical data parameters, and interpretation procedures to enable other researchers to reproduce or independently evaluate the analysis.

These improvements would considerably strengthen the technical reliability and scientific interpretation of the manuscript.

Language and Presentation

The manuscript contains relevant geological information and technical terminology. However, significant language editing and formatting corrections are necessary to improve readability and professional presentation.

- Correct grammatical errors, spelling mistakes, punctuation, and inconsistent spacing throughout the manuscript.
- Several words are joined together without appropriate spaces, particularly in the abstract, introduction, methodology, and discussion. The entire manuscript requires careful proofreading.
- Standardize geological terminology, including aeromagnetics, radiometry, petrography, granodiorite, dolerite, lineaments, and lithological units.
- Maintain consistent usage of abbreviations such as RTP, 1VD, AS, TMI, GIS, and RAD.
- Ensure consistent formatting of mineral names, mineral abbreviations, scientific units, and numerical expressions.
- Correct inconsistencies in the figure captions. For example, Figure 5 is described as a photomicrograph of dolerite, whereas the caption refers to a photomicrograph of diorite.
- Figure 4 contains multiple panels (A–D), but the caption does not adequately explain all the panels. Each panel should be identified and described correctly.
- Improve the resolution and labelling of the photomicrographs, particularly the mineral abbreviations and scale bars.
- Ensure that all figures and tables are cited in the appropriate sections of the manuscript.
- Improve sentence construction in the discussion and conclusion to avoid overly lengthy and repetitive statements.
- Correct the inconsistent formatting of headings, figure numbers, references, and subheadings.

ISSN: 2320-5407
International Journal of Advanced Research
Publisher's Name: Jana Publication and Research LLP
www.journalijar.com

REVIEWER'S REPORT

The manuscript would benefit from comprehensive English-language editing and a final technical proofreading process.

Structure and Organization

The manuscript follows a generally logical structure, progressing from the regional geological setting and methodology to geological mapping, structural analysis, discussion, and conclusions. The overall organization is appropriate for a geological and geophysical research article.

However, the following improvements are recommended:

- Abstract: Clearly present the research objectives, geophysical techniques, petrographic methodology, principal findings, and major scientific contributions. Ensure that the structural orientations reported in the abstract agree with the results and conclusion.
- Introduction: Strengthen the research background by explaining the limitations of conventional geological mapping beneath thick lateritic cover and clearly identifying the research gap.
- Regional and Local Geological Setting: Provide a clearer description of the regional geological framework and the geological characteristics of the Kalamon mining permit. Improve the readability of Figure 1.
- Methodology: Organize the airborne magnetic survey, gamma-ray spectrometry, ground validation, petrographic analysis, and GIS processing into clearly defined subsections. Include the missing technical parameters.
- Geological Mapping: Present the characteristics of the three identified lithological units systematically, preferably with a comparative table summarizing mineralogical composition, magnetic susceptibility, density, and diagnostic geophysical characteristics.
- Structural Analysis: Clearly distinguish the magnetic lineament interpretation from the structural measurements obtained through field observations and drill-core investigations.
- Discussion: Strengthen the comparison between the present findings and previous geological studies in the West African Craton. Clearly distinguish direct observations from regional geological interpretations.
- Conclusion: Summarize the principal findings without introducing new interpretations. Highlight the contribution of integrated geophysical and petrographic methods to geological mapping beneath lateritic cover.
- Figures and Tables: Improve the quality, resolution, labelling, and consistency of all figures. Ensure that the captions accurately describe the corresponding images and geological interpretations.

The manuscript would benefit from a more systematic presentation of the geophysical results and their integration with petrographic and structural observations.

References and Citations

The manuscript includes references related to the geology of the West African Craton, Birimian formations, Eburnean orogeny, airborne geophysical surveys, structural interpretation, and petrographic investigations. The references are generally relevant to the subject.

However, the following improvements are recommended:

- Verify the accuracy and completeness of all bibliographic information, including author names, publication years, article titles, journal names, volume numbers, page ranges, and DOI details wherever applicable.

ISSN: 2320-5407
International Journal of Advanced Research
Publisher's Name: Jana Publication and Research LLP
www.journalijar.com

REVIEWER'S REPORT

- Ensure that all in-text citations correspond to the correct entries in the reference list.
- Standardize reference formatting according to the journal's prescribed guidelines.
- Include additional recent research publications, particularly from 2021–2026, on airborne geophysical imaging, aeromagnetic data processing, gamma-ray spectrometry, and geological mapping of Birimian formations.
- Include more recent studies concerning dolerite dyke swarms, Paleoproterozoic magmatism, and structural evolution of the West African Craton.
- Provide appropriate references supporting the interpretation of magnetic susceptibility variations and the relationship between opaque iron-titanium minerals and magnetic anomalies.
- Ensure that the methodology for RTP, analytical signal processing, and first vertical derivative interpretation is supported by appropriate technical references.
- Check the accuracy of the references cited in the discussion, particularly those used to support the proposed post-orogenic extensional or transtensional tectonic setting.
- Ensure that all maps and geological information adapted from previous reports or publications have appropriate source acknowledgements.

The reference section should be carefully reviewed to improve consistency, traceability, and scientific support for the interpretations.

Overall Recommendation

Minor Revision

The manuscript addresses an important geological research problem and presents a useful integrated approach combining airborne geophysical imaging, GIS-based geological mapping, field observations, drill-core investigations, and petrographic analysis.

The identification of three lithological units and the characterization of dolerite dykes beneath thick lateritic cover are valuable contributions. The correlation between magnetic anomalies and the presence of iron-titanium oxide minerals is also an interesting aspect of the investigation.

However, the manuscript requires substantial improvements in geophysical data-processing methodology, radiometric interpretation, petrographic validation, magnetic susceptibility measurements, and structural analysis. The inconsistencies in structural orientations across different sections must be corrected. Furthermore, the proposed geodynamic interpretations should be supported by stronger geological evidence and presented with appropriate scientific caution.

The figures, tables, language, and references also require revision to improve the overall quality and clarity of the manuscript.

Addressing these concerns would significantly improve the scientific reliability, technical presentation, and contribution of the study to geological mapping and mineral exploration.

ISSN: 2320-5407
International Journal of Advanced Research
Publisher's Name: Jana Publication and Research LLP
www.journalijar.com

REVIEWER'S REPORT

Final Decision
Minor Revision

The manuscript has potential scientific value, particularly because of its integration of airborne geophysical data and petrographic investigations for mapping concealed Birimian geological formations.

However, the authors should address the methodological limitations, provide additional details of the geophysical processing procedures, strengthen the validation of geological interpretations, and resolve the inconsistencies in structural orientations.

Particular attention should be given to the contribution of gamma-ray spectrometry, the reliability of magnetic susceptibility measurements, the relationship between interpreted lineaments and field or drill-core observations, and the justification of the proposed geodynamic interpretation.

The revised manuscript should also undergo comprehensive language editing, figure corrections, and reference verification.

A further review is recommended after resubmission to determine whether the technical and scientific concerns have been satisfactorily addressed.