The International Association for Structural Geology and Tectonics Conference

Accra, Ghana, 22-24 July, 2026

ex solo ad solem, वसुधैव कुटुम्बकम्
ex solo ad solem, Vasudhaiva Kutumbakam
from the earth to the sun, the world is one family

Tectono-metamorphic and metallogenic evolution of the Oume-Fetekro belt, Central Cote d'Ivoire: Implications for the mapping of areas favourable to gold mineralization

Jonas A. ANE[1], Lionel BOYA[1], Lenka BARATOUX[2] , Augustin KOFFI[1], Yan BOURASSA[3], Emmanuelle ESMEL[3]

[1] UFR STRM, Université Félix Houphouët-Boigny d'Abidjan-Cocody, 22 BP 582 Abidjan 22

[2] Institut de Recherche pour le Développement, GET Université e Toulouse 3, France

[3] Allied Gold Corporation, Headquartered in Toronto, Canada at : Royal Bank Plaza, North Tower 200 Bay Street, Suite 2200 Toronto

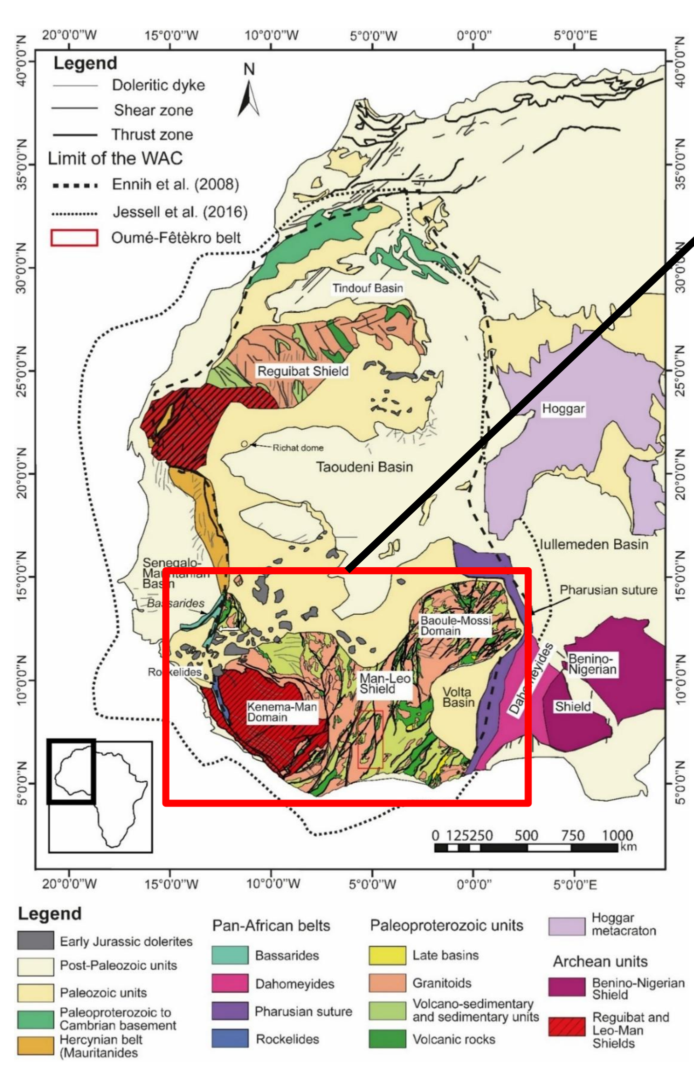
1. INTRODUCTION

Cote d'Ivoire belongs to the West African Craton, which comprises Archean and Paleoproterozoic domains. The Paleoproterozoic domain, corresponding to the Baoulé-Mossi domain, is characterized by the alternation of Birimian volcano-sedimentary belts and Eburnean granitoids (≈ 2.25–1.98 Ga). These formations constitute a favourable geological environment for the emplacement of gold mineralization (Perrouty et al., 2012), particularly within the Oume-Fetekro belt. Located in south-central Côte d'Ivoire, this belt hosts several major industrial gold deposits, including Bonikro, Agbaou, Hire and Lafigue. Its geological evolution is marked by a polyphase tectono-metamorphic history, characterized by successive episodes of deformation, metamorphism, magmatism and hydrothermal fluid circulation. Major regional structures (shear zones, folds, lineaments and fracture networks) have played a key role in controlling the localization of gold mineralization.

Despite these advances, detailed structural mapping of the Oume-Fetekro belt remains incomplete. The integration of structural, petrophysical, geochemical, geophysical and geochronological data is necessary to better constrain its tectono-metamorphic evolution and identify favourable zones for mineralization.

Main objective: Build an integrated tectono-metamorphic and metallogenic model of the Oumé-Fêtèkro belt to identify and map areas favourable for gold mineralization.

2. STUDY AREA



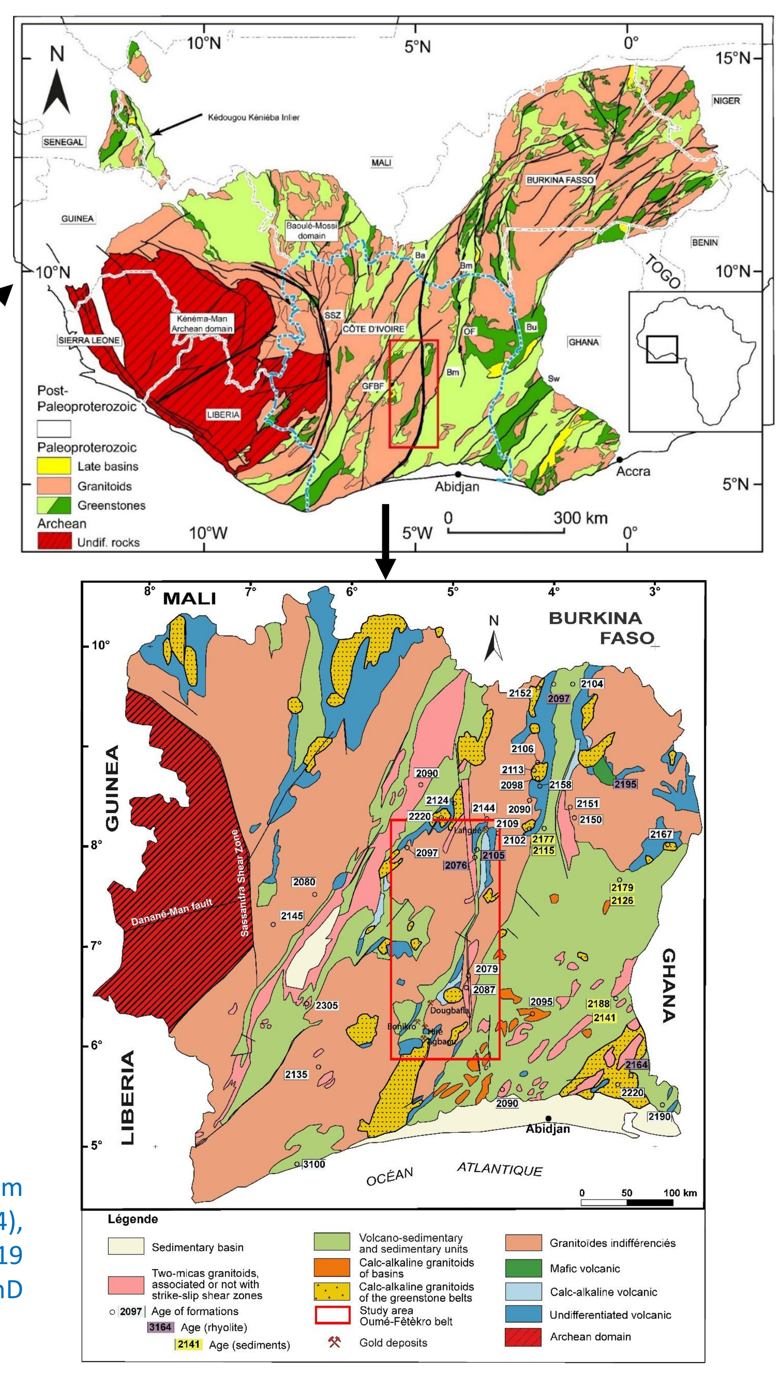


Fig. 1: Map of the West African Craton, modified from Baratoux et al., 2024 (compiled from Milési et al. (2004), Jessell et al., 2015, Thieblemont, 2016, Baratoux et al., 2019 and Guillot et al., 2019) showing the study areas of the PhD project.

3. METHODOLOGY

Field data : Collection of lithological, structural and petrophysical data, complemented by existing datasets.

Petrography and metamorphism : Study of thin sections, mineral assemblages, microstructures and mineral–deformation relationships.

Petrophysics : Magnetic susceptibility measurements.

Lithogeochemistry and mineralogy : XRF, ICP-MS analyses, mineral-chemical analyses using electron microprobe (EPMA) and SEM-EDS, with interpretation of tectono-magmatic signatures.

Geochronology : U-Pb, Ar-Ar and/or Re-Os dating to establish the chronology of tectono-magmatic and hydrothermal events.

4. PRELIMINARY RESULTS

Geophysical data (gravity and aeromagnetic)

Positive Bouguer anomalies (red to magenta), located in the NW, SW and E, indicate the presence of dense geological formations, mainly mafic rocks. Negative anomalies (blue), observed in the NE, E and central-eastern parts of the study area, indicate the presence of less dense felsic formations **(Fig. 2a)**. Aeromagnetic maps enabled the extraction of lineaments representing the major structural features within the study area..

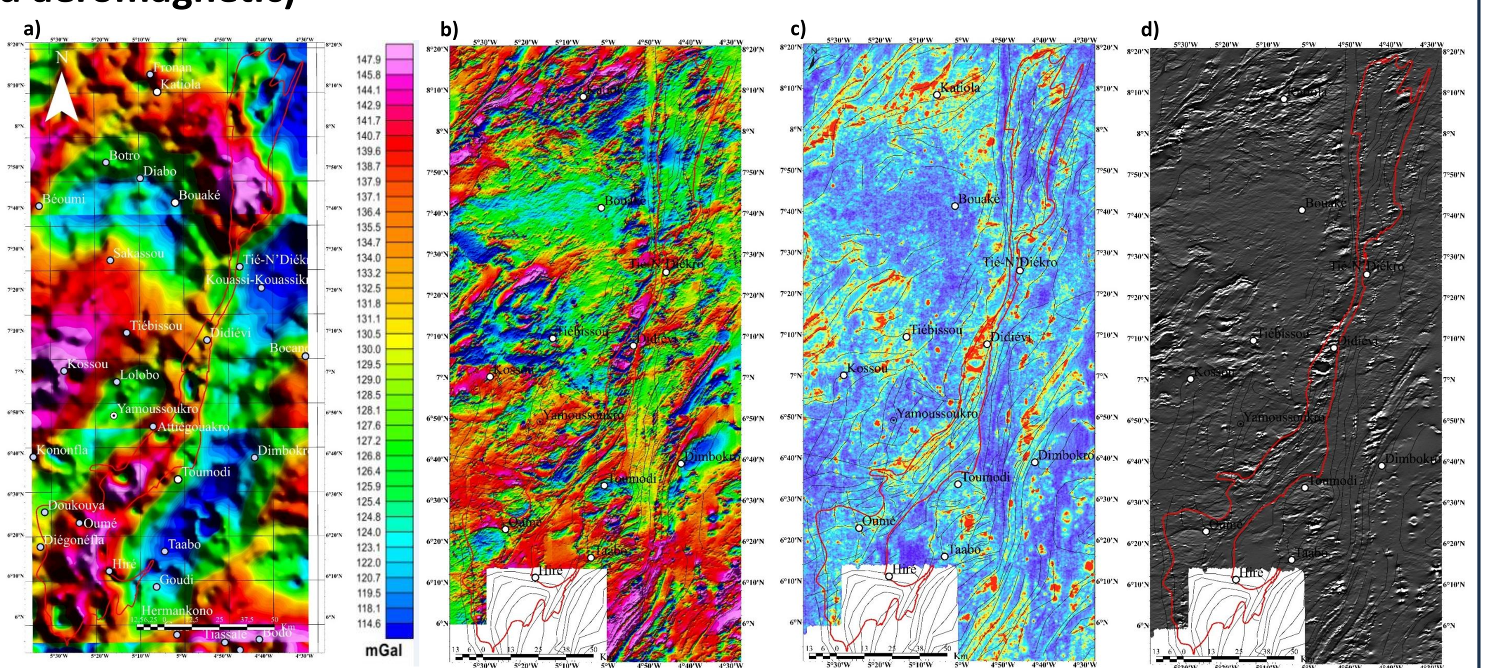


Fig. 2: a) Bouguer anomaly; b) Total magnetic field; c) Analytical signal; d) Reduced-to-pole magnetic field (vertical derivative). These maps were used for the extraction and field validation of regional lineaments.

Lithostructural data (drill cores)

Drill cores from boreholes ABDD187 and ABDD244 (Agbaou pit) reveal shear planes with a dominant NW–SE orientation, with poles concentrated toward the SW and the centre of the stereographic projection.

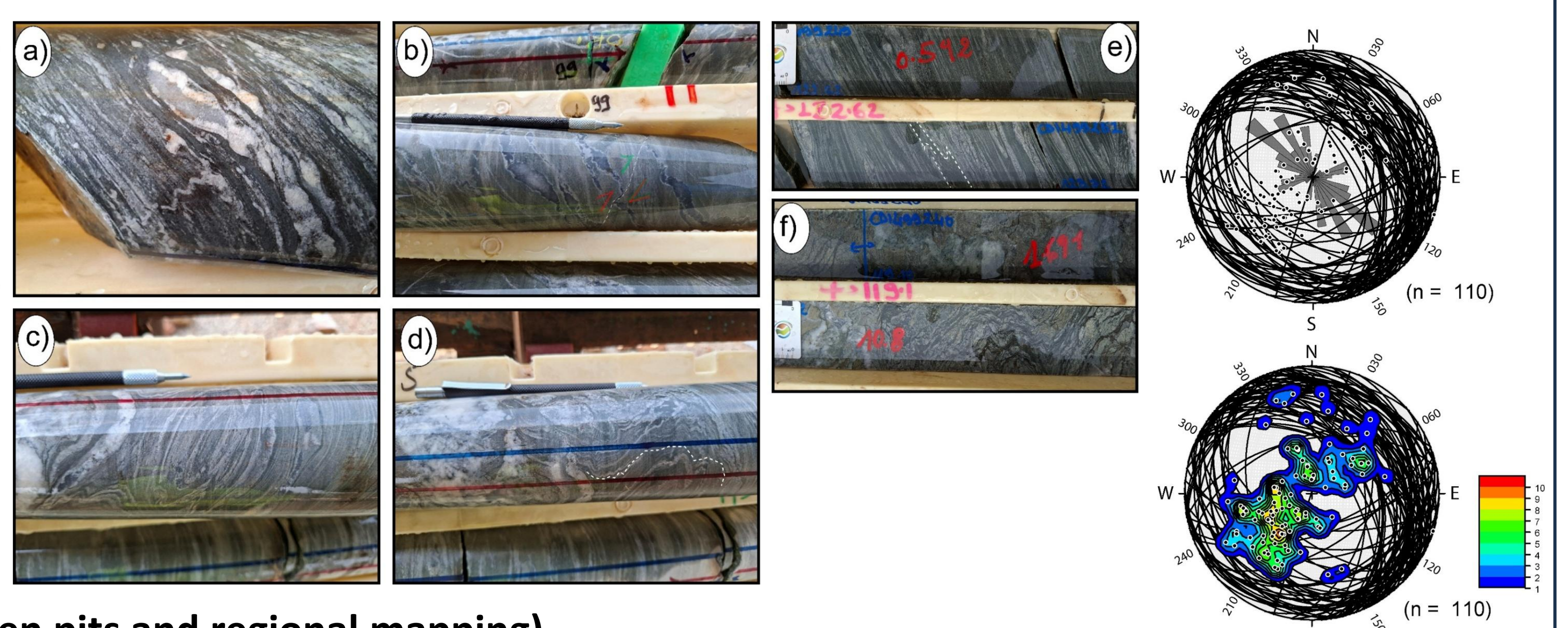


Fig. 3: a) Boudinaged quartz-carbonate vein parallel to the foliation; b) Quartz vein showing apparent strike-slip displacement; c) Sheath fold; d) Crenulation; e) Foliation; f) Shear zone showing foliation crenulation and sulphide concentration within the fold hinge.

Lithostructural data (open pits and regional mapping)

- **1. Bedding (S0) and schistosity/foliation**

The S0 bedding is oriented NNW–SSE, whereas the foliation/schistosity trends N40° **(Fig. 4)**. Lineations and fold axes are oriented NNE–SSW (≈20°) **(Fig. 5)**, whereas NNW–SSE faults exhibit displacement toward the NNW–NW and SSE–SE **(Fig. 6)**.

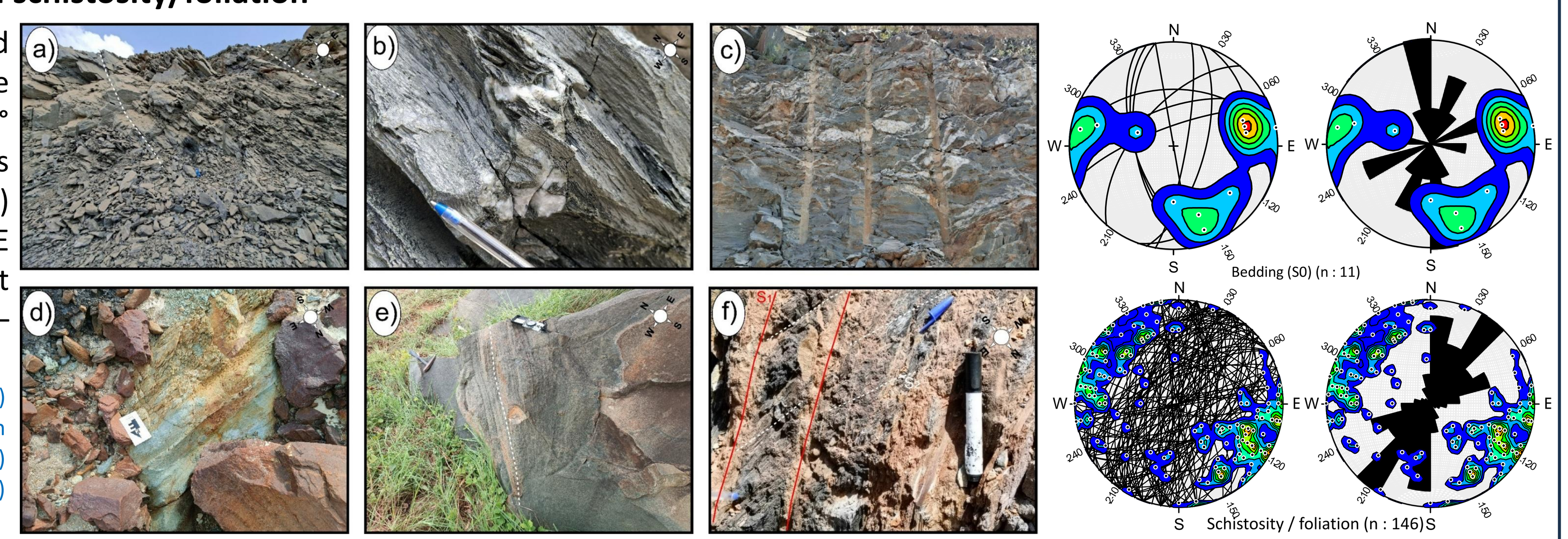


Fig. 4: a) Shear zone observed in the pit; b) Folded veins within the shear zone, with axial planes parallel to the schistosity; c) Boudinaged veins within the shear zone; d) S1 is commonly E–W oriented in the pit;
e) S0 oriented N220/60 in cinerites; f) S1 oriented N045/80 and S2 oriented N070/60 in metasedimentary.

- **2. Mineral and stretching lineations, fold axes and faults/slickenlines**

Fig. 5: a) Vertical mineral lineation; b) Folded quartz vein with a fold axis plunging 20° toward N190°; c) Mineral and stretching lineations plunging 10° toward the north.

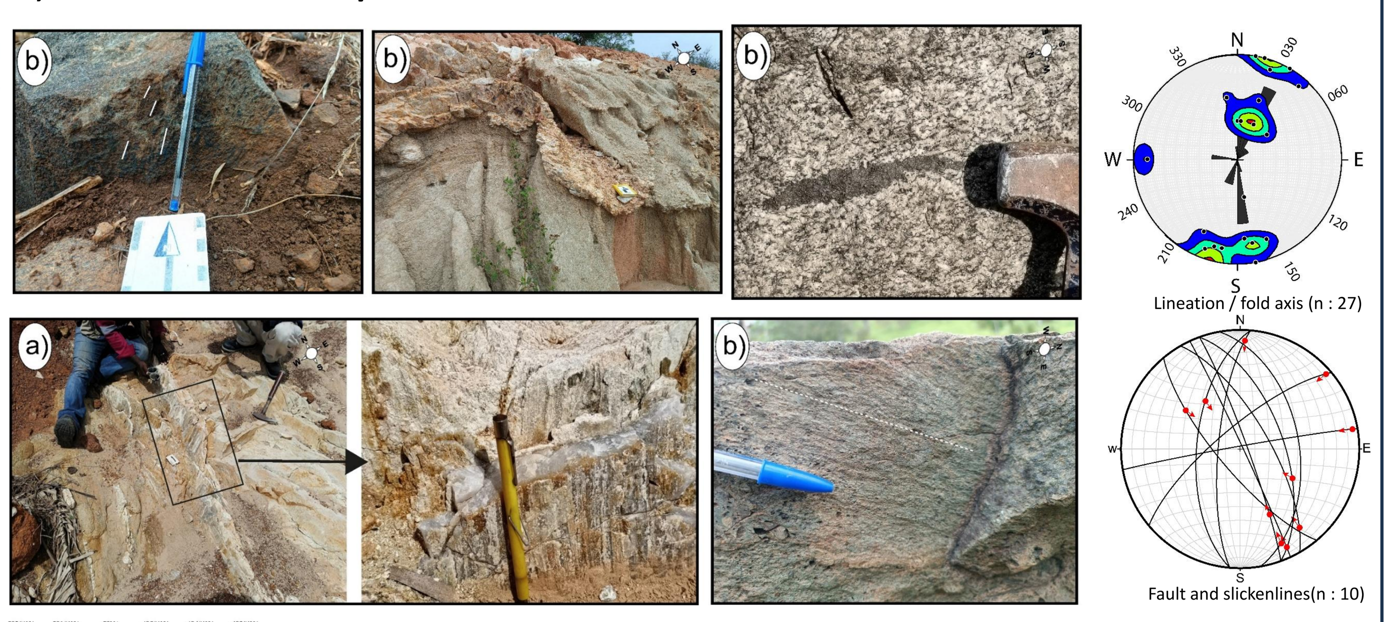
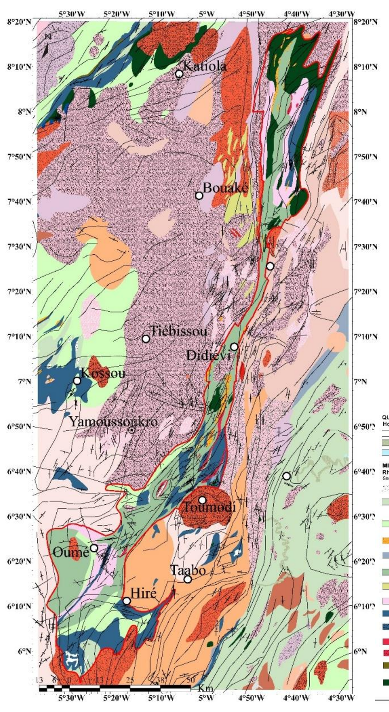


Fig. 6: a) N–S-oriented fault with vertical slickenlines; b) N–S reverse fault with slickenlines plunging 40° toward N00° within volcano-sedimentary rocks. The rose diagram indicates that the dominant fault orientation is N–S to NNW–SSE, with slickenlines plunging alternately toward the NNW and SSE.



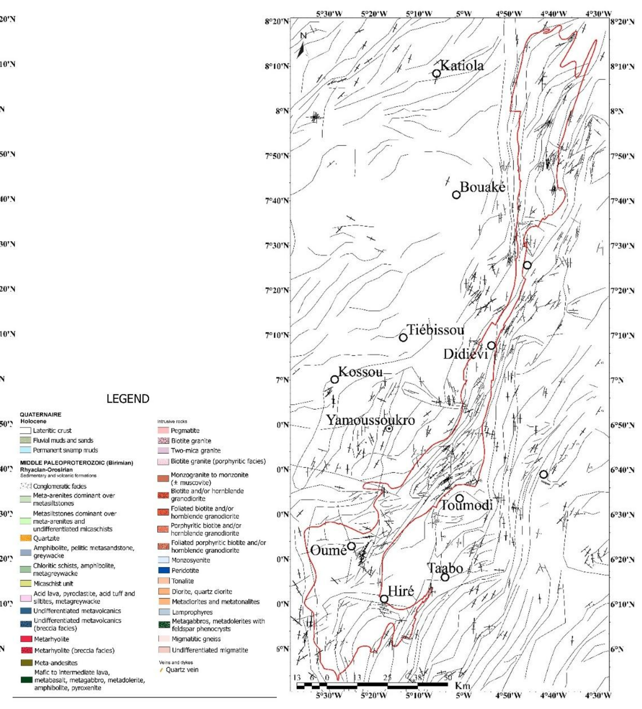


Fig. 7: Preliminary lithostructural and structural map established from field data, geophysical data, and the various geological maps of the study area.

5. CONCLUSION

The preliminary results reveal a polyphase tectonic evolution controlled by major structural features. The integration of structural, geophysical and geological mapping data has enabled the establishment of a preliminary lithostructural map, including the foliation trajectories.

Future work will integrate petrographic, geochemical and geochronological data to further constrain the tectono-metallogenic model and identify areas favourable for gold mineralization.

ACKNOWLEDGEMENTS

We thank the staff of Allied Gold, both on-site and off-site, for the logistical and scientific support provided during the fieldwork, and for sharing the datasets used in this study.

REFERENCES

Baratoux, L., Jessell, M.W., Kouamelan, A.N., 2024. The West African Craton, in: Hamimi, Z., Chabou, M.C., Errami, E., Fowler, A.-R., Fello, N., Masrouhi, A., Leprêtre, R. (Eds.), The Geology of North Africa. Springer International Publishing, Cham, pp. 47–68. https://doi.org/10.1007/978-3-031-48299-1_3

Baratoux, L., Söderlund, U., Ernst, R. E., de Roever, E., Jessell, M.W., Kamo, S., Naba, S., Perrouty, S., Metelka, V., Yatte, D., Grenholm, M., Diallo, D.P., Ndiaye, P.M., Dioh, E., Cournède, C., Benoit, M., Baratoux, D., Youbi, N., Rousse, S., Bendaoud, A., 2019. New U–Pb Baddeleyite Ages of Mafic Dyke Swarms of the West African and Amazonian Cratons: Implication for Their Configuration in Supercontinents Through Time, in: Srivastava, R.K., Ernst, Richard E., Peng, P. (Eds.), Dyke Swarms of the World: A Modern Perspective. Springer, Singapore, pp. 263–314. https://doi.org/10.1007/978-981-13-1666-1_7

Guillot, S., Agbossoumondé, Y., Bascou, J., Berger, J., Duclaux, G., Hilairet, N., Ménot, R.-P., Schwartz, S., 2019. Transition from subduction to collision recorded in the Pan-African arc complexes (Mali to Ghana). Precambrian Res. 320, 261–280. https://doi.org/10.1016/j.precamres.2018.11.007

Jessell, M., Santoul, J., Baratoux, L., Youbi, N., Ernst, R.E., Metelka, V., Miller, J., Perrouty, S., 2015. An updated map of West African mafic dykes. J. Afr. Earth Sci., Tectonics, mineralisation and regolith evolution of the West African Craton 112, 440–450. https://doi.org/10.1016/j.jafrearsci.2015.01.007

Perrouty, S., Aillères, L., Jessell, M.W., Baratoux, L., Bourassa, Y., Crawford, B., 2012. Revised Eburnean geodynamic evolution of the gold-rich southern Ashanti Belt, Ghana, with new field and geophysical evidence of pre-Tarkwaian deformations. Precambrian Res. 204–205, 12–39. https://doi.org/10.1016/j.precamres.2012.01.003

Thieblemont, D., 2016. An updated geological map of Africa at 1/10 000 000 scale. Presented at the 35th International Geological Congress : IGC 2016.

Structural Geology in a Changing World: Tectonics, Resources and Sustainable Transitions