

[Home](#) > [Journal](#) > [Earth & Environmental Sciences](#) > [IJG](#)
[Indexing](#) | [View Papers](#) | [Aims & Scope](#) | [Editorial Board](#) | [Guideline](#) | [Article Processing Charges](#)
[IJG](#) > Vol.3 No.1, February 2012



Structural Evolution of a Precambrian Segment: Example of the Paleoproterozoic Formations of the Mako Belt (Eastern Senegal, West Africa)

PDF (Size: 1861KB) PP. 153-165 DOI: 10.4236/ijg.2012.31017

Author(s)

Mahamadane Diene, Mamadou Gueye, Dinna Pathé Diallo, Abdoulaye Dia

ABSTRACT

The western part of the Kedougou Kenieba Inlier is located in the West African Craton. It consists of paleoproterozoic NE-trending elongate belts (subprovinces) of metavolcanic and granitic rocks that alternate with metasedimentary belts. Major linear fault such as the MTZ which also approximate a north-easterly trend form the eastern boundaries. The field observations and geophysics analyses were completed by a microscopic study. Based on these data we define across this region four lithostructural domains from east to west. The western domain is structurally complex. The rocks of this domain have been subjected to a complex history of polyphase deformation and metamorphism. The structural analyse allow us to distinguished three deformation events. The deformation results in the formation of D1 thrust tectonic and D2 and D3 transcurrent tectonic. The structural evolution of the Mako Belt is characterized by deformation dominated by the intrusion of large TTG batholiths (D1) followed by basins formation and transpression accommodating oblique convergence and collision (D2 and D3). The change from thrusting (D1 deformation to transcurrent motion (D2 and D3) is recorded in the marginal basin of the central domain and in Tinkoto pull apart basin. The timing of these basins indicates a diachronous evolution. Deformation styles within the basin are compatible with a dextral transpression which terminated at ca 2090 Ma. Small extensional basins formed over the rocks of the Mako Belt are filled with continental detrital sedimentary rocks that show weak foliation and active felsic volcanism. We suggest that the sinistral transpressive tectonic associated with oblique subduction may have generated the pull-apart basin and subaqueous volcanism. In part these features are now related to terrain accretion, thrusting and strike slip movement during oblique convergence. The inversion of the large scale structural evolution from thrusting to strike slip is common to modern orogenies.

KEYWORDS

Kedougou Kenieba Inlier; Paleoproterozoic; Transpression; Mako Belt; Oblique Convergence; Collision; Thrusting; Transcurrent

Cite this paper

 M. Diene, M. Gueye, D. Diallo and A. Dia, "Structural Evolution of a Precambrian Segment: Example of the Paleoproterozoic Formations of the Mako Belt (Eastern Senegal, West Africa)," *International Journal of Geosciences*, Vol. 3 No. 1, 2012, pp. 153-165. doi: 10.4236/ijg.2012.31017.

References

- [1] J. P. Bassot, " Le Complexe Volcanoplutonique Calco Alcalin de la Rivière Daléma (Est du Sénégal): Discussion de la Signification Géodynamique Dans le Cadre de l' Orogenèse Eburnéenne (Protérozoïque Inférieur)," *Journal of African Earth Sciences*, Vol. 6, No. 4, 1987, p. 25.
- [2] A. Dia, " Caractères et Significations Des Complexes Magmatiques et Métamorphiques du Secteur de Sandikounda-Laminia (Nord de la Boutonnière de Kédougou, est du Sénégal). Un Modèle Géodynamique du Birimien d' Afrique de l' Ouest," *Thèse d' Etat, Dakar*, 1988.
- [3] W. Abouchami, M. Boher, A. Michard and F. Albaredo, " A Major 2.1 Ga Event of Mafic Magmatism in West Africa: An Early Stage of Crustal Accretion," *Journal of Geophysical Research*, Vol. 95, No. B11, 1990, pp. 17605-17629. doi:10.1029/JB095iB11p17605

- [Open Special Issues](#)
- [Published Special Issues](#)
- [Special Issues Guideline](#)

[IJG Subscription](#)
[Most popular papers in IJG](#)
[About IJG News](#)
[Frequently Asked Questions](#)
[Recommend to Peers](#)
[Recommend to Library](#)
[Contact Us](#)

Downloads:	165,245
------------	---------

Visits:	393,624
---------	---------

[Sponsors, Associates, and Links >>](#)

- [4] M. Boher, A. Michard, F. Albarede, M. Rossi and J. P. Milési, " Crustal Growth in West Africa at 2.1 Ga," *Journal Of Geophysical Research*, Vol. 97, No. B1, 1992, pp. 345-369. doi:10.1029/91JB01640
- [5] P. M. Ndiaye, A. Dia, A. Vialette, D. P. Diallo, P. M. Ngom, M. Sylla and S. Wade, " Les Granitoïdes du Protérozoïque Inférieur du Supergroupe de Dialé-Daléma. Données Pétrographiques, Géochimiques et Géochronologiques Nouvelles," CIFEG, Publication Occasionnelle, Paris, 1993.
- [6] A. Dia, W. R. Van Schmus and A. Kröner, " Isotopic Constraints on the Age and Formation of a Paleoproterozoic Volcanic Arc Complex in the Kedougou Inlier, Eastern Senegal, West Africa," *Journal of African Earth Sciences*, Vol. 24, No. 3, 1997, pp. 197-213. doi:10.1016/S0899-5362(97)00038-9
- [7] S. Pawlig, M. Gueye, R. Klischies, S. Schwars, K. Wemmer and S. Siegesmund, " Geochemical and Sr-Nd Isotopic Data on the Birimian of the Kedougou-Kénieba Inlier (Eastern Senegal): Implications on the Palaeoproterozoic Evolution of the West African Craton," *South African Journal of Geology*, Vol. 109, No. 3, 2006, pp. 411-427.
- [8] M. Gueye, S. Siegesmund, K. Wemmer, S. Pawlig, M. Drobe, N. Nolte and P. Layer, " New Evidences for an Early Birimian evolution in the West African Craton: An Example from the Kédougou-Kénieba Inlier, Southeast Senegal," *South African Journal of Geology*, Vol. 110, No. 4, 2007, pp. 511-534. doi:10.2113/gssajg.110.4.511
- [9] J. M. Bertrand, A. Dia, E. Diah and J. P. Bassot, *Réflexions sur la Structure Interne du Craton Ouest - Africain au Sénégal Oriental et des Confins Guinéo- Maliens*," *Comptes Rendus de l' Académie des Sciences*, Vol. 309, 1989, pp. 751-756.
- [10] J. P. Milési, M. Diallo, J. L. Feybesse, E. Keita, P. Ledru, C. Vichon and A. Dommanget, " Caractérisation Litho- structurale de Deux Ensembles Successifs dans les séries Birimiennes de la Boutonnière de Kédougou (Mali- Sénégal) et du Niandan (Guinée): Implications Géotectoniques," CIFEG, Publication Occasionnelle, 1986, pp. 113-121.
- [11] P. Ledru, J. Pons, J. P. Milési, A. Dommanget, V. Johan, M. Diallo and C. Vinchon, " Tectonique Transcurrente et Evolution Polycyclique dans le Birimien, Protérozoïque Inférieur, du Sénégal-Mali (Afrique de l' Ouest)," *Comptes Rendus de l' Académie des Sciences*, Vol. 308, 1989, pp. 117-122.
- [12] J. P. Milési, J. L. Feybesse, P. Ledru, A. Dommanget, M. F. Ouedraogo, E. Marcoux, A. Prost, C. Vinchon, J. P. Sylvain, V. Johan, M. Tegye, J. Y. Calvez and P. Lagny, " Les Minéralisations Aurifères de l' Afrique de l' Ouest: Leurs Relations avec l' Evolution Lithostructurale au Protérozoïque Inférieur," *Chronique de la Recherche Minière*, Vol. 497, 1989, pp. 3-98.
- [13] J. L. Feybesse, J. P. Milési, Y. Johan, et al., " La Limite Archéen-Protérozoïque d' Afrique de l' Ouest: Un Zone de Chevauchement Antérieure à l' Accident de Sassandra; l' Exemple des Régions d' Odienné et de Touba (Côte d' Ivoire)," *Comptes Rendus de l' Académie des Sciences*, Vol. 309, 1989, pp. 1847-1853.
- [14] J. L. Feybesse, M. Billa, C. Guerrot, E. Duguey, J. L. Lescuyer, J. P. Milési and V. Bouchot, " The Paleoproterozoic Ghanaian Province: Geodynamic Model and Ore Controls, Including Regional Stress Modelling," *Precambrian Research*, Vol. 149, No. 3-4, 2006, pp. 149-196. doi:10.1016/j.precamres.2006.06.003
- [15] P. Ledru, J. Pons, J. P. Milési, J. L. Feybesse and V. Johan, " Transcurrent Tectonics and Polycyclic Evolution in the Lower Proterozoic of Senegal-Mali," *Precambrian Research*, Vol. 30, 1991, pp. 337-354.
- [16] M. Guèye, " Transcurrent Fault Propagation and Granitoid-plutonism during Lower Proterozoic transpression (SE Sénégal)," *Zeitschrift der Deutschen Geologischen Gesellschaft*, Vol. 152, No. 24, 2001, pp. 175-198.
- [17] J. Pons, P. Barbey, D. Dupuis and J. M. Leger, " Mechanisms of Pluton emplacement and Structural Evolution of a 2.1 Ga Juvenile Continental crust: The Birimian of Southwestern Niger," *Precambrian Research*, Vol. 70, No. 3-4, 1995, pp. 281-301. doi:10.1016/0301-9268(94)00048-V
- [18] M. Gueye, P. M. Ngom, M. Diène, Y. Thiam, S. Siegesmund, K. Wemmer and S. Pawlig, " Intrusive Rocks and Tectono-Metamorphic Evolution of the Mako Paleoproterozoic Belt (Eastern Senegal, West Africa)," *Journal of African Earth Sciences*, Vol. 50, No. 2-4, 2008, pp. 88- 110. doi:10.1016/j.jafrearsci.2007.09.013
- [19] S. Zounou, " Les Formations Leptyno-Amphibolitiques et le Complexe Volcanique et Volcano-

Sédimentaire du Protérozoïque Inférieur de Bouroum-Nord (Burkina- Faso Afrique de l' Ouest). Etude Pétrographique, Géochimique, Approche Pétrogénétique et Evolution Géodynamique," Thèse d' Etat, University Nancy I, 1987.

- [20] P. J. Sylvester and K. Attoh, " Lithostratigraphy and Composition of 2.1 Ga Greenstone Belts of the West African Craton and Their Bearing on Crustal Evolution and the Archean-Proterozoic Boundary," *Journal of Geology*, Vol. 100, No. 4, 1992, pp. 377-393. doi:10.1086/629593
- [21] I. Ama-Salah, J. P. Liégeois and A. Pouclet, " Evolution d' un Arc Insulaire Océanique Birimien Précoce au Liptako Nigérien (Sirba): Géologie, Géochronologie et Géochimie," *Journal of African Earth Sciences*, Vol. 22, 1996, pp. 235-254.
- [22] A. Pouclet, M. Vidal, C. Delor, Y. Siméon and G. Alric, " Le Volcanisme Birimien du Nord-Est de la Côte d' Ivoire, Mise en Evidence de Deux Phases Volca-Tectoniques Distinctes dans l' Evolution Géodynamique du Paléo- protérozoïque," *Bulletin de la Société Géologique de France*, Vol. 167, 1996, pp. 529-541.
- [23] M. Lompo, " Geodynamic Evolution of the 2.25-2.0 Ga Palaeoproterozoic Magmatic Rocks in the Man- Leo Shield of the West African Craton. A Model of Subsidence of an Oceanic Plateau," *Geological Society, London, Special Publications*, Vol. 323, 2009, pp. 231-254.
- [24] J. P. Milési, P. Ledru, P. Ankrah, V. Johan, E. Marcoux and Ch. Vinchon, " The Metallogenic Relationship between Birimian and Tarkwaian Gold Deposits in Ghana," *Mineralium Deposita*, Vol. 26, 1991, pp. 228-238.
- [25] A. Allibone, J. Teasdale, G. Cameron, M. Etheridge, P. Uttley, A. Soboh, J. Appiah-Kubi, A. Adanu, R.