Paper Number: 3367

# Tectono-metamorphic Evolution of West Africa: Implications for Mineralization

Baratoux L.[1,2], Jessell, M.W.[1,3], Block, S.[1], Ganne, J.[1], Perroury, S.[1,4], Siebenaller, L.[1,5], Béziat D.[1], Davis, J.[3], Fontaine, A.[6], Moussa, P.M.[7], Miller, J.[8], Dioh, E.[2], Metelka, V.[1,3], WAXI team

[1]GET, IRD, CNRS, OMP, 14 avenue E. Belin, Toulouse, France, lenka.baratoux@ird.fr
[2]Institut Fondamental d'Afrique Noire Cheikh Anta Diop Dakar, Senegal
[3]CET, The University of Western Australia, 35 Stirling Highway, Crawley, Perth, Western Australia 6009
[4]Western University, Earth Sciences Department, 1151 Richmond Street, London, ON, N6A 5B7, Canada
[5]ONG-D "Le Soleil dans la Main" asbl, 48, Duerfstrooss, L-9696 Winseler, Luxembourg
[6]Université de Lorraine, 15 rue Notre Dame des Pauvres, BP20 54501, Vandoeuvre Les Nancy
[7]UniversitéCheikh Anta Diop, Dakar, Senegal
[8]CSIRO, 26 Dick Perry Avenue, Kensington WA 6152, Australia

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The West African Craton (WAC) consists of an Archean nucleus tectonically juxtaposed to Paleoproterozoic granite-greenstone domains. The southern part of the craton (sWAC) was affected by up to six deformation events, which can be correlated across the craton. The first deformation episode of predominant constrictional character, called Eo-Eburnean or Tangaean, was identified in the eastern part the sWAC, operating between ~2160 and ~2130 Ma. The major phase of the Eburnean Orogeny took place between ~2130 and 2100 Ma, and it is characterized by a transition from constrictional to transcurrent regime. The latest deformation phase is as young as 2060 Ma, it is of transcurrent character, and was described in Senegal, Mali and Guinea.

Up to three metamorphic phases M1, M2 and M3, were distinguished in various studied areas. However, it is difficult to correlate them craton-wide due to the overall poorly constrained absolute ages of metamorphism. High temperature and high pressure conditions of M1 were found at the boundary between the Archean and Paleoproterozoic terrains in Ivory Coast. Another widespread occurrence of early HP and MT metamorphism M1 was found in north-western Ghana characterized by cold metamorphic gradient (15-20°C/km). High pressure-low temperature metamorphism (10-15°C/km) was found in eastern Burkina Faso. Medium to high pressures (5-10 kbar) and medium apparent thermal gradient (25-40°C/km) are common for the M1 and in particular for the M2 metamorphic phase craton-wide. The P-T paths reach early M1 pressures of 6-8 kbar and temperatures of 420-500°C (apparent thermal gradient of 25°C/km) followed by isobaric M2 heating up to 700°C. In some areas across the craton (SW Burkina Faso, southern Mali) the peak greenschist facies metamorphic conditions during the M2 metamorphism are predominant. Late metamorphic stages M3 are characterized by low temperatures (100-400°C) and very low pressures (1-3 kbar).

Zinc, copper, and nickel deposits are associated with the very early phase of the Eburnean orogeny and are interpreted to be related to the volcanic and magmatic activity in the volcanic arcs. Gold deposits occur throughout the Eburnean orogeny. The early gold deposits such as Morila, Kiaka are related to magmatic intrusions or are found in pyrite-bearing sediments in the case of Wassa. Most of the gold

deposits are associated with the regional scale late-orogenic transcurrent shear zones. Multiple mineralization events and gold remobilization was observed at many gold deposits (e.g. Obuasi, Inata, Wassa and others). To conclude, base metal deposits are essentially related to the pre- or early orogenic volcanic island arc magmatic activity, while gold deposits occur at various stages of the Eburnean orogeny, in various geodynamic settings, and under various metamorphic conditions.

*We wish to gratefully acknowledge AMIRA International and the industry sponsors, including AusAid and the ARC Linkage Project LP110100667, for their support of the WAXI project (P934A).