
Sedimentology and climate evolution in the eastern region of Central Africa during the Permian-Triassic: an example of the Lukuga Group in the oriental part of the Congo Basin

Alexis Caillaud*^{†1}, Christian Blanpied², and Damien Delvaux³

¹Université Lille 1 (UMR LOG) – Université Lille I - Sciences et technologies, CNRS : UMR8187 – UFR des Sciences de la Terre bâtiment SN5, 59655 Villeneuve d'Ascq cedex, France

²Total EP – Total EP – 2 place Jean Millier, 92078 Paris La Défense, France

³Royal Museum for Central Africa (MRAC) – Royal Museum for Central Africa, Geodynamics and Mineral Resources, B-3080, Tervuren, Belgium, Belgium

Abstract

In the eastern region of the Central Africa, the Karoo rift system is contemporaneous of the Permian-Triassic transition. In this area, the sediments, observed at outcrop and in sub-surface, have recorded several changes of climatic conditions between the late Carboniferous and the Triassic. In order to refine the sedimentology and the depositional environments of the Karoo rift sediments in the eastern region of Central Africa, three cores from the Lukuga Valley (eastern part of the Congo Basin, Democratic Republic of Congo) have been described. These cores are available at the Royal Museum for Central Africa (MRAC/KMMA, Tervuren, Belgium), and they correspond to the upper part of the Lukuga Group (Permian) and the Haute-Lueki Group (Triassic) in the Congo Basin. Fifteen lithofacies have been identified, which permit a reinterpretation of the depositional environment and paleogeography of these groups in this area. The sandstones of the upper part of the Lukuga Group are interpreted to represent a braided river system, followed by sandstones, mudstones, and coals deposits, which correspond to a shallow, perennial, sand-bed braided river with an extensive flood plain. The top of the Lukuga Group is marked by the return of a braided river system. The Haute-Lueki Group is characterized by the paleosols deposits (red sandstones and mudstones), which are interpreted as a semi-perennial fluvio-lacustrine system, followed by a semi-perennial fluvial system at the top of the group. The upper part of the Lukuga Group was deposited in a humid to temperate climate, while the Haute-Lueki Group was deposited in a more arid climate, with periods of emersion. These unpublished results are compared with: 1) the deep boreholes in the central part of the Congo Basin; 2) the historical studies in the oriental part of the Congo Basin, along the shore of Lake Tanganyika; and 3) the Karoo rift basins in the western part of Tanzania (Ruhuhu Basin, Galula Basin, and Songwe-Kiwira Basin) and in the north-eastern part of Zambia (Luangwa Basin). This compilation permits to build the following climatic evolution between the end of Carboniferous and the Triassic in the eastern region of the Central Africa: 1) a cold and semi-arid to temperate climate during the end of Carboniferous, through the deposition of glacio-lacustrine

*Speaker

[†]Corresponding author: caillaud.alexis@gmail.com

and periglacial lacustrine sediments; 2) a hot and humid to semi-humid climate during the Permian, as evidence by the swampy fluvio-lacustrine and lacustrine environments; and 3) the persistence of a hot and humid to very-humid climate during the Triassic, through the occurrence of the paleosols, which indicated the semi-perennial lacustrine, fluvio-lacustrine, and fluvial environments.