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Geology, mineralogy and geochemistry of the Kekem dyke swarm (Western Cameroon): Insights into Paleozoic–Mesozoic magmatism and geodynamic implications

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ABSTRACT

The broadly N70°–90°E-trending dykes swarm at Kekem cut across the Paleoproterozoic-to-Achean terranes of West Cameroon remobilized during the Pan-African orogeny. They are picrite basalts and basalts with tholeiitic/transitional affinity, as shown by mineralogical and geochemical data, with variable major and trace element contents, MgO ranges from 7.3 to 12.4 wt.%, Cr from 190 to 411 ppm, Ni from 15 to 234 ppm. All the dykes are light REE enriched with La_N/Yb_N values of 5.3–8.1, suggesting a co-magmatic origin. They originated from a 2.8% partial melting of a spinel-mantle source with no or little crustal input. The geochemical features of Kekem dykes are similar to those of Paleozoic and Mesozoic dykes recorded in North and Central Africa, suggesting multiple reactivations of pre-existing fractures that resulted in the fragmentation of western Gondwana and the opening of Central and South Atlantic Oceans.

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1. Introduction

The northern margin of the Congo craton recorded the 0.6 Ga Pan-African orogeny (also known as the Central Pan-African Fold belt; CAFB; Toteu et al., 2001). The CAFB is exposed in Cameroon, Nigeria, Chad and Central Africa Republic. It is linked to the Brasiliano orogen of northeastern Brazil in a pre-drift reconstruction (Fig. 1a). The geodynamic evolutionary models of the Cameroon segment (Fig. 1b) suggest an early extension that resulted in the formation of Early Neoproterozoic sedimentary basins followed by subduction and collision at 0.6 Ga between the São Francisco–Congo craton, the West African craton and the Saharan metacraton (Ngako and Njonfang, 2011), or between the Congo craton and the Saharan metacraton (Bouyo Houketchang et al., 2013). The post Pan-African tectonic evolution in West-Central Africa remains poorly known. During the Late Paleozoic and Mesozoic times, the regional tectonic regime of West-Central Africa was governed by tensional stresses originated from the reactivation of Central Africa Shear Zone (Guiraud and Maurin, 1991; Moreau et al., 1987; Tchouankoué et al., 2014) or St. Helena mantle plume activity (Coulon et al., 1996). In the Central Africa, this tectonic regime resulted in the formation of graben and extended intracratonic rift structures. These rifts were filled with Cretaceous sedimentary deposits, accompanied with Mesozoic to Early Cenozoic magmatism (Maluski et al., 1995). Tchouankoué et al. (2012, 2014) documented Paleozoic and Mesozoic magmatism, so far unknown within the Central Cameroon

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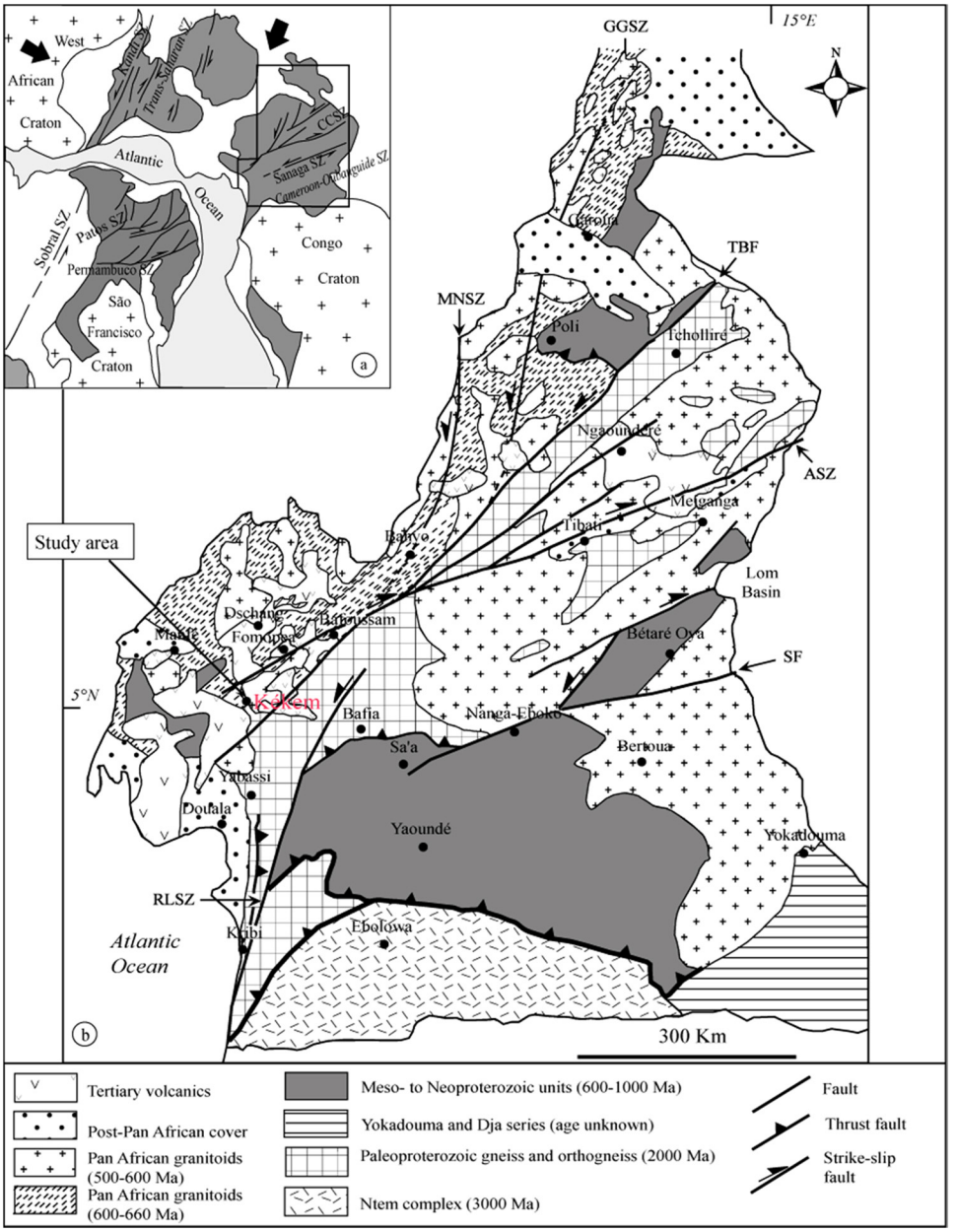

Fig. 1. a: Geological reconstruction of Africa and NE Brazil (Late Precambrian) after Caby et al. (1991). CCSZ: Central Cameroon Shear Zone; SF: Sanaga Fault; SL: São Luis Craton; Pa: Patos shear zone; Pe: Pernambuco shear zone. b: Pan-African structural map of Cameroon (Ngako et al., 2008; modified and re-interpreted by Toteu et al., 2001). Thick lines: shear zone (SZ); BSZ: Balché SZ; BNMB: Buffle Noir–Mayo Baléo; CCSZ: Central Cameroon SZ; GGSZ: Godé–Gormaya SZ; MNSZ: Mayo Nolti SZ; RLSZ: Rocher du Loup SZ; SSZ: Sanaga SZ. I: Paleoproterozoic basement and Pan-African syn-tectonic granitoids; II: Meso- to NeoProterozoic volcano sedimentary basins.

Shear Zone (CCSZ; Ngako et al., 1991), which underlines their geodynamic significance in the evolution of the Pan-African formation at the northern margin of the Congo craton. This magmatism is of great interest to understand the post-Pan-African crustal evolution in Cameroon and hence, the break up of the West Gondwana supercontinent.

Few mineralogical and geochemical data have been published on the Paleozoic to Mesozoic igneous rocks in Cameroon. Here, we present field, petrographic, mineral chemical and whole-rock geochemical data of the Kekem dykes swarm (Western Cameroon) and discuss the magmatic evolution, mantle source as well as their geodynamic significance in order to infer the post Pan-African tectonic evolution in Cameroon.

2. Geological setting

The Kekem area is located in the southwestern part of the CCSZ (Figs. 1b and 2a), which represents the northern limit of the Congo craton (De Plaen et al., 2014; Kwékam

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