Journal of African Earth Sciences 124 (2016) 94–103

Contents lists available at ScienceDirect

Journal of African Earth Sciences

journal homepage: www.elsevier.com/locate/jafrearsci

Timing and tectonic implications of the Pan-African Bangangte syenomonzonite, West Cameroon: Constraints from in-situ zircon U-Pb age and Hf-O isotopes

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ARTICLE INFO

Article history:
Received 12 April 2016
Received in revised form
13 July 2016
Accepted 15 September 2016
Available online 16 September 2016

Keywords:
Petrology
Geochemistry
Zircon U-Pb age
Zircon Hf-O isotopes
Syenite
Monzonite
Shoshonite
Pan-African orogeny
West Cameroon

ABSTRACT

The Bangangte pluton is a SW-NE elongated (5 × 20 km) massif located in the southeastern part of the Pan-African North Equatorial Fold Belt in Cameroon, consisting of two units with dominant monzonites in the south and syenites in the north. SIMS U-Pb zircon dating yields consistent emplacement ages of 585 ± 4 Ma and 583 ± 4 Ma for the southern unit and the northern unit, respectively. The Bangangte rocks display typical shoshonitic compositions characterized by $Na_2O + K_2O > 5$ wt%, K_2O/Na_2O ~2, enrichment in LILE and LREE, but depletion in HFSE. Rocks from both units have similar O-Hf isotopes, with the monzonite zircons from the southern unit showing slightly higher $\delta^{18}O$ (7.0 ± 0.4‰) but lower εHf(t) (−15.3 ± 1.4) value than the syenite zircons from southern unit ($\delta^{18}O$ = 6.0 ± 0.4‰; εHf(t) = −14.0 ± 2.0). They were generated by partial melting of an enriched mantle source metasomatized by previous subduction processes, accompanied by crystal fractionation of pyroxene, Ti-Fe oxides and apatite, as well as crustal contamination to varying degrees. These rocks display a transitional geochemical feature of the subduction-related and within-plate shoshonites, suggesting that they were most likely emplaced in a post-collisional setting at the waning stage of the Pan-African orogeny.

1. Introduction

The Cameroon territory occupies the northern border of the Congo Craton and adjacent Proterozoic belts which prolong West-Gondwana pre-drift similar formations of North East Brazil (Fig. 1a). Precambrian rocks of Cameroon (Fig. 1b) are divided into two lithotectonic groups: (1) The Ntem group to the south includes the Archean Ntem unit and the surroundings Ayna and Nyong Paleoproterozoic units (e.g., Tchameni et al., 2004; Shang et al., 2007; Li et al., 2016), and (2) the Pan-African North Equatorial Fold Belt (PANEFB) (e.g., Nzenti et al., 1999, 2001) composed of metamorphic and plutonic rocks reworked or formed during the Pan-African orogeny. Archean and Paleoproterozoic relics are found within the Pan-African domain, particularly in East Cameroon (e.g., Tchameni et al., 2006; Penaye et al., 2006; Ganwa et al., 2008, 2011, 2016; Segem et al., 2014). The PANEFB in Cameroon is characterized by thrusting and transcurrent tectonics (e.g. Toteu et al., 2001; Njiekak et al., 2008) that led to the development of strike–slip shear zones trending mostly N–S to ENE–WSW along a corridor known as Adamawa Shear Zone (ASZ). Intrusive rocks in the PANEFB form large batholith in Central East Cameroon and medium-sized plutons in West and Northwest Cameroon. In the western part, Paleoproterozoic rocks have been identified. Between these two major domains of the PANEFB, the Mayo Kebbi unit that straddles the boudary between Chad and Cameroon is composed of TTG (tonalites, trondjhemites and granodiorites) and hypersthene monzodiorites emplaced into a metavolcanic–metasedimentary sequence interpreted as a middle Neoproterozoic arc stabilized at ca. 650 Ma (Penaye et al., 2006). On the geology sketch map of Cameroon (Fig. 1b), the SSW-NNE oriented Tchollire Banyo Fault (TBF) delineates elongated small to medium size Neoproterozoic granitoids of West Cameroon (Njiekak et al., 2008; Djouka-Fonkwe

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http://dx.doi.org/10.1016/j.jafrearsci.2016.09.009
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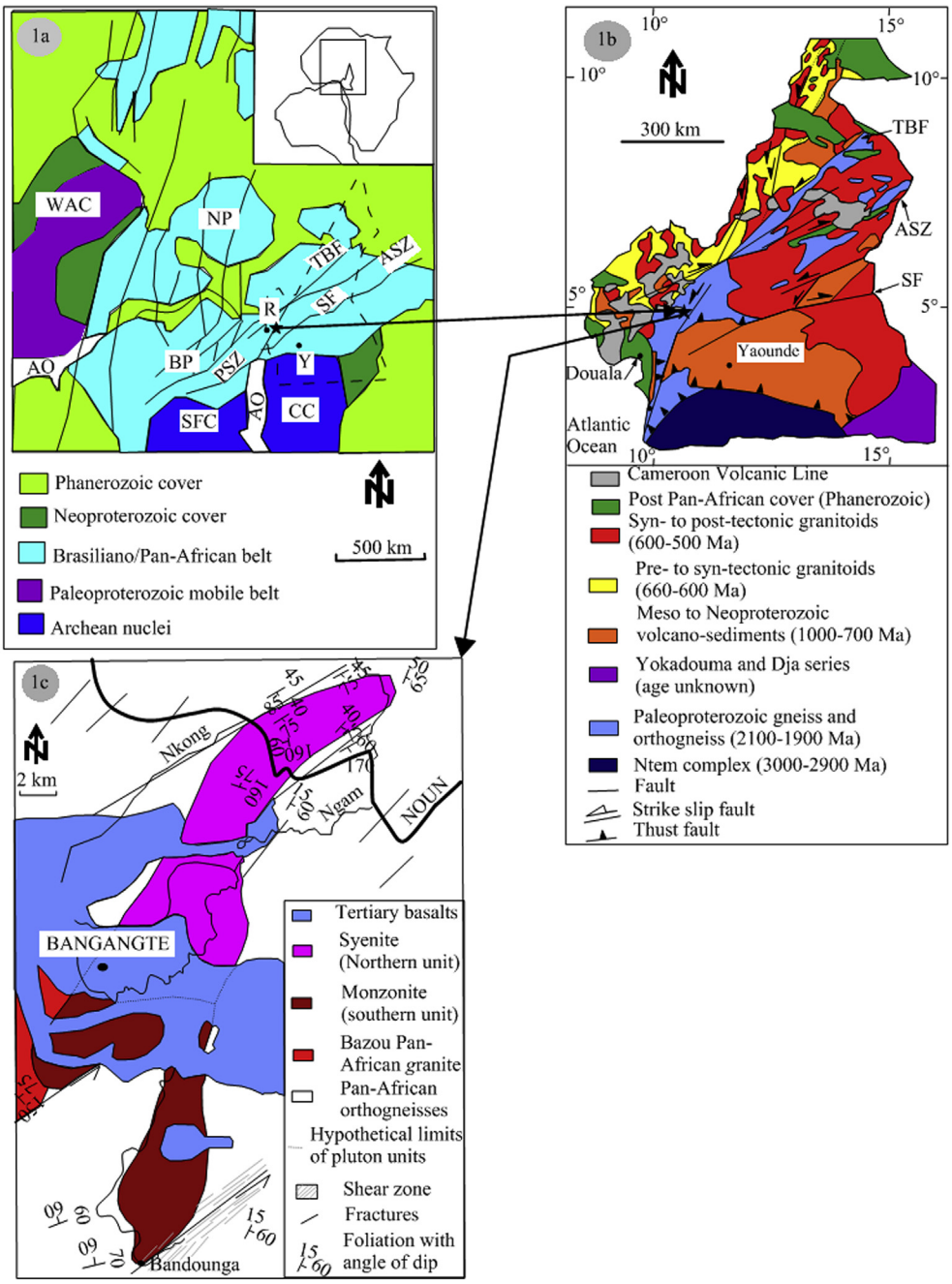

Fig. 1. (a) Generalized geologic map of West Central Africa and North East Brazil in a West Gondwana pre-drift (Van Schmus et al., 2008). (b) Geology sketch map of Cameroon (Nkoumbou et al., 2014). (c) Simplified geological map of the Bangangte syenomonzonite. AO = Atlantic Ocean, ASZ = Adamawa Shear Zone, BP = Borborema Province, CC = Congo Craton, NP = Nigerian Province, R = Recife, SFC = Sao Francisco Craton, PSZ = Pernambuco Shear Zone, SF = Sanaga Fault, TBF = Tcholliré-Banyo Fault, WAC=West Africa Craton, Y = Yaounde.

et al., 2008; Kwekam et al., 2015) and batholitic granitoids of the Adamawa-Yade massif with inherited Archean ages (Ganwa et al., 2016). The Bangangte syenomonzonite pluton occurs closer to the southwestern prolongation corridor of the TBF. It is the southeasternmost pluton of the Pan-African belt of West Cameroon (Fig. 1c), and is a good candidate for attempts to better understand the geodynamic history of the transition between the northern border of the Congo Craton and the Pan-African domain in West Cameroon. This paper presents integrated in-situ zircon U-Pb and Hf-O isotopes and geochemistrty for the Bangangte syenomonzonites. We use these data to investigate the petrogenesis of the rocks and their tectonic implications. We conclude that the Bangangte syenomonzonite pluton is a late-tectonic pluton generated by partial melting of a metasomatized mantle source at the waning stage of the Pan-African collisional orogeny.

2. Geological background

West Cameroon was characterized by extensive magmatism during the Pan-African orogeny, with the rock types ranging from minor basic and intermediate to abundant felsic lithologies. Two groups of the Pan-African granitoid rocks in West Cameroon are