Available online at www.sciencedirect.com
ScienceDirect
Lithos 102 (2008) 460–477
LITHOS
www.elsevier.com/locate/lithos

U–Pb zircon and microfabric data of (meta) granitoids of western Cameroon: Constraints on the timing of pluton emplacement and deformation in the Pan-African belt of central Africa

Gautier Njiekak [a,*], Wolfgang Dörr [a], Jean-Pierre Tchouankoué [b], Gernold Zulauf [a]

[a] *Institute of Geosciences, Frankfurt a. M. University, Altenhöferallee 1, D-60438 Frankfurt a.M., Germany*
[b] *Department of Earth Sciences, Yaoundé I University, P.O. Box 812 Yaoundé, Cameroon*

Received 12 May 2006; accepted 25 July 2007
Available online 27 August 200727 August 2007

Abstract

Striking characteristics of the western Neoproterozoic belt of Cameroon (NFBC) are the large volume of granitoids and crustal-scale shear zones. New structural and geochronological data from this area are provided to put constraints on the tectonic evolution of this segment of the belt and to make further correlations between major shear zones exposed on both sides of the Atlantic Ocean.

Three different complexes have been identified in the study area: the migmatitic complex of Foumbot (MCF), the metagranitoid complex of Bangwa (BC), and the Batié pluton (BP). The MCF was intruded by the BC, while the BP cuts through the BC. U–Pb zircon dating of metaleucogranite and metagranodiorite of the BC yielded concordant to subconcordant ages of 638±2 Ma and 637±5 Ma, respectively. A concordant U–Pb zircon age of 602±1.4 Ma has been obtained from porphyrogranite of the BP. These ages are interpreted as emplacement ages. Continuous deformation from magmatic to solid-state flow along the BP margins and the (sub) parallelism of the steep solid-state foliation in the BP margins with the foliation in the surrounding BC and MFC suggest synkinematic emplacement of the BP along crustal-scale NNE to ENE-trending strike–slip shear zones. Subhorizontal foliations in migmatitic-gneiss xenoliths found in the BC suggest that the major transcurrent motion was preceded by thrusting.

The new data confirm previous assumptions that the western NFBC is equivalent to parts of the Borborema province of Brazil. There are geochronological correlations between the studied (meta)granitoids and Brasiliano pre- to syn-transcurrent granitoids of the Borborema province.
© 2007 Elsevier B.V. All rights reserved.

Keywords: Cameroon; Granitoids; Pan-African; Shear zone; U–Pb; Zircon

1. Introduction

Available data on the Pan-African belt of central Africa north of the Congo craton suggest its evolution to be the result of convergence and collision between the Congo–São Francisco cratons, the West African craton and a Pan-African mobile belt (e.g. Trompette, 1994, 1997) (Fig. 1a). The tectonic evolution of the belt involved voluminous granitic magmatism that occurred variably and at different times along continental-scale strike–slip shear zones. Factors such as terrane amalgamation, associated with collisional events, and the absence of reliable ages in some areas, led to various

* Corresponding author.
E-mail address: g.njiekak@em.uni-frankfurt.de (G. Njiekak).

0024-4937/$ - see front matter © 2007 Elsevier B.V. All rights reserved.
doi:10.1016/j.lithos.2007.07.020

and divergent evolutionary models for the origin of the belt. For example, recent use of U–Pb and Sm–Nd dating techniques in northern central Cameroon (Toteu et al., 2001) led to the conclusion that the Adamawa shear zone, also known as the central Cameroon shear zone, is not the boundary between the Congo–São Francisco craton to the south and a Paleoproterozoic plate to the north as suggested by some models (e.g. Ngako et al., 1991). The Adamawa shear zone occurs within the extended (disrupted) northern portions of the Paleoproterozoic (Eburnian) Congo–São Francisco craton (Toteu et al., 2001).

As knowledge concerning the borders of the Archean and Paleoproterozoic plates is being discussed and refined, the geodynamic significance of granitic magmatism and transcurrent tectonics that prevail during the evolution of the adjacent Neoproterozoic mobile belt remains poorly understood. This paper provides new petrological, structural and U–Pb zircon data from the variably deformed granitoids of the western Neoproterozoic fold belt of Cameroon (NFBC). The timing of movement along the large strike–slip shear zones and their relationships to magma emplacement will be discussed. Correlations between the NFBC and equivalent crustal parts in Brazil are also made.

2. Regional geology

There are three main Proterozoic rock units within the NFBC: (1) high-grade metamorphic complexes of Paleoproterozoic (Eburnean) age, consisting of metasedimentary and metaplutonic rocks, found within the Pan-African granitic batholiths in central Cameroon (Bafia and Adamaoua regions) (e.g. Toteu et al., 2001); (2) schist belts of early-Neoproterozoic age including the Poli, Lom and Yaoundé basins (e.g. Soba et al., 1991; Ngako et al., 2003), and (3) Pan-African granitoids present throughout the belt.

Investigations in northern (Poli region), southern (Yaounde region) and eastern-central NFBC (Lom-Ngaoundere region) revealed the evolution of the belt to be characterized by thrusting and transcurrent tectonics (e.g., Ngako et al., 1991; Toteu et al., 2001). It should be emphasized here that the term northern NFBC has been often used by some authors to refer to the area extending from the Poli region to western Cameroon (Fig. 1b). Here we retain the term northern NFBC for the Poli region only since the non-use of the term western NFBC, which refers to western Cameroon (i.e., the area extending from Foumban region to the Atlantic coast, Fig. 1b), probably arises from the gap in detailed studies in this part of the belt. The subhorizontal foliation (S_1), which results from the thrusting event, developed under low to high-grade metamorphism (e.g. Jégouzo, 1984; Nédelec et al., 1986; Penaye et al., 1993; Nzenti, 1998). In the southern NFBC, southward-directed thrusting on top of the Congo craton has been described.

Transcurrent tectonics led to the development of strike–slip shear zones trending mostly N–S to ENE–WSW in the northern and eastern-central NFBC (Fig. 1; Soba, 1989; Ngako et al., 1991, 2003). The related magmatism broadly includes pre-, syn- and post-tectonic granitoids. Available data on pre- and syn-tectonic granitoids indicate that they were emplaced between ca. 640 Ma and 580 Ma (U–Pb on zircon, Toteu et al., 1987, 2001) and largely consist of calc-alkaline to subalkaline intrusions (e.g., Bessoles and Trompette, 1980; Toteu et al., 1987, Nguiessi et al., 1997; Tagne-Kamga, 2003). The late group of Pan-African granitoids includes subcircular massifs (550–500 Ma, Rb–Sr whole rock data; Lassere and Soba, 1976) of dominantly alkaline composition.

The regional setting of the western NFBC is characterized by a Pan-African basement, consisting of plutonic and metamorphic rocks, that was affected by Cenozoic plutons and volcanic rocks. Remote sensing studies reveal major lineaments trending N30°E and parallel to the long axis of Pan-African leucogranites (Dumort, 1968; Moreau et al., 1987). Since the reconnaissance survey of Dumort (1968), studies on the substratum in the western NFBC rely mainly on petrology and geochemistry. Data from Pan-African plutons reveal that most of them include a wide variety of rocks, ranging from basic to felsic units (e.g., Batié pluton, Talla, 1995; Ngondo pluton, Tagne-Kamga, 2003; Bandja pluton, Nguiessi et al., 1997; see Fig. 1b for different locations). The available initial strontium ratio and Sm–Nd data from some of these granitoids point to a mantle origin and contamination by continental crust (e.g., Talla, 1995; Tagne-Kamga, 2003). Due to shortcomings of the Rb–Sr method, almost no reliable and precise ages have been obtained from granitoids of the western NFBC (e.g., Tagne-Kamga, 2003; Tchouankoue, 1992). As the available Rb–Sr data have large uncertainties, the timing of emplacement or remelting of the inferred granitoids is less well constrained.

The study area includes the Batié pluton and the variably deformed surrounding rocks (Fig. 2).

The Batié pluton (BP) consists of about 90% coarse- to medium-grained monzogranite including both biotite and hornblende (576±24 Ma, Rb–Sr whole rock dating). Other rock types include granodiorite and

Download English Version:

https://daneshyari.com/en/article/4717647

Download Persian Version:

https://daneshyari.com/article/4717647

Daneshyari.com