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$^{40}\text{Ar}/^{39}\text{Ar}$ ages in two alkaline igneous complexes from the Tikar Plain, Cameroon (Central Africa): a contribution to the interpretation of the Cameroon Line magmatism

Njonfang E.¹, Laurenzi M.A.², Wokwenmenda Nguet P.³

1. Laboratoire de Géologie, Ecole Normale Supérieure, Université de Yaoundé 1, B.P. 47, Yaoundé, Cameroun.

2. Istituto di Geoscienze e Georisorse, Area della Ricerca CNR, Via G. Moruzzi, 1, 56124 Pisa, Italy

3. Centre de Recherche Géologique et Minière, Ekona, B.P. 370 Buéa, Cameroun.

Corresponding author: email enjonfang@yahoo.fr

Abstract.

The Tikar Plain is located within the central part of the Cameroon Line (continental sector), and is characterized by abundant alkaline igneous complexes roughly aligned SW–NE. A common feature of these complexes is the coexistence of plutonic and volcanic rocks and the scarcity of radiometric data. Only the Sabongari complex has been dated making it difficult to establish the chronology of relative emplacement between the different isolated and aligned complexes. Available ages along the whole Cameroon Line (CL) were obtained mostly by Rb/Sr and/or K/Ar methods, and range between 70 and 30 Ma for alkaline complexes and from 51 Ma to Present for volcanic massifs. Indeed, only 13 from over 137 ages were determined by Ar/Ar analysis. Since K/Ar ages are sometimes unreliable because of hydrothermal overprinting and associated uptake of excess argon, an $^{40}\text{Ar}/^{39}\text{Ar}$ campaign of dating has been initiated in the Tikar Plain and the Sabongari and neighbouring Nana complexes. Dating experiments were performed at the ^{40}Ar - ^{39}Ar laboratory of the Istituto di Geoscienze e Georisorse, CNR, Pisa, following the procedures of Laurenzi et al. [1]. The dated samples include a peralkaline pyroxene–amphibole granite (SA89) and a metaluminous trachyte (SA63) from the Sabongari complex and a microdiorite (NA223) and a basaltic trachyandesite (NA231) from the Nana complex. The pyroxene–amphibole granite yielded an amphibole age of 57.70 ± 0.44 Ma and the associated trachyte a groundmass age of 56.75 ± 0.28 Ma. The microdiorite gave a plagioclase age of 52.39 ± 0.82 Ma and the associated basaltic trachyandesite, a groundmass age of 49.31 ± 0.40 Ma. The following conclusions can be drawn: i) volcanic rocks post–date plutonic rocks in both complexes; ii) the Sabongari complex is older than the Nana complex, iii) there is a close consanguinity between plutonic and volcanic rocks in a given complex, iv) such volcanic activity should be distinguished from those at the origin of the more voluminous Cameroon Volcanic Line (CVL) lavas; indeed, the age of 56.79 Ma obtained in the trachyte of Sabongari is older than the oldest age of 51 ± 1.2 Ma (K/Ar method) so far determined for the CVL, in the olivine free transitional basalt of Bamoun plateau. Noteworthy are the older ages of 62 Ma and 68.8 Ma (K/Ar method) respectively for the basalt from suite 2 and the peralkaline trachyte from suite 1 alkaline complex of Gwenfalabo [4], WNW Adamawa plateau.

The ages obtained in the Nana complex are similar to those already published for at least two other complexes in the North (52 ± 2 Ma, granite from Mboutou complex) and West (51 ± 1 Ma, granite from Bana complex) of Cameroon. These results are consistent with the interpretation considering the CL as a major lithosphere structure tapping a hot deep asthenospheric zone [2], and more globally as the result of complex interactions between hotspots and lithospheric fractures during African plate motion [3;5].

Keywords: Tikar Plain, Sabongari complex, Nana complex, Cameroon Line, $^{40}\text{Ar}/^{39}\text{Ar}$ ages, Central Africa.

References

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