

Paper Number: 5583

A Palaeoproterozoic magmatic arc in SW Angola (Congo Craton): petrochemical evidence and geochronological data

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The Macota Gabbro-Diorite Complex (MGDC) includes gabbros, hornblende-bearing quartz-gabbros, quartz diorites, granodiorites and, in lesser volumes, olivine hyperites and hornblendites. Similar rocks near Chibia include ultramafic rocks, the Hamutenha dunite. Hypabyssal and volcanic rocks are represented by the Cainde quartz-feldspar porphyries (CQFP).

Petrochemical and geochronological data led to the inclusion of these extensive outcropping suites of rocks from the Lubango – Namibe region in a newly recognized magmatic arc in the SW of Angola. All the rocks analyzed in both MCDG and CQFP shows a calc-alkaline signature [1]. The gabbro-diorites are characterized by LREE enrichment ($LaN/YnN = 17.0 - 6.7$) and a moderate negative Eu anomaly ($Eu/Eu^* = 0.9-0.4$). The porphyries are characterized by the high steep REE patterns ($LaN/YbN = 19.8-11.3$) and moderate to negative anomalies Eu ($Eu/Eu^* = 0.58-1.02$). Other parameters such as Th/Nb (1.58-0.6), La/Nb (4.34-3.1) and Zr/Nb (17.1-13.1) are indicative of slight fractionation and various degrees of crustal contamination.

A U-Pb zircon age cluster of ca 1.8 Ga was obtained for these rocks [1]. The concordant zircon grains obtained in the large bodies of diorites NW of Cainde yielded a mean ^{207}Pb - ^{206}Pb age of 1834 ± 22 Ma (LA-HR_ICPMS, Neptune type). This value is interpreted as the diorite igneous crystallization age. The Tdm of 2.2 Ga and the Nd value close to zero, calculated to 1834 Ma, indicate that these rocks are derived from magmas produce by partial melting of rocks with short crustal life or produced by mixing of juvenile magmas with subordinate magmas derived from melting of older continental rocks. A U-Pb baddeleyite age of 1805 ± 5 Ma was obtained for the Cainde diorite. Zircon grains from the felsic porphyries east of Cainde yield an upper intercept U-Pb age of 1804 ± 7 Ma (LA-HR-ICPMS). In concordant zircon fractions from three porphyry samples of the same local, a U-Pb zircon mean $^{207}Pb/^{206}Pb$ age of 1808 ± 6 Ma was determined. This set of zircon U-Pb ages allows a clear distinction between the gabbroic rocks of the MGDC and the Cunene Anorthositic Complex, dated with a zircon U-Pb SHRIMP concordant age of 1340 ± 7 [2], which represents an anorogenic magmatic episode after the Congo Craton final stabilization.

The collisional record of the São Francisco and Congo cratons is of central importance in the reconstitution of the Columbia supercontinent amalgamation (ca 1.8 Ga) [3]. In eastern and southern sectors of the Congo Craton, Eburnean tectogenesis has been characterized by dispersed cratonic blocks and tectonothermal reworking of Archaean crust. The occurrence of amphibolitized basic rocks is doubtfully reported to magmatic arc environments [4]. In this context, the recognition of a 1,8 Ga magmatic arc in the SW of Angola (Namibe and Lubango region) represents a new insight in the research focused in the western part of the Congo Craton.

References:

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