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New U-Pb ages and geochemical characteristics of the Proterozoic doleritic dyke swarms from the Leo-Man craton

Baratoux L.^{1,2}, Jessell, M.W.^{1,3}, Söderlund, U.⁴, Ernst, R.E.⁵, Benoit, M.¹, Naba, S.⁶, Cournède, C.⁷ Perrouty, S.⁸, Metelka, V.³, Yatte, D.⁹, Diallo, D.P.⁹, Ndiaye, P.M.⁹, Baratoux, D.^{1,2}

¹GET, IRD, CNRS, OMP, 14 avenue E. Belin, Toulouse, France, lenka.baratoux@ird.fr

²Institut Fondamental d'Afrique Noire Cheikh Anta Diop Dakar, Senegal

³CET, The University of Western Australia, 35 Stirling Highway, Crawley, Perth, Western Australia 6009

⁴ Department of Geology, Lund University, Sölvegatan 12, SE-223 62 Lund, Sweden

⁵Department. of Earth Sciences, Carleton University, 1125 Colonel By Drive, Ottawa, Canada K1S 5B6

⁶Université de Ouagadougou, Ouagadougou, Burkina Faso

⁷Aix Marseille Univ, CNRS, CEREGE, Aix En Provence, France

⁸Western University, Earth Sciences Department, 1151 Richmond Street, London, ON, N6A 5B7, Canada ⁹Université Cheikh Anta Diop, Dakar, Senegal

Over 20 sets of dolerite dykes crosscutting Paleoproterozoic basement in West Africa were distinguished via the interpretation of regional and high resolution magnetic airborne data of West African Craton [1]. Some of the dykes reach over 300 km in length and they are considered to be parts of much larger systems of mafic dyke swarms which are part of the plumbing system for Large Igneous Provinces and may be therefore used for the reconstruction of Precambrian supercontinents [2]. Five different dyke swarms in Burkina Faso, Niger, Ghana and Senegal were analysed and dated. From a petrographic point of view, the mafic dykes correspond to tholeiitic basalts and are typically composed of plagioclase + clinopyroxene (augite) ± orthopyroxene (enstatite) ± olivine, and display a doleritic texture of variable grain size.

Eleven ID-TIMS U-Pb ages obtained on baddeleyite (for details on the technique see [3]) define five generations of Proterozoic age. The oldest, the N-S trending Libiri dyke swarm, was found in Niger, in the Libiri pit of the Samira gold mine, yielded an age of ca. 1790 Ma. The N40 Bassari swarm in Senegal was dated at ca. 1764 Ma, and is potentially linked to the 1790 Ma Libiri swarm, 1400 km away. The 300 by 400 km Korsimoro N100 dyke swarm transects central Burkina Faso and was dated at ca. 1575 Ma. Five ca. 1520 Ma ages were obtained for dykes of the Essakane swarm, three in Burkina Faso, one from Ghana and one from Senegal, and document a large extent (600 km wide and 1500 km long) and short duration of dyke emplacement. The orientation of this swarm changes from N130 in Burkina Faso and Ghana to E-W in Senegal. The Manso N350 dyke swarm in southern Ghana, which is about 400 km long and about 200 km wide, yields a preliminary age of ca 870 Ma. In addition, a dolerite sill in the Taoudeni basin is dated at ca. 200 Ma and confirmed to be related to the CAMP event. The range of dyke swarm ages represent an initial Proterozoic magmatic barcode for this portion of the West African craton which now can be compared with the barcodes of other crustal blocks to test proposed Nuna and Rodinia reconstructions involving the West African craton.

With the possible exception of the near flat pattern of the Korsimoro swarm (only one sample analysed), the rest of the swarms display clear fractionated, moderately enriched, trace element patterns. Except

for the Manso and Korsimoro swarms, the dykes are characterized by a clear negative Nb anomaly, indicating a plausible subduction fingerprint, which may be inherited from the lithospheric mantle source where the ancient 2.2 Ga old subduction zones were recycled.

References:

[1] Jessell et al., (2015) J Afr Earth Sci; doi: 10.1016/j.jafrearsci.2015.01.007

[2] Ernst (2014) LIPs. Cambridge U. Press;

[3] Söderlund and Johansson (2002) Geochem Geophys Geosyst doi:10.1029/2001GC000212

