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Proterozoic to Jurassic LIP mantle source evolution: example from the 180Ma-Karoo and 1.1Ga-Umkondo provinces, Africa.

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Most of the studies focus on the Phanerozoic large igneous provinces (LIPs) and in particular those related to the disruption of Pangea (e.g. CAMP, Parana-Etendeka,) while Precambrian LIPs (e.g. Ventersdorpf, Fortescue) remain less studied. Although the investigation of Precambrian CFBs is difficult because of their poorly preserved character, their study, in parallel with younger overlapping LIP, is fundamental for monitoring the evolution of the mantle composition through time. Such a study has been previously successfully carried out on superimposed LIPs from the South American platform [1] but has not been documented so far for LIPs in Southern Africa.

Recent $^{40}Ar/^{39}Ar$ geochronological studies of the Okavango giant dyke swarm (and related sill satellites) showed that $\sim$ 88% of the dykes were emplaced at 179 $\pm$ 1 Ma and belong to the Karoo large igneous province [2] whereas $\sim$12% of dykes (plus sills) yielded Proterozoic ages ($\sim$1-1.1 Ga; [3]). Here, we provide new preliminary major, trace and Rare Rarth element analyses of the Low-Ti Proterozoic dykes that suggest, combined with age data, a cognate origin with the 1.1 Ga Umkondo large igneous province [4].

The geochemical characteristics of the Proterozoic basalts are comparable to the overlapping low-Ti Karoo basalts and suggest that both LIPs were derived from similar enriched mantle sources. A mantle plume origin for these LIPs is not easily reconciled with our data as (1) a mantle plume signature is not recognized in the Protero-

zoic dyke dataset, neither is it convincingly established for Karoo basalts which bear a dominant lithospheric mantle signature [5], (2) drifting of the African plate during $\sim$900 Ma implies that Umkondo and Karoo magmatism would have tapped different mantle plume reservoirs (with different signatures) and (3) two different mantle plumes should have been chemically modified in a different way during their ascent through a heterogeneous mantle. Rather, we propose that the Karoo and Umkondo provinces monitored the slight evolution of a shallow enriched (lithospheric?) mantle through time. To probe the Southern African mantle further in time, the Archaean Palabora dyke swarm is under investigation.

[1] Iacumin et al. (2003), ESR 62, 365-397

[2] Jourdan et al. (2004), EPSL 222, 989-1006

[3] Jourdan et al. (2006), EPSL 241, 307-322

[4] Hanson et al. (1998), Geology, 26: 1143-1146.

[5] Jourdan et al. (2007), Jpet 48, 1043-1077