

An identity crisis in Namaqualand: The tale of the NW-SE trending Cederberg dyke swarm and E-W dykes north of it, Western and Northern Cape Provinces, South Africa

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Most dyke swarms along the west coast of South Africa are inferred as roughly cotemporaneous with the Cretaceous rifting and opening of the South Atlantic. We recently reported two prominent and coast-parallel mafic Namaqualand and Garies dykes aged ~485 Ma [1]. Here we turn to other mafic dykes in the same region: (1) a NW-SE-trending swarm that clearly cuts sedimentary cover rocks of the Karoo in the Cederberg region, and (2) a few, thin and E-W striking dykes that cross cut the coast-parallel, 485 Ma Namaqualand dyke about 300 km further to the NW.

For the coast-oblique Cederberg dyke swarm, we report weighted baddeleyite ages of 131.4 ± 4.5 Ma (sample 18CK003 from a northern Knersvlake dyke) and 133.0 ± 1.5 Ma; (18CK025 from a southern Doring-Tanqua dyke). $^{40}\text{Ar}/^{39}\text{Ar}$ dates on these two dykes, and two others in the same swarm, that lacked baddeleyite, cluster between 128.5 ± 1.4 Ma and 132.2 ± 1.5 Ma. Together, these six ages permit confidence that these dykes were emplaced c. 130 Ma.

Three of the E-W-striking dykes were studied and sampled solely for $^{40}\text{Ar}/^{39}\text{Ar}$ geochronology, and yielded ages up to 10 Myr older than the Cederberg dykes: 139.3 ± 3.5 and 137.0 ± 1.2 Ma for two coastal dykes located 27 and 165 km south of Kleinsee, respectively (19CK001 and 19CK006) and 140.3 ± 1.2 Ma for a dyke near Garies (19CK003).

The agreement in the Cederberg swarm between the $^{40}\text{Ar}/^{39}\text{Ar}$ dates and the baddeleyite U-Pb ages (generally considered to be more reliable) inspires confidence in the former, and suggests that the almost 10 million year difference in ages between the two sets of dykes (E-W vs NW-SE) could be real. While both of these swarm ages could straddle a prolonged continental rifting and breakup of the South Atlantic, we also consider that there was a closer association to a more juxtaposed Paleo-Discovery hotspot source [2], rather than to the ~135 Ma Parana-Etendeka LIP, centered >1,500 km to the north of our dykes.

[1] Kingsbury et al. (2021) *Precambrian Geology* 354,