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Reassessment of Mesoproterozoic granitic rocks in southern Namibia and their context within the broader western Namaqua Province

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Voluminous granites and granitic gneisses are found throughout southern Namibia and northern South Africa and are generally linked to the Mesoproterozoic D_2 Namaquan Orogeny at ~1200 Ma. Historically these granites spanned a range of different granite types and textures and were called different names by different researchers at different times. Recent 1:50 000 scale geological mapping in southern Namibia by the Geological Survey of Namibia and the Council for Geoscience (Macey et al., 2015) has re-examined these granites and granitic gneisses and developed a new lithodemic framework based on petrography, geochemistry, radiogenic isotopes, U-Pb zircon geochronology and tectonic context. The focus of this contribution are the Mesoproterozoic megacrystic granites and granite gneisses that fall within the newly defined Eendoorn Suite. The Eendoorn Suite as a whole spans the compositional range of alkali-feldspar granite through to granodiorite and all members of the suite have a prominent negative Nb-Ta anomaly. The oldest member of the suite is the Pioneer Granodiorite at ~1230 Ma. The Pioneer Granodiorite is spatially closely associated with the alkali-feldspar Kinderzitt Granite which is younger at ~1190 Ma. In between these ages are the Beenbreek Granite (~1210 Ma), the Bokkiesbank Granite (~1214 Ma), the Khaais Granitic Gneiss (~1206 Ma) and the Twakputs Gneiss (~1208 Ma). All members have variable development of a gneissic fabric and the intensity of the gneissic fabric is generally a function of proximity to the thrusts and shear zones associated with the newly defined Lower-Fish-River-Onseepkans Thrust Zone (LFROTZ). The LFROTZ represents an imbricate stack of strongly deformed and sheared rocks delineating the terrane boundary between the largely Mesoproterozoic granulite-facies Kakamas Domain in the east and the Palaeoproterozoic amphibolite-facies Pella Domain of the Richtersveld Magmatic Arc in the west. The garnet-bearing strongly deformed Twakputs and Bokkiesbank granitic gneisses occur in the hangingwall of the Kerelbad-Tafelkop Thrust and hence are within the Kakamas Domain. The Beenbreek Granite and the strongly sheared Khaais Granitic Gneiss sit within the LFROTZ and generally have smaller megacrysts and less garnet distributed more unevenly. The undeformed to weakly deformed Pioneer and Kinderzitt granites intrude both the LFROTZ and Pella Domain rocks in the footwall to the LFROTZ and were emplaced after emplacement of the Kakamas Domain over the Pella Domain. Despite being grouped together into the Eendoorn Suite, there are many differences between these granitic rocks and it is still unclear whether all members belong to the Eendoorn Suite. The granites to the west of the Kerelbad-Tafelberg Thrust typically have depleted mantle (T_{DM}) model ages of 1.95 – 2.39 Ma, whereas the Twakputs Gneiss to the east of this thrust has a T_{DM} model age of ~1.78 Ma. Based on these model ages, the source region for the Pioneer, Kinderzitt, Beenbreek and Khaais granites is likely to include cannibalised Richtersveld Magmatic Arc as well as the older Sperrgebeit Arc and the Ta-Nb anomaly typical of arc magmas is inherited. However, the younger T_{DM} model ages combined with the similar Ta-Nb anomaly for the Twakputs Gneiss suggests

derivation from a different source albeit one that includes components of arc magmas although it is not clear what arc this is. The subtleties in petrography, geochemistry, and geochronology raise important issues about the grouping and ungrouping of different rock units of similar composition within a given region during regional mapping. These decisions play a central role in how we see the generation, amalgamation and reworking of different crustal blocks and understanding these processes helps us to decide on the broader scale tectonic environment of the region being mapped.

Macey, P.H. et al. (2015). CGS/GSN explanation to 1:50 000 geological map sheets 2818 Warmbad, 701pp