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# TWO CONTRASTING METAMORPHOSED ULTRAMAFIC-MAFIC COMPLEXES FROM GREENSTONE BELTS, THE NORTHERN KAAPVAAL CRATON AND THEIR SIGNIFICANCE IN ARCHAEAN TECTONICS

C.A. Smit and J.R. Vearncombe, Dept. Geology, Rand Afrikaans University, Johannesburg.

The character of Archaean ultramafic-mafic complexes can, given their prominance in greenstone belts, provide critical clues to help deduce the tectonic setting of these belts. Here we describe two contrasting, metamorphosed, ultramafic-mafic complexes, the first a partially serpentinised dunitic body with associated chromite from Lemoenfontein, one of several peridotitic bodies occurring as discrete lenses and pods in granulite facies gneisses of the northern Kaapvaal craton. The second, the Rooiwater complex is a major layered igneous body, now metamorphosed in the amphibolite facies, but without pervasive deformation, which crops out in the northern Murchison greenstone belt.

The Lemoenfontein body is circular, about 100m in diameter, having the form of a steeply plunging boudin which complements the regional structural pattern. The surrounding granulite facies gneisses were isotopically reset about 2650 Ma and may be considerably older. The Lemoenfontein rocks are partially serpentinised dunite, displaying a prominent tectonic fabric defined by the preferred orientation of olivine grains, chromite pods and disseminated chromite stringers, all of which are believed to have been through the granulite facies metamorphism. Chromite is present as massive high-grade ore, 'leopard' (nodular) ore, tectonically layered ore and disseminated ore. Zones of chromite enrichment range in thickness from 1 to 30cm. The Lemoenfontein chromites are similar to those mined in the Ultramafic Formation of the Selukwe greenstone belt, Zimbabwe.

Olivines from Lemoenfontein are Fo94 to Fo96 with NiO contents from 0.35 to 0.59wt%. The mineral chemistry of the chromites of all different types (pods, trains, and inclusions in silicate grains) is very similar indicating either complete metamorphic equilibration or they represent consistent primary compositions. The Lemoenfontein chromites have refractory characteristics (low $TiO_2$, $Al_2O_3$ and alkali metals) and plot on geochemical fence diagrams in or close to the fields of other podiform chromites. Rocks which in Phanerozoic series are closely associated with alpine-type peridotites or ophiolite suites.

The Rooiwater complex is a thick on end differentiated igneous body, of age greater than 2650 Ma, probably intruded at 2960 Ma. The complex is heterogenously deformed with much of the 7.5km exposed thickness showing no pervasive deformation. Metamorphosed pyroxenite, anorthosite, gabbro, sulphide-bearing gabbros, thick magnetitite layers and differentiated granites are compatible with the hypothesis that the body is a layered intrusion although it is now allochthonous and intruded by younger unrelated granites. Southward increasing $TiO_2$ and decreasing $V_2O_5$ contents in magnetitite layers combined with a general southerly disposition of differentiated hornblende granite suggest that the Rooiwater complex is southward facing. A paucity of ultramafic cumulates and up to 1.5km of highly differentiated hornblende granite suggests that the original magma was more felsic than that of similar layered intrusions.

The Lemoenfontein chromites and associated ultramafic rocks are lithologically and chemically similar to their Phanerozoic equivalents of ophiolitic origin, interpreted as obducted oceanic crust. Similarly we interpret the Lemoenfontein complex as being a remnant of Archaean oceanic material. In contract, the Rooiwater complex is, despite the lack of exposed intrusive contacts, similar to layered igneous complexes such as Ushushwana or Bushveld. These complexes are intrusive in continental environments. We conclude that contrasting ultramafic-mafic complexes represent a heterogeneity in greenstone belts with either oceanic or continental environments involved. Whether this heterogeneity relates to a temporal or spatial (or both) control remains uncertain.