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Archaean volcano-sedimentary cyclicity in komatiite flow sequences at Schapenburg, Barberton Mountain Land, South Africa

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Mafic and ultramafic rocks of komatiitic affinity are distributed in a variety of geological settings in the ca. 3550-3200 Ma Barberton granite-greenstone terrane, South Africa. They occur (1) as komatiitic and high-Mg basaltic extrusives, developed throughout the stratigraphic column of the Barberton greenstone belt, but particularly in the lowermost formations of the Onverwacht Group (e.g., Komati Formation); (2) as ultramafic-mafic intrusions generally displaying pronounced magmatic differentiation and cyclical layering (e.g., Stolburg Complex); and (3) as multiple, cyclically repetitive volcano-sedimentary units such as those displayed in the Schapenburg greenstone remnant (Fig. 1).



Figure 1. (Left) Google Earth view of the cyclic layering in the Schapenburg greenstone remnant: (Right) Multiple cyclic layers intruded by the ca. 3231 Ma [2] Schapenburg tonalite pluton (foreground).

This paper highlights relationships displayed by a cyclically repetitive volcano-sedimentary assemblage of komatiites, basaltic komatiites, and silicate-facies iron formations found in the ca. 3,500 Ma Schapenburg greenstone remnant, 30 km south of the Barberton greenstone belt [1, 3, 4]. Cyclic units, of which more than 20 have been identified [1], mostly consist of aphyric as well as spinifex-textured komatiite lava flow sequences or interlayered cumulate sills. These rocks are overlain, in turn, by basaltic komatiites and metatuffs, the latter generally capped by banded grunerite-chert iron formation (BIF). Sharp contacts separate the rock types and evidence for structural repetition of the cyclical units is lacking. It is suggested that the alternating cyclical extrusion of komatiites and komatiitic basalts resulted from a magma chamber being replenished from time to time by plume-related olivine-rich magma, some of which may have been expelled together with alternating pulses of basaltic magma. Sedimentary rocks (BIFs) were deposited during intervals separating the volcanism.

References

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