Geochemistry of mafic to ultramafic granulites from the Larsemann Hills, east Antarctica

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Mafic and ultramafic granulites occur as lenses or boudins within the late Proterozioc (1000-1100 Ma) paragneiss and felsic orthogneiss in the Larsemann Hills, east Antarctica.

The ultramafic and mafic granulites show compositional features of igneous cumulates. The rock types include lherzolite, pyroxenite and metagabbro. Whole rock X_{Mg} (atomic Mg/Mg+Fe^{2+}) values are high (up to 0.73 for lherzolite, 0.84 for pyroxenite and 0.78 for metagabbro). Microprobe analyses of pyroxene indicate X_{Mg} values up to 0.91. Whole rock Cr and Ni contents are also high, with [Cr] up to 1826 ppm for lherzolite and 1813 ppm for pyroxenite, and [Ni] up to 1400 ppm for lherzolite and 1035 ppm for pyroxenite. Relatively low contents of Cr (191-580 ppm) and Ni (40-110 ppm) in metagabbros may be attributed to fractional crystallization of initial magmas.

In the PM-normalized spider diagram, a pronounced negative Nb anomaly is consistent with the distinctive feature of subduction-related magmas, while low TiO_2 values and K-enrichment in mafic granulites are also comparable to arc basalts [1]. A relative enrichment in LREE's in the REE patterns and incompatible elements implies that they may derive from an enriched mantle.

Thus, the ultramafic to mafic granulites in the Larsemann Hills may have been generated in a subduction zone environment related to arc setting during the late Proterozoic (1000-1100 Ma) orogeny. This study suggests that, similar to the northern Prince Charles Mountains [2], the Larsemann Hills region may have experienced a Proterozoic subduction in an arc setting, whereas the ~500 Ma (Pan-African) event may only be a reflection of intra-plate deformation during the formation of Gondwana supercontinent.

References

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