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PETROGENESIS OF PROTEROZOIC MAFIC ROCKS IN WESTERN DRONNING MAUD LAND

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Bulk major-, trace- (including rare earth) element and isotopic data of variably metamorphosed mafic rocks in the polymetamorphic Maud Belt of western Dronning Maud Land, East Antarctica, in conjunction with limited geochronological data, indicate that the Maud Belt was once an active continental volcanic arc that formed on the southeastern margin of the Kaapvaal-Grunehogna Craton during the late Mesoproterozoic (1160-1130 Ma). This is in contrast to previous models of an oceanic island arc that was obducted onto the craton margin in analogy with the perceived evolution of the Natal Belt in southern Africa. Four groups of pre- to syn-tectonic amphibolite are distinguished in the Maud Belt on the basis of new lithogeochemical and Rb-Sr as well as Sm-Nd isotope data. Group 1 is the oldest and is interpreted as representing volcanic arc-related mafic protoliths. It is characterized by Archaean Sm-Nd model ages (2500 to 3300 Ma), depletion in Nb and Ta, and strong enrichment in light rare earth and large ion lithophile elements. Its ЄNd (1110 Ma) values range between –6.0 and –15.0. The protoliths to the Group 2 amphibolites are ascribed to a subcontinental-scale mantle thermal anomaly at approximately 1107 Ma (Umkondo event of southern Africa) on the basis of comparable Sm-Nd model ages and trace element distributions. Equivalents of this group were also found in only very low-grade metamorphic dolerite dykes/sills within the 1140 Ma volcano-sedimentary fill of the Ritscherflya Basin for which a back-arc position could be established. Group 3 amphibolites are distinguished by flat, E-type MORB-like rare earth element patterns and low Th/Yb ratios. They are interpreted to represent largely juvenile oceanic basalt or mafic dykes that were emplaced during Neoproterozoic extension at approximately 600 Ma. Group 4 amphibolites show overall enrichment in rare earth elements and Zr. They are interpreted to be related to c. 530 Ma syn-tectonic mafic magmatism that resulted from mixture of mantle-derived melts with partial melts of late Mesoproterozoic lithosphere.