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TECTONOTHERMAL EVOLUTION OF THE SCHIRMACHER HILLS, QUEEN MAUD LAND, EAST ANTARCTICA THROUGH MULTIPLE EPISODES OF DEFORMATION, METAMORPHISM AND MIGMATIZATION

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The Precambrian basement of the Schirmacher Hills consists of six major rock units.The western part, although occurring at a lower tectonic level, is dominantly granitic. The eastern part is mostly granulitic, composed of interlayered enderbite and mafic granulite in almost equal proportions. Isolated enclaves of mafic and ultramafic rocks occur in the banded gneiss. The earliest tectonothermal event (D1/M1) was identified within some isolated mafic and ultramafic enclaves, which represent an earlier basement with a composite fabric parallel to the compositional banding. On the basis of detail thermobarometry and textural interpretation, we conclude that the enclaves bear the evidence of an early phase of granulite facies metamorphism at ~900^{o}C, 11.2 kbar. The enclaves are considered to be fragments of a former lower crust brought up by the later intrusive enderbitic magma. Most parts of this early basement have now been incorporated within the present basement. The second tectonothermal event (D2/M2) also took place under lower crustal conditions at around 850^{o}C and 8 kbar. The deformation involved isoclinal folding and formation of high strain zones. The third group of events (D3/M3) is the most dominant tectonothermal event in the region, which took place under middle crustal amphibolite facies conditions at 6 kbar and 600^{o-}650^{o}C. The isoclinal folds deformed all earlier structures with a dominant axial planar cleavage. The rocks also suffered intense ductile shearing in micro- and macro scale causing a regional inversion with granulites emplaced over the amphibolite facies rocks. The microstructure of the mylonites shows characteristic features of high temperature deformation and thus gives us an idea of deformation mechanisms of the constituent minerals at great crustal depth. The fourth and fifth group of events produced two sets of upright folds and vertical shear zones under amphibolite facies conditions. Towards the cessation of the tectonothermal events, there was development of discrete fractures and emplacement of mafic and felsic bodies. A set of unmetamorphosed post tectonic mafic dykes cuts across all the earlier structures.