Determination of magnetic anisotropy and a ca. 1.2 Ga palaeomagnetic pole from the Bremer Bay area, Albany Mobile Belt, Western Australia

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ABSTRACT

Granulite facies tonalitic gneiss, mafic granulite and late metadolerite dykes from Bremer Bay in the Mesoproterozoic Albany Mobile Belt yield palaeomagnetic remanence that were acquired between ca. 1.2 Ga and 1.1 Ga. A well-constrained pole (66.6°N, 303.7°E) fits the ca. 1.2 Ga part of the Precambrian Australian apparent polar wander path. This pole is in agreement with the high-latitude position of Australia at ca. 1.2 - 1.1 Ga shown on some Rodinia reconstructions. More data are required before any significance can be attributed to a second, poorly defined pole (41.8°S, 243.7°E) that falls at some distance from the ca. 0.8 Ga part of the Australian apparent polar wander path. Magnetic anisotropy measurements from all samples except late granite dykes indicate northeast-southwest elongation (i.e. parallel to the local trend of the orogenic belt) and northwest-southeast contraction. This is in agreement with the orientation of principal strain axes deduced from structures formed during late stages of ductile deformation. The mean magnetic fabric lineation (long axis of the strain ellipsoid) is subparallel to a mineral elongation and the axes of late upright to inclined folds. Short axes of the strain ellipsoid determined from magnetic fabric measurements are in a similar orientation to poles to the axial surfaces of these folds and to the associated cleavage. This mean shortening axis bisects late conjugate ductile shear zones that overprint the folds. This study has shown that structurally complex high-grade gneisses and intrusive rocks with variable timing relationships may yield meaningful palaeomagnetic results for late stages of metamorphism. Magnetic anisotropy analysis is also seen to be a valuable tool in providing principal strain directions for late ductile deformation.