Metamorphism and exhumation of basement gneiss domes in the Quadrilatero Ferrifero, SE Brazil: Proterozoic reworking of an Archean dome-and-keel province

KATHRYN CUTTS[1], CRISTIANO LANA[1], FERNANDO ALKMIM[1]

[1]Departamento de Geologia, Escola de Minas, Universidade Federal de Ouro Preto, Morro do Cruzeiro, 35400-000 Ouro Preto, MG, Brazil.

The formation mechanisms of dome-and-keel provinces in Archean cratons has been intimately connected with the debate on the initiation of plate tectonics on Earth because these features seem to have typically only formed in Archean rocks. This suggests that dome-and-keel provinces result from conditions unique to Archean geology. The dome-and-keel province of the Quadrilátero Ferrífero in Brazil has been identified as such for more than three decades. The prevailing model for its formation suggests that it occurred in the Palaeoproterozoic, making it unique among dome-and-keel provinces. This study presents the first metamorphic conditions for the Quadrilátero Ferrífero and contributes to the scarce metamorphic data available for dome-and-keel provinces in general. Two samples from the Baçao dome have a clockwise pressure-temperature path with peak conditions of 8-9 kbar and 650-700 °C corresponding to an interpreted metamorphic zircon age of ca. 2775 Ma. A third sample which has a zircon crystallisation age of ca. 2230 Ma experienced peak conditions of 5-6 kbar and 650-700 °C on a near isothermal, anticlockwise pressure-temperature path, with corresponding metamorphic zircon and titanite ages of ca. 2050 Ma. The earlier event is consistent with pressure-temperature paths obtained from other dome-and-keel provinces plausibly as a result of partial convective overturn. The subsequent event is interpreted as a reactivation of the dome-and-keel formation structures, putting the cold keel rocks in contact with the hot domes. The results of this study suggest that the Quadrilátero Ferrífero is in fact an Archean dome-and-keel province that was reactivated in the Paleoproterozoic.