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Full size detailed colour figures are made available (Appendix 1) and supporting datasets (Appendices 2 to 6) are contained in electronic appendices.

ABSTRACT

Damara Belt is well-exposed mid-crustal section through a collisional orogen of Cambrian age that closed the Khomas Ocean basin between passive margins on the Congo and Kalahari Cratons. Collision resulted in a bi-vergent orogen with distinct paired metamorphic pattern of foreland-vergent high-P/low-T orogenic margins and a broad high-grade, low-P/high-T orogen core. Spatial and temporal patterns of the metamorphic response to collision have been characterized for all parts of the belt using; a large dataset (n~240) of internally consistent quantitative PT determinations, evolution of mineral parageneses and semi-quantitative P-T paths, metamorphic mapping and quantitative metamorphic field gradients. Integration with deformation history, structural profiles, metamorphic chronology, magmatic history and stratigraphy, constrains a dynamic model of crustal architecture during peak metamorphic events. The pattern of zonal metamorphic response is demarcated by three major metamorphic discontinuities (MD) with steep pressure gradients, inferring crustal-scale structures that accommodated lateral exhumation of crustal wedges. Discontinuities are confirmed by deformation features in the field, and metamorphic mineral growth indicate that vertical flattening at the peak of metamorphism progressing through ductile to brittle extensional structures. Crustal wedges along the orogenic margins experienced steep clockwise P-T paths with peak-PT conditions terminated by isothermal decompression during rapid exhumation in isostatic response to deep burial. Metamorphic chronology and over-printing metamorphic fabrics constrain a sequence of foreland propagating out-wedging of crustal thrust wedges that resulted in telescoping of the orogenic margins. Peak metamorphism at a geothermal gradient of 20-25 ºC/km and 8-9 kb in the Southern Zone (Wedge I) was attained between ~517-530 Ma, followed by south-directed out-wedging at the Uis-Pass Suture, accommodated by relative extension (MD1) at high structural levels near the boundary with the high-grade orogen core. Out-wedging of the Southern Zone, further buried the Southern Margin Zone (Wedge II) in the footwall below the Uis-Pass Suture. Peak metamorphism at 17 ºC/km and 9.5-11.5 kb in the Southern Margin Zone was attained at 517±4 Ma and followed by out-wedging on basal thrusts, accommodated by vertical flattening and extensional reactivation of the Uis-Pass Suture (MD2). Peak metamorphism at 17 ºC/km and 10.5 kb in a high-P/low-T crustal wedge in the northern margin (Wedge III) occurred at 510±4 Ma. Peak metamorphism in this wedge was terminated by isothermal decompression during north-directed thrusting, accommodated by extension at higher structural levels near the high-grade orogen core