# Paired residual deformation and post-orogenic exhumation of the Kaoko and Dom Feliciano belts – impacts of the migrating orogenic front during the assembly of western Gondwana

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The reactivation of shear zones under brittle conditions during exhumation due to extensional collapse of the thickened continental crust is a common feature of post-collisional settings. New illite K-Ar analyses and (U-Th)/He data help establish the timing of exhumation and residual deformation during the final stages of orogenic activity in the Kaoko Belt. Dating of clay-sized white mica from fractionated samples can be used to estimate late-stage deformation in shear zones and constrain the transition from the ductile to the brittle regime. XRD characterization of the dated material indicates epizonal conditions (>300°C) for its crystallization, and the lack of correlations of illite crystallinity and polytype composition with age in fractionated samples are suggestive of protracted mineral growth. This supports the interpretation that K-Ar ages concentrating at 510-480 Ma in the analyzed samples set a maximum limit for the end of ductile activity in different structural domains of the Kaoko Belt, after which brittle faulting is interpreted to have been the predominant deformation mechanism. This observation is in accordance with new and published zircon thermochronological data, which typically record a fast cooling towards temperatures below 200°C shortly thereafter. This pattern is also in accordance with geological evidences in the Brasiliano equivalents of the Kaoko Belt in South America. Previous studies in the Dom Feliciano Belt have shown how late crystallization of illite in mylonites can occur synchronically to the initiation of brittle deformation during a retrograde trajectory, and a new compilation of geochronological data highlights how periods of pronounced fault activity coincide with regional exhumation events as constrained by thermochronological modelling. This process was most intense after the post-orogenic denouement of the Dom Feliciano Belt between ca. 550 to 400 Ma. A comparison of the timing of the main tectonic stages in South America and Africa reveals that, while the peak orogenic stage of the Dom Feliciano Belt (650-570) took place many tens of Myr earlier than in the Kaoko Belt (580-550 Ma), the transition from ductile to brittle deformation (535-465 Ma and 510-480 Ma, respectively) and rapid exhumation into upper crust conditions (550-400 Ma and 500-350 Ma, respectively) has much more significant overlaps. This observation suggests that, with the progression of the main deformation front from present-day South America to Africa at the time of the collisional process in the Kaoko Belt after ca. 580 Ma, the late-stage deformation and eventual post-orogenic exhumation of the Dom Feliciano Belt may have been controlled by the far-field tectonic influence of the continuing orogenic activity in the Kaoko Belt. The late stages of the former were, on its turn, also influenced by a continuation of the progressive migration of the orogenic front towards the Damara Belt, thus highlighting the interconnected character of deformation and exhumation within the entire orogenic system.

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