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Insights into Craton Evolution and Destruction Based on Studies of Deep Seated Xenoliths from the North China and Tanzanian Cratons

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The Tanzanian Craton has been an island of stability within eastern Africa, despite the fact that it was surrounded by continent-continent collision belts during the East African Orogeny and is currently surrounded by the East African Rift. Archean crust within the Mozambique Belt to the east of the craton underwent high-grade metamorphism associated with the Pan-African amalgamation of Gondwana, yet ancient craton-like mantle lithosphere presently underlies this belt(Burton *et al.*, 2000), and there appears to have been no loss of mantle lithosphere associated with the orogeny. This may be due to the fact that the Tanzanian Craton lies in the footwall of the collision (much like India in the present-day Himalayan orogen)(Fritz *et al.*, 2009). The presence of thick, strong Archean mantle lithosphere below the Mozambique Belt may be the reason that the rift changes from a well-defined rift valley in southern Kenya to a region of widespread extension in northern Tanzania. The East African Orogeny had little affect on the present-day craton, where thermochronology of lower crustal feldspars shows that even the deep crust remained below ~600oC since the Late Archean(Bellucci *et al.*, 2011). By contrast, complete metamorphic recrystallization occurred in the Archean crust of the Mozambique Belt during the East African Orogeny, where crustal thicknesses of up to 80 km were attained(Blondes *et al.*, 2013). Thermochronlogy of deep-seated xenoliths from the Mozambique Belt show that the crust cooled differentially following the East African Orogeny, with the lowermost crust cooling extremely slowly ($\leq 1^{o}$C/Ma), whereas the middle crust of the orogen (present-day upper crust) cooled more quickly (~7^{o}C/Ma). This differential cooling is likely related to the westward emplacement of nappes onto cratonic lithosphere(Blondes *et al.*, 2013).

By contrast, the eastern block of the North China Craton underwent a fundamental transformation from a thick, stable craton to a thinned, tectonically active region during the Mesozoic(Griffin *et al.*, 1998)(Menzies *et al.*, 1993). Not only did the lithosphere thin, but the original Archeancratonic lithospheric mantle was removed and replaced with more fertile lithosphere(e.g., Gao *et al.*, 2002)(Wu *et al.*, 2003)(Chu *et al.*, 2009). The composition of unusual high Mg andesites and high Mg# basalts and picrites suggest a role for foundered cratonic lower crust in their formation(Gao *et al.*, 2004, Gao *et al.*, 2008). While the mechanism for lithosphere replacement beneath the North China Craton is the subject of debate, the fact that the craton was on the hanging wall during multiple collisions (Yangtze Craton to the south, Solonker Suture to the north) may explain the fundamentally difference in behavior compared to the Tanzanian Craton.

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