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Localized collision vs regional heating: the paradoxical aspects of 2720-2670 Ma geological evolution in the Kaapvaal craton, southern Africa.

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The Kaapvaal craton (KC) in South Africa, one of the oldest cratonic nuclei on Earth, is bounded to the North by the Limpopo belt, whose Southern Marginal Zone (SMZ) is regarded as a ca. 2.7Ga collisional orogeny. This is substantiated by structural data, such as the south verging thrust system that bounds the SMZ to the South (HRSZ); metamorphic data, demonstrating that metapelites from the SMZ underwent a very fast ($\sim$40Ma) clockwise PTt loop at ca. 2.7Ga, with a peak of metamorphism dated at 2713$\pm$8Ma. The SMZ is therefore interpreted as representing a partially molten orogenic channel behaving like modern Himalaya. However, a review of geochronological data of Limpopo Belt, KC and Zimbabwean Craton shows that geological activity at around 2.7Ga was not restricted to the Limpopo belt, but was instead scattered throughout the KC. That is not in agreement with a Himalayan model but could be a response to a general thermal event, which is recorded by:

1) The massive flood basalts of the Vendersdorp Supergroup in central South Africa. This supergroup crops out from Johannesburg in the North to Prieska in the South and records the most widespread sequence of volcanic rocks of the KC. This massive basaltic extrusion occurs between 2714$\pm$8Ma (Klipriviersberg Group) and $\sim$2650Ma (Transvaal Supergroup lower limit).
2) A series of granitic plutons immediately south of the HRSZ, emplaced at 2670-2680Ma; all of them include a mantle-derived component whose composition is similar to the Ventersdorp basalts. A similar and synchronous pluton, the Mashishimale, emplaces South-East of the HRSZ.
3) Further afield, in the Eastern KC, slightly older plutons (I-type (high-Ca) granitoids) emplace in Swaziland between 2720 and 2700Ma.
4) Granulite-facies metamorphism in Swaziland at ca. 2.7Ga.
5) Finally, in the Zimbabwe Craton intermediate to felsic lavas erupted at the same time as well as gneisses and granitoids from northern Botswawa However, interactions of Zimbabwe craton with Limpopo Complex and KC are still vagueness.

Collectively, the data demonstrate that during the evolution of the SMZ, the whole of the KC crust underwent significant heating, permitting partial melting and extraction of granitic melts even far away from the main collision. The crustal heating is linked to mantle activity, as mafic, mantle-derived melts also form and emplace at the same time.

The coexistence of both an Himalayan-style belt, and the far-field heating (apparently not related to any plate boundary), can be interpreted in different ways: (i) Coexistence of a mantle hotspot and a collision orogeny in close vicinity; (ii) Small-scale convections in the asthenospheric mantle, driven by differences in thickness of the lithosphere and resulting in heating of the foreland; (iii) Alternatively, the combination of apparently distinct events can actually reflect specificities of neo-Archaean orogenic style and could be the response of a hot, possibly molten or near-melting crust to regional convergence, permitting generation or extraction of melt over a zone much wider than in typical modern orogens.