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Craton destruction by subduction, collision or plume impingement? Comparisons of some representative cratons in the world

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The fact that cratonic lithosphere can be destructed has been demonstrated by numerous studies. However, the driving force of craton destruction and its mechanism are still unclear[1,2]. Subduction, collision and mantle plumes, the most important driving forces for most geological events, may also be responsible for craton destruction. However, their relationship in the destruction process including which of them is the major driving force and how they interact with each other is not understood sufficiently[1,2]. In this article, the North China Craton, North Atlantic Craton, Tanzania Craton, Wyoming Craton, Kaapvaal Craton, Yangtze Craton, Yilgarn Craton and Superior Craton are used as examples to study their difference and similarities during subduction, collision, or mantle plume impingement. The work is mainly based on comparison of their tectonic history, geophysical data, as well as xenolith chronology. It is suggested that large-scale craton destruction can be influenced by the interaction of subduction, collision and mantle plumes, acting to different degrees in different examples. Mantle plume related thermal action enhances the chemical stratification or layering of subcontinental lithospheric mantle (SCLM), which can form a weak-coupling mid lithosphere discontinuity (MLD) [3,4,5] and a lower denser SCLM below the MLD. Convergence (subduction and collision), especially when associated with slab rollback [6], leads to the regional thinning of the cratonic margin, which is subsequently linked by extension (mantle plume or slab rollback) related discontinuities. Continuous extension-related discontinuities extend upward to the MLD depth and cut off the shearing resistance from adjacent blocks. Next, the lower part of the chemically stratified SCLM in the cratonic interior is decoupled along the weakly coupled MLD and founders into the deep asthenosphere [7]. Then the destruction of the rest of the lithosphere can be affected by upwelling related decompression melting and subduction related hydroweakening. Additionally, if the craton is surrounded by orogenic (mobile) belts, these, can absorb tectonic energy from collisions, may be aid in the preservation of the cratonic root [8].

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