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# Geodynamic modelling of the thinning of cratonic lithosphere

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Cratons are the ancient continental cores, and contain the oldest and thickest(180∼250km) lithosphere on Earth. Several mechanism have been proposed to explain the longevity and stability, including the excess buoyancy, a large viscosity contrast with the underlying asthenosphere, and a relatively high brittle yield stress of cratonic lithosphere(Lenardic et al.2003), which can be all attributed to the unique chemical composition and low temperature of cratonic lithosphere. Cratons have highly melt-depleted and dry mantle roots which make them more buoyant and insusceptible than surrounding lithosphere.

Even though cratons are often considered stable and indestructible, there are at several examples that underwent significant thinning. Seismic evidence shows that the current thickness of eastern part of North China Craton(NCC) is now at most 80km, while kimberlitic evidence implies the previous existence of a thick(∼200km) and refractory mantle lithosphere in the middle Ordovician (Gao et al.2008). Significant thinning is also suggested for the Wyoming Craton (Lee et al.2011). Lithospheric delamination and thermal erosion from the bottom of lithosphere are the two of most discussed mechanisms for the thinning (or destruction)of cratons, with water and water relative processes playing an important role in both mechanisms. Some other cratons may also have experienced different geodynamic thinning processes. For example, a mantle plume may have affected the South Africa craton and contributed to its high topography(Brown, 2006). In this study, we compare numerical results of cratonic lithospheric thinning processes to some of the discussed observations. We show how lithospheric delamination can lead to rapid thinning(about 80km) over a timescale of 5∼30 Myrs, and illustrate how it can shed light on the thinning of the NCC or its surrounding lithosphere . In addition, we discuss some preliminary results of spontaneous lithospheric thinning by small-scale convective instabilities.