# Survival of cratonic roots in an evolving mantle: dependence on mantle structure and tectonic regime

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The formation of cratonic lithosphere is contentious, and intrinsically tied to tectonic regime during craton assembly. Unfortunately, the nature and variability of Precambrian tectonic systems is poorly understood. The long survival time of cratons has often been attributed to the comparative strength and buoyancy of cratonic roots, compared to non-cratonic lithosphere. Numerical models, however, suggest that neither of these parameters alone can explain the longevity of cratons in a convecting mantle. More recently, the role of weak mobile belts in buffering cratons from stress extremes has been suggested to contribute to their senescence. It has also been shown that water delivery to cratonic peripheries may preferentially weaken these regions, and protect cratonic cores from deformation.

The incorporation of an asthenosphere into convection simulations has been shown to improve the plate-like behaviour of a dynamically convecting system; by profoundly affecting the stress coupling of the system - effectively introducing a zone of weakness beneath the lithosphere. Here we model the survival of cratonic and non-cratonic lithosphere in convecting systems incorporating realistic plates and a low-viscosity asthenosphere due to partial melt. We also simulate how this plate-like behaviour may have changed through time, due to increased mantle heat production in the past, affecting mantle viscosities and partial melt. Our results demonstrate that realistic mantle viscosity structures can profoundly affect the evolution of cratons, and that low sublithospheric viscosities in the past may in fact have assisted the survival of cratonic roots under Archean mantle conditions.