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What are cratons?

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The term craton has a complex and confused etymology. Despite originally specifying only strength and stability – of the crust – the term craton has seen widespread use as referring to a region characterised by crustal basement older than 2.5 Ga, despite the fact that some such "cratons" no longer possess their deep lithospheric root and have geological histories that contnue well beyond the Archean/Proterozoic boundary. Viscous, buoyant lithospheric mantle roots are key to the survival and stability of continental crust. Here we use a revised craton definition (Pearson et al., 2021, Nature), that includes the requirement of a deep (~150 km or greater) and intact lithospheric root, to re-examine extent and character of regions defined as crtons. The revised definition has a nominal requirement for tectonic stability since ~ 1 Ga and recognises that some regions are "modified cratons" – having lost their deep roots, i.e., they may have behaved like cratons for an extended period but subsequently lost much of their stabilising mantle roots during major tectono-thermal events. In other words, despite being long-lived features, cratons are not all permanent. The 150 km lithospheric thickness cut-off provides an optimal match to crustal terranes with 1 Ga timescale stability.

We examine the processes involved in craton ormation and growth. Seismology can help to define the lateral extent of today's cratons, but a detailed understanding of the regional geological history, kimberlite eruption ages and geothermal conditions is required to evaluate periods of past diamond potential, no-longer evident today.