**The continent Itsaqia amalgamated at 3.66 Ga, and rifting-apart from 3.53 Ga: Evidence and mechanisms for a Wilson cycle at the start of the rock record**

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ABSTRACT

A continent, here named *Itsaqia,* is proposed to have formed not later than 3.66 Ga from amalgamation of Eoarchaean to possibly Hadean quartzofeldspathic crust. From 3.53 Ga Itsaqia started to disintegrate by rifting. Evidence for this is reconstructed from the remaining oldest rock record (only ca. 10,000 $km^2$ globally) found within gneiss complexes scattered across six continents.

Dominating the surviving fragments of Itsaqia are 3.9-3.66 Ga tonalites that represent juvenile crustal additions with whole rock initial $\varepsilon_{Nd}$ >+1 and zircon initial $\varepsilon_{Hf}$ ca. 0. The Acasta Gneisses of Canada are the only rocks of Itsaqia where the rock record extends back to the Hadean. The trace element chemistry of the Itsaqia tonalites shows that they were derived by ca. 30% partial melting of eclogitized basic rocks, leaving behind a subcrustal garnet-rich restite. The tonalites contain inclusions of mafic rocks with chemical signatures diagnostic of mantle wedge fluxing. We interpret that this juvenile crust formed repeatedly in arc-like constructs at convergent plate boundaries. Sedimentary rocks associated with the arc volcanic rocks are mafic-intermediate clastic rocks derived from volcanic sources, banded iron formation and dolomitic carbonates, in which 3.7 Ga stromatolites are preserved at one locality.

Before ca. 3.66 Ga, individual gneiss complexes show distinct chronologies of crust formation, yet despite their present-day isolation, they underwent identical 3.66-3.6 Ga high temperature orogenic events (*Isukasian orogeny*) – which we contend indicates that from 3.66 Ga these complexes had amalgamated into a single continental mass. Rare surviving 3.66 Ga high pressure granulite rocks that suffered rapid decompression indicate tectonic crustal thickening during amalgamation.

Starting from ca. 3.53 Ga, komatiite and basalt eruption and dyke emplacement marked the start of Itsaqia's dismemberment by rifting. We propose that the deep mantle upwelling responsible for this plume-related magmatism was triggered by either the cascade of pre-3.66 Ga sub-Itsaqia high density garnet-rich restitic subduction graveyards into the lower mantle or the thermal insulation effect of Itsaqia. This resembles the mechanism of supercontinent breakup throughout Earth's history. Hence we propose that Wilson Cycles of continent amalgamation and breakup already operated by the Eoarchean, at the start of the rock record. Australia's East Pilbara region was over the top of the plume, where the enormous thermal impact destroyed Itsaqia by melting to give rise to felsic igneous rocks coeval with komatiites. Greenland's Itsaq Gneiss Complex was peripheral to the plume, and hence was heavily diked at ca. 3.5 Ga, but was not melted. This synthesis provides a holistic model for early crustal evolution, incorporating all data that some researchers have regarded as mutually exclusive.