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Basement architecture of the Central African Kasai Craton revealed using high precision SHRIMP II U-Pb zircon geochronology

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The Kasai Craton forms the southern part of the Congo Craton of Central Africa. With an aerial extent of ~1.7 million km^2, much of which is covered by Phanerozoic Congo Basin sediments [1], the basement geology is poorly understood, mainly limited to investigations during colonial times, with only a trickle of new observational data collected by researchers over the last decades [2]. Radiometric age data remain incredibly scarce, comprising largely pre-1990's Rb-Sr, Pb-Pb and K-Ar ages no longer considered reliable, making stratigraphic correlations and basement architecture reconstructions difficult.

The Kasai Craton was studied between 2008 and 2014 during Greenfields exploration conducted by De Beers in Angola and the Democratic Republic of Congo. As part of the work program, samples were systematically collected during reconnaissance field surveys, petrographically described and submitted for geochronology studies. Zircons were separated from 53 samples and all samples were analysed using the SHRIMP II (sensitive high resolution ion microprobe) instrument in Canberra (Australia), thereby covering a large part of the region and *providing one of the world's best internally consistent geochronology datasets for a cratonic region*. Results include new interpreted crystallization, inheritance and metamorphic ages for 42 basement rock samples and provenance ages for 11 sedimentary rock samples, supplementing results from 14 samples previously analysed using the same technique and laboratory, collected from the Angolan Shield to the west [3].

On the basis of the new age constraints, field observations, drill core data, information gleaned from historic geological maps, and structural geological interpretations of geophysics and remote sensing data, three crustal tectonic domains were distinguished. These have been referred to as: (1) the Northern Kasai Domain (NKD), which is a 3.0-2.7 Ga domain and interpreted as a juvenile Neoarchean magmatic arc complex; (2) the Southern Kasai Domain (SKD), a complex, 3.6-2.8 Ga domain, interpreted as the old nucleus of the craton, and intruded by 2.5 Ga granites in the southwest and 2.1 Ga granites in the southeast; and (3) the intervening Central Kasai Shear Zone (CKSZ), which is a long-lived trans-lithospheric structure, well-imaged using geophysics and mapped as a complex assemblage of terranes and sedimentary basins with a combined width of between 40 and 80 km. Of note are the marked differences between the three tectonic domains, in terms of age constraints obtained to date, geophysical crustal and mantle lithosphere responses, and structural geometries mapped. The proposed architecture provides new insights into the tectonic and temporal evolution of the Central African region during Neoarchean and Proterozoic times and new puzzle pieces for supercontinent reconstruction efforts.

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