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Archean crust components within the Rehoboth terrane, Namibia: evidence from xenolith derived zircons in kimberlites and carbonatites

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Knowledge about the crustal basement age of the Rehoboth terrane in Namibia is only sketchy because of an extensive cover with Nama Group sediments. Known ages are proterozoic. Archean ages up to 2.9 Ga were recently recorded from basement components in Karroo tillites exposed within the Rehoboth terrane (Cornell et al., 2011; Van Schijndel et al., 2011). These authors argue that the Archean components were not transported very far and that they were derived more or less locally implicating an Archean age for parts of the Rehoboth basement. Other possible sources to collect deep crustal components are volcanic diatremes which transport mantle and crustal xenoliths and their debris to the Earth's surface. The $\sim$ 75 Ma old Gibeon kimberlite field close to the western border of the Rehoboth terrane consists of about 75 non-diamondiferous kimberlite diatremes and of some carbonatitic to silicocarbonatitic plugs and dikes, many of them with garnet peridotites and deep crustal xenoliths. For this study, we separated zircons from five crustal xenoliths from carbonatite dikes close to Gross Brukkaros, from one xenolith from the Louwrensia kimberlite diatreme and also from the matrix of the kimberlite. We determined the U-Pb ages of the zircons and their Hf isotopys by laser ablation ICPMS (Element2 resp. Neptune from Finnigan). The xenoliths are high grade gneissic rocks of sedimentary origin. Their zircons should give an age spectrum of the various sources of their components. The zircons from the kimberlite matrix (from disintegrated xenoliths) should give an overview of all ages present underneath the Gibeon field.
Individual xenoliths give individual age spectra with main peaks at around 650 Ma, 1100-1200 and 1900 Ma. These ages also appear in the kimberlite matrix sample. Youngest ages are at around 500 Ma and the kimberlite matrix sample gives one 2.4, two 2.7 and one 2.9 Ga age. This is a similar spread of ages as was obtained by the work of Cornell et al. (2011) and Van Schijndel et al. (2011).
These results show a prolonged history of juvenile crust accretion, recycling and mixing:
First crust may have been generated in the Archean from a primitive mantle source around 2.7 to 2.9 Ga ago or from a depleted source about 3.1 Ga ago.
During the attachment of the Rehoboth terrane to the Kaapvaal craton at around 2.0 to 1.8 Ga, mesoarchean crust was recycled. This coincides with the time of mantle enrichment as determined by the Lu-Hf isotope system on garnet peridotites from the Gibeon kimberlite field (Luchs et al., submitted, Precambrian Research).
At around 1.4 Ga, juvenile crust was generated from a depleted mantle source, which was constantly recycled until 1.1 Ga with a remarkable crustal mixing trend around 1.3 Ga. Nearly 60% of all datapoints are lying within this age range and are interpreted to mark a subduction process beneath the Kalahari plate (Becker et al., 2006).
The latest timespan between 0.9 and 1.1 Ga is characterized by juvenile crust generation and subsequent recycling during the Namaquan and Pan African Orogeny.

Becker, T., et al. J.Afr.E.Sc.(2006). Cornell, D.H., et al. Lithos(2011). Luchs, T., et al. Precam.Res.(submitted).Van Schijndel, V., et al. Geol.Soc.Spec.Pub(2011).