

Age-Hf isotope record of detrital zircons in uppermost Transvaal Supergroup, South Africa; evidence for Paleoproterozoic (2.5-2.0 Ga) craton collision and break up

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The Magaliesberg Formation quartzite of the upper Transvaal Supergroup in South Africa represents the biggest Paleoproterozoic arenite deposit on Earth (extent >600 km). It therefore has a great potential to provide detailed information about Archean to early Paleoproterozoic crust-mantle evolution in the hinterland of the Kaapvaal Craton and for global plate tectonic reconstruction. Detrital zircons point to magmatic activities at 2080-2130, 2220 and 2350-2450 Ma, and following an age gap of ca. 200 million years, at 2650-2780, 2820-2910, and at 3060-3100 Ma. The data indicate that the Magaliesberg sediments were deposited between 2080 and 2055 Ma. Distinct age-Hf isotope spectra furthermore provide evidence for two major sources and rapid deposition without complete homogenization in a regressive shore line, braid-delta environment. Zircon grains with Archean ages between 3.10 and 2.65 Ga were derived from granitoids of the adjacent Pietersburg Block, whereas Paleoproterozoic grains with ages between 2.45 and 2.08 Ga (ϵ_{Hf} between +4 and -19) stem from a magmatic arc and/or collisional orogenic belt, which was located outside of the present-day Kaapvaal craton. A possible source might have been the Ophthalmia orogenic belt, which became amalgamated to the joined Kaapvaal-Pilbara cratons at 2.22-2.14 Ga [1]. The complete absence of detrital zircons with ages of 2.5 Ga in Magaliesberg sandstones, but their abundant occurrence in older Transvaal units hints that Vaalbara was attached to an early Paleoproterozoic orogenic belt, which broke up between 2.3 and 2.08 Ga.

[1] Zeh et al. (2016) *Precam. Res.* **278**, 1-21.