



The Rustenburg Layered Suite (Bushveld Complex) crystallised in less than 1.5 million years

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The timing and crystallisation of the ca. 2.055 Ga old Rustenburg Layered Suite (RLS) of the Bushveld Complex is the subject of ongoing debate. The RLS represents one of the Earth's oldest large igneous provinces, and contains the world's largest reserves of PGE, chromium and vanadium. Previous high-precision U-Pb zircon dating indicated periodic crystallisation over an interval of 5.2 ± 0.79 Ma, with zircon crystallisation events at 2060.5 Ma, below the UG2 chromitite, and at 2055.3 Ma from the Merensky Reef (MR) upwards in the succession (Scoates & Friedman, 2008; Scoates et. al., 2012). Such a prolonged and periodic crystallisation history, however, contradicts field observations and petrological data, which rather require a relatively fast and continuous crystallisation process, periodically interrupted by new magma replenishment (Eales & Cawthorn, 1996; Cawthorn & Walraven, 1998). Here, we present new data from high-precision U-Pb dating, Ti-in-zircon thermometry, and mineral inclusion studies that support this latter interpretation. Our data indicate that zircon crystallised from highly fractionated, silica-saturated intercumulus melts at temperatures between 890 and 700°C most likely continuously from the base of the RLS (Marginal Zone) to the top (Upper Zone), within 0.92 ± 0.57 Ma, between 2055.81 ± 0.20 and 2054.89 ± 0.37 Ma.

References

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