Extreme U-Pb zircon age variability in the lower crustal Galiléia Batholith (SE Brazil)

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The garnet-epidote-bearing cordilleran-type Galiléia Batholith (30000 km^2) appears to have been assembled in the lower crust (> 0.8 GPa) between ca. 630 and ca. 570 Ma [1]. New U-Pb zircon LA-ICP-MS dating on metaluminous to peraluminous granitoids from the batholith disclose an intriguingly long potential crystallization history, that is consistent with the proposed >10kbar crystallisation indicated by the mineralogy and mineral chemistry of the rocks [1]. In most cases, the scatter of U-Pb zircon dates from a single sample cannot be explained by analytical uncertainties alone, yielding weighted mean dates with considerable over-dispersion (MSWD >> 1). In individual samples, the ages of oscillatory zoned, magmatic zircon, appears to record between ca. 20 to 50 Myrs of crystallisation suggesting extremely protracted zircon crystallisation. Hf isotopic compositions of the same zircon crystals show negative values, with εHf from -6 up to -16, and scattered behaviour, varying from 4 up to 10 εHf units per sample. Zircon ages and εHf are correlated, with εHf decreasing in young crystals, while zircon Th/U ratios appear to increase through time. The rare occurrence of dissolution textures in zircon suggest that the magma was kept near Zr-saturation for ca. 50 Myr. Collectively, these data suggest that the Galiléia batholith was incrementally assembled over an extended period of time in a magmatic system that became progressively less radiogenic in Hf and enriched in Th. Overall, this might have been assisted by the fact that the Galiléia Batholith was emplaced in the lower crust, as indicated by the coexistence of garnet, epidote and phengite in some samples.

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