Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.37980

Long-lived Neoarchean (2.72–2.58 Ga) juvenile magmatism and crustal growth in the Cassinga Zone, Angolan Shield: insights from zircon U–Pb–Hf–O isotopes

EZEQUIEL FERREIRA[1,2], PABLO VALVERDE-VAQUERO[1], DR. ENRIQUE MERINO MARTÍNEZ[1], BRUNO DHUIME[3], ARATZ BERANOAGUIRRE[2,4], ANDRÉ OSÓRIO[2], JAIME MAXIMO[2], JORGE BUZZI MARCOS[2], JOÃO CARLOS SOUSA[2], COLOMBO TASSINARI[5], KEI SATO[5], PILAR MONTERO[6], AMÉRICO DA MATA LOURENÇO VICTORINO[7] AND JOSÉ MANUEL[7,8]

[1]Instituto Geológico y Minero de España (IGME-CSIC)
[2]UTE (IGME, LNEG, IIA)
[3]CNRS-UMR5243, Géosciences Montpellier, Université de Montpellier
[4]Frankfurt Isotope and Element Research Center (FIERCE), Institute of Geosciences, Goethe University Frankfurt am Main
[5]University of São Paulo
[6]University of Granada
[7]Instituto Geológico de Angola
[8]Universidade Agostinho Neto

Quantifying the timescales and mechanisms of Neoarchean crustal growth requires integrated geochronological and isotopic constraints from cratonic regions where the Archean basement remains poorly characterized. The Cassinga Zone of the Angolan Shield, which hosts the Jamba–Cassinga granite–greenstone belt, represents one of the least studied crustal domains of the southern Congo Craton, and its age, magma sources, and crustal evolution have until now been largely unconstrained. We present the first combined zircon U–Pb, Lu–Hf, and O-isotope dataset from felsic volcanics of the Jamba Group and granitoids of the Jamba–Tchamutete Plutonic Suite, providing new insights into the timing and nature of Neoarchean magmatism and crustal growth in this underexplored cratonic domain.

Jamba Group felsic volcanic rocks record U-Pb zircon crystallization ages at 2716.1 ± 4.5 Ma, 2611.6 ± 7.5 Ma, and 2594 ± 12 Ma, with the youngest also preserving inherited zircon cores at 2651 ± 18 Ma. These rocks exhibit consistently mantle-like $\delta^{18}O$ values (5.3 ± 0.5‰ to 6.0 ± 0.9‰) and mildly positive $\varepsilon Hf_{(t)}$ signatures (+1.0 ± 1.9 to +1.9 ± 0.9; inherited cores: +1.2 to +2.7). Jamba–Tchamutete Plutonic Suite granitoids intruded during the later stages of this magmatic history, yielding crystallization ages of 2617 ± 18 Ma, 2595.5 ± 5.2 Ma, 2582.4 ± 4.9 Ma, and 2575 ± 15 Ma, and displaying overlapping $\varepsilon Hf_{(t)}$ values (+0.8 ± 1.5 to +2.1 ± 0.9) and predominantly mantle-like $\delta^{18}O$ compositions (4.8 ± 1.0‰ to 6.4 ± 0.5‰).

The temporal overlap and isotopic coherence between the volcanic and plutonic suites define a long-lived (>140 Myr) and internally consistent magmatic system operating between ca. 2.72 and 2.58 Ga, sourced from broadly juvenile crustal and/or mantle-derived reservoirs with minor contributions from older crust and limited assimilation of supracrustal materials. Collectively, these U–Pb–Hf–O data reveal a previously unrecognized period of sustained Neoarchean juvenile crust formation in the Cassinga Zone and establish the first integrated isotopic framework for crustal processes, magma sources, and the timescales of lithospheric evolution in the Angolan Shield (southern Congo Craton), highlighting late Archean crustal growth dominated by prolonged juvenile magmatism rather than extensive reworking of pre-existing crust.