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A case study of in situ analyses (major and trace elements, U-Pb geochronology and Hf-O isotopes) of a zircon megacryst: implication for the evolution of the Egéré terrane (Central Hoggar, Tuareg Shield, Algeria)

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The Tighsi area of the Egéré/Aleksod Terrane (Tuareg Shield) contains mafic eclogites interlayered within anatectic metapelites interpreted as metabasalts coeval with a shallow water marine sedimentation. In this study we present *in-situ* geochronological (U-Pb) and geochemical (major and trace elements, Hf and O isotopes) analyses from a 2.6 mm zircon megacryst found in a high-pressure kyanite pegmatite enclosed in the metapelites. Oscillatory zoning, HREE-enriched patterns and positive Ce anomalies are consistent with crystallization of the megacryst from the anatectic melt. Ti-in-zircon temperatures and low Th/U ratios indicate crystallization at 811 ± 15°C in an allanite/monazite buffered anatectic melt. Oxygen isotopes yield large intra-grain variations (7.1 to 12.3‰) with a gradual lowering towards the edge of the grain in contact with secondary feldspathic veinlets. These results indicate fluid-assisted oxygen isotope disturbances, consistent with the low retentivity of O in zircon under wet conditions. Hf isotopes do not display intra-grain variations (mean εHf_i =-20.7 ± 1.0) and support production of the leucosome by melting of crustal material. U-Pb analyses provide an age of 654 ± 5 Ma (2σ), attributed to post-peak decompression and heating. HP eclogite facies conditions in the Egéré terrane are thus significantly older than HP metamorphism in the western part of the shield (610-625 Ma) in agreement with multiple subduction events along the margins of the Tuareg Shield. The rim of the megacryst is characterized by a decrease of trace elements (U, Y, HFSE), but preserved identical Hf isotope ratios, which is consistent with recrystallization processes. The rim displays a Ti-in-zircon temperature of 717 ± 28°C and a U-Pb age of 584 ± 6 Ma (2σ) coeval with the climax of batholith intrusion in Central Hoggar. Reheating and softening of the lower/middle crust at that time may have assisted upward viscous flow of basement domes and escape tectonics along lithospheric shear zones. We propose that the final push of the Saharan metacraton in the east was responsible for the observed architecture of the Egéré terrane, where anatectic elongated domes of basement gneisses alternate with HP metasedimentary synforms.