##### Appendix A.1: Supplementary online Material

**Analytical methods**

Whole-rock major and trace element analyses were performed by fusion-dissolution sample decomposition and inductively coupled plasma mass spectrometry techniques (ICP-MS) at the SGIker-Geochronology and Isotope Geochemistry Facility Spain following procedures adapted from García de Madinabeitia et al. (2008). Major element compositions of minerals were determined on a Cameca SX100 electron microprobe at the Laboratoire Magmas & Volcans (LMV) in Clermont-Ferrand, France. Operating conditions were 15 kV accelerating voltage and 15 nA focused beam for minerals. Synthetic and natural minerals standards were used for calibration. with counting time set at 10 s for all elements. Fe3**+**/Fe2**+** and H2O contents in biotite and amphibole were estimated by charge balance criteria and regression methods (cf. Droop. 1987; Li et al.. 2020a. 2020b). An automated VG 54E thermal ionization mass spectrometer in the double collection mode was used at the LMV for Nd isotope composition and Sm-Nd concentration measurements by isotope dilution. A mixed 149Sm-150Nd tracer was used and the procedures for chemical separation and instrumental analysis are essentially similar to those described by Pin and Santos Zalduegui (1997). U-Pb analyses were performed also by isotope dilution–thermal ionization mass spectrometry at the LMV on the least magnetic mechanically abraded and crack-free zircon grains. Zircon dissolution, chemical separation of U and Pb, and isotope analyses were carried out according to methods described by Paquette et al. (1997). The U and Pb isotopes were analysed on a Fisons VG Sector 54-30 mass spectrometer in multicollector static mode. Initial common Pb is determined for each fraction using the Stacey and Kramers (1975) two-step model. Concordia graphs and ages were calculated using Isoplot Ex. 4.15 (Ludwig. 2001) and IsoplotR (Vermeesch. 2018). using actualized decay constants and errors: λ238U= 0.155125 ± 0.00016 Gyr-1 (Jaffey et al.. 1971); λ235U= 0.98531 ± 0.00012 Myr-1 (Schoene et al.. 2006; Mattinson. 2010. 2011; Hiess et al.. 2012) and 238U/235U natural ratio is 137.818 ± 0.005 (Hiess et al.. 2012). Ages and graphs in Figs. 8 to 10 show the uncertainty associated with the decay constants and are given at the 2σ or 95% confidence interval.

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