

Appendix 1

Methodology of U-Pb analysis on zircon grains.

Approximately 20-30 lbs of felsic volcanic material were reduced to fist-sized or smaller fragments, weathered surfaces were removed, and clean pieces selected for analysis were washed and dried before passing through a jaw crusher. Crushed fragments were then fed into a disk mill and reduced to sand-sized material or smaller.

Standard methods involving magnetic and heavy liquid separation were used to concentrate the highest quality, least paramagnetic zircon grains. A modest amount of variable quality zircon was present in the least magnetic fractions of each sample (non-magnetic and magnetic fractions at 0° side slope). Highest quality grains were defined on the basis of optical clarity, absence of cracks and alteration, and, to the degree possible, of inherited, xenocrystic zircon cores. Grains that contained visible cores were deliberately avoided. Handpicked grains were selected under alcohol using a binocular microscope and photographed (Fig. 1).

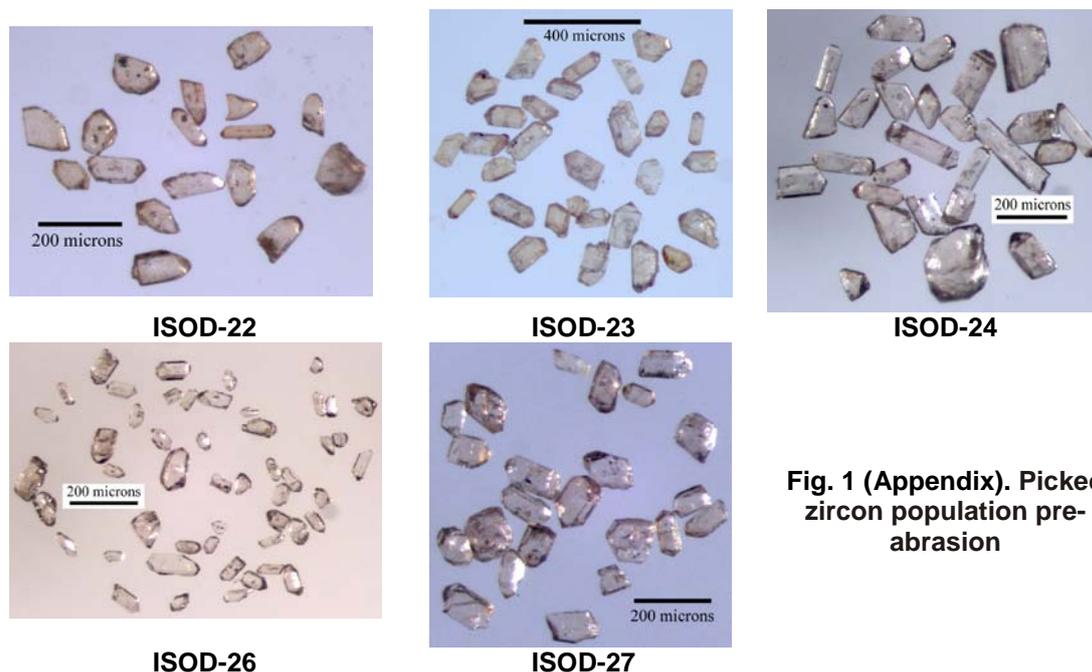


Fig. 1 (Appendix). Picked zircon population pre-abrasion

All grains were given an air abrasion treatment to reduce the effects of surface-correlated Pb-loss (Krogh, 1982). Zircons were subsequently re-picked, washed in dilute nitric acid, and re-photographed (Fig. 2). Grains were not physically weighed but a visual estimate was made of each grain's dimensions using a digital camera, and a volume estimate was converted to weight. Most zircon fractions comprised small single grains weighing less than 2 micrograms, at times significantly less than 1 microgram.

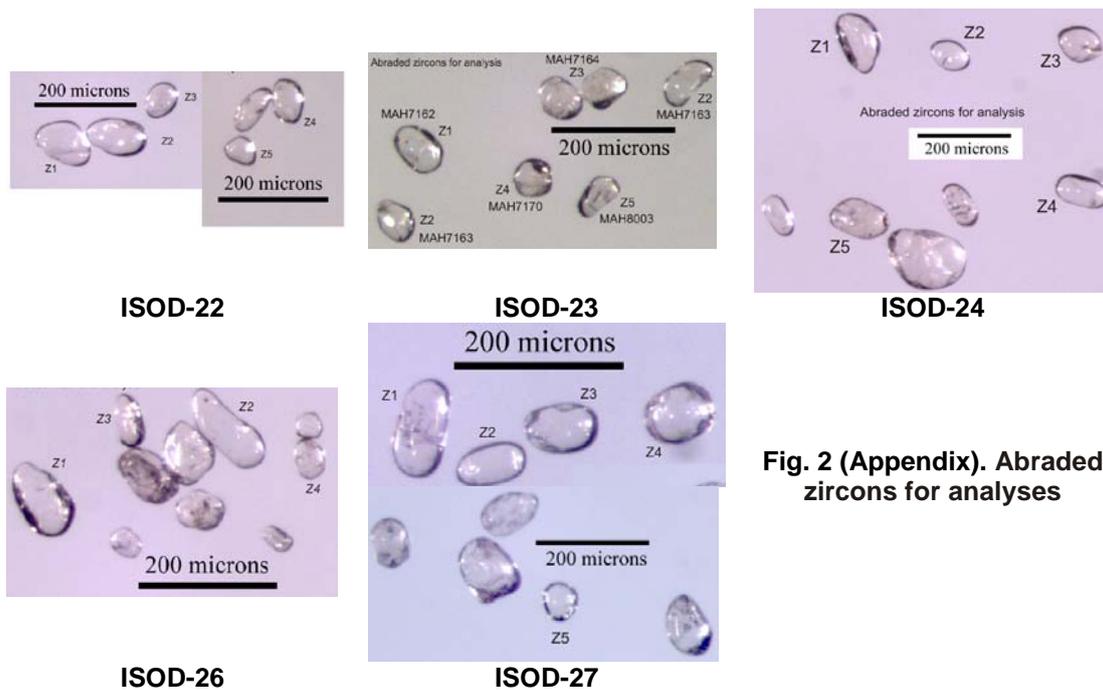


Fig. 2 (Appendix). Abraded zircon for analyses

Zircon grains were then washed and subsequently dissolved in a 10:1 volume of HF:HNO₃ acid and spiked using a mixed ²⁰⁵Pb-²³⁵U isotopic tracer in Teflon bombs. Sample dissolution was achieved over a period of a few days at a temperature of approximately 200°C. Equilibrated solutions were dried down and loaded in silica gel directly onto single rhenium filaments, and isotopic compositions of Pb and U were determined sequentially on a VG354 mass spectrometer. Laboratory procedural blanks at Jack Satterly Geochronology Laboratory are routinely at the 0.5 pg and 0.1 pg level or less for Pb and U, respectively.

In this study, total common lead ranged from 0.17-0.74 picograms for >92% of the analyses, with two fractions having slightly higher levels above 1 pg. Initial compositions of any common Pb in excess of the laboratory blank were estimated here after Stacey and Kramers (1975), and decay constants used are those recommended by Jaffey et al. (1971). Age errors in the text are presented at the 95% confidence level. Error ellipses in the concordia diagrams are shown at the 2σ level. The U-Pb concordia diagrams were generated, and associated ages and errors calculated using the IsoPlot/Ex (v. 3.00) program of Ludwig (2003). Because of the intrinsic uncertainties in visually estimating the weights of each grain fraction, uranium and lead concentrations (only) are probably accurate at best to ~ ±20%, an error which would be comparable had these small grains had been physically weighed in a microbalance. This method does not affect the age calculations for the fractions, which are measured independently using the isotopic ratios.

References.

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Stacey, J.S. & Kramers, J.D. 1975. Approximation of terrestrial lead isotope evolution by a two-stage model. *Earth and Planetary Science Letters*, **26**, 207-221.