

Laboratory & Sample Preparation	
Laboratory name	CODES Analytical Laboratories, University of Tasmania – Australia
Sample type/mineral	Zircon
Sample preparation	Conventional mineral separation, 1 inch resin mount, 0.3um alumina polish. Cleaned in DI H ₂ O degassed in vacuum.
Laser ablation system	
Make, Model & type	ASI Resolution S155-SE
Ablation cell & volume	Two volume laser cell with an 8.8 cm ³ small 2 nd volume fixed cup.
Laser wavelength (nm)	193nm
Pulse width (ns)	5ns
Fluence (J.cm ⁻²)	2.0 J/cm ² .
Repetition rate (Hz)	5Hz
Ablation duration (secs)	30secs
Ablation pit depth / ablation rate	~9µm pit depth measured by optical interferometry, equivalent to ~60 nm/pulse
Spot size (um)	30µm
Sampling mode / pattern	Static spot ablation
Carrier gas	100% He in the cell set to 0.35 l/min, Ar carrier gas combined in 2 nd volume of laser cell and was set to 1.05 l/min.
ICP-MS Instrument	
Make, Model & type	Agilent 7900 ICP-MS and a TOFWERK icpTOF R
Sample introduction	Sample mixing done via 'squid' and Nylon tubing
RF power (W)	1350W for both ICP-MS
Make-up gas flow (l/min)	0.8 for both instruments
Detection system	Electron multiplier with Pb and U in pulse counting mode for the quadrupole and a Micro-Channel-Plate detector for the TOF
Masses measured	Quadrupole: Experiment 1: ³¹ P, ⁴⁹ Ti, ⁵⁶ Fe, ⁸⁹ Y, ⁹¹ Zr, ⁹³ Nb, ¹³⁹ La, ¹⁴⁰ Ce, ¹⁴¹ Pr, ¹⁴⁶ Nd, ¹⁴⁷ Sm, ¹⁵³ Eu, ¹⁵⁷ Gd, ¹⁵⁹ Tb, ¹⁶³ Dy, ¹⁶⁵ Ho, ¹⁶⁶ Er, ¹⁶⁹ Tm, ¹⁷² Yb, ¹⁷⁵ Lu, ¹⁷⁸ Hf, ¹⁸¹ Ta, ²⁰² Hg, ²⁰⁴ Pb, ²⁰⁶ Pb, ²⁰⁷ Pb, ²⁰⁸ Pb, ²³² Th, ²³⁵ U and ²³⁸ U Quadrupole Experiment 2: ⁴⁹ Ti, ⁵⁶ Fe, ⁹¹ Zr, ¹⁷⁸ Hf, ²⁰² Hg, ²⁰⁴ Pb, ²⁰⁶ Pb, ²⁰⁷ Pb, ²⁰⁸ Pb, ²³² Th, ²³⁵ U, & ²³⁸ U TOF Experiments 1 & 2: All masses collected during data acquisition.
Integration time per peak/dwell times (ms); quadrupole settling time between mass jumps	Quadrupole ICP-MS: 10ms dwell for ⁴⁹ Ti, ²⁰² Hg, ²⁰⁸ Pb, ²³² Th & ²³⁵ U 15ms dwell for ²⁰⁴ Pb & ²³⁸ U 25ms dwell for ²⁰⁶ Pb & ²⁰⁷ Pb. 2ms dwell time for all others TOFMS 278ms integration time.
Total integration time per output	Quadrupole ICP-MS: 255ms for Experiment 1 188ms for Experiment 2 TOFMS: 278ms for both Experiments
'Sensitivity' as useful yield cps/ ppm	2,000 cps / ppm on ²³⁸ U in 91500 zircon assuming 80 ppm U
EM Dead time (ns)	37 for quadrupole ICP-MS
Data Processing	
Gas blank	30 seconds
Calibration strategy	91500 used as primary reference material for U-Pb and Th-Pb ratios. NIST610 used for Pb isotope ratios (²⁰⁷ Pb/ ²⁰⁶ Pb) and trace element concentrations, corrected to BCR-2g as a secondary standard..
Reference Material info	91500 (Horstwood et al., 2016)

	NIST610 (Baker et al., 2004; Jochum et al., 2011)
Data processing package used / Correction for LIEF	LADR –3 rd order polynomial correction for LIEF..
Mass discrimination	Corrected using standard / sample bracketing
Common-Pb correction, composition and uncertainty	²⁰⁷ Pb Common Pb correction applied to some analyses in Mudtank, Penglai, and Qing Hu zircons using Stacey-Kramer's model Pb at age of zircon and 0.01 error (absolute) common Pb composition.
Uncertainty level & propagation	Ages are quoted at 2 sigma absolute, propagation is by quadratic addition of signal error of unknowns and standards, error in drift corrections, etc. as described by Horstwood et al. (2016).