

Table S1. Metadata for LA-ICP-MS U-(Th-)Pb analyses

Laboratory and Sample Preparation	
Laboratory name	Boise State University Isotope Geology Laboratory
Sample type/mineral	Zircon
Sample preparation	Conventional mineral separation, 1 inch resin mount, 0.3 $\mu\text{m}$ polish to finish
Imaging	CL, JEOL T300, 10 nA, 17 mm working distance
Laser ablation system	
Make, Model and type	Teledyne (Photon Machines) Analyte Excite+
Ablation cell and volume	HelEx II active 2-volume ablation cell
Laser wavelength (nm)	193 nm ArF excimer
Pulse width (ns)	4 ns
Fluence ( $\text{J cm}^{-2}$ )	energy stabilization mode, set daily at $\sim 2.5 \text{ J cm}^{-2}$ using in-cell EPC utility
Repetition rate (Hz)	5 Hz
Ablation duration (s)	20 s
Ablation pit depth / ablation rate	20 $\mu\text{m}$ pit depth, measured using an optical microscope, equivalent to 0.1 $\mu\text{m}/\text{pulse}$
Spot diameter ( $\mu\text{m}$ )	25 $\mu\text{m}$
Sampling mode / pattern	Static spot ablation
Cell carrier gas flow ( $\text{l min}^{-1}$ )	0.2 $\text{L min}^{-1}$ He cup flow, 1.2 $\text{L min}^{-1}$ He cell flow
ICP-MS Instrument	
Make, Model and type	ThermoElectron, iCAP-RQ, single quadrupole mass spectrometer
Sample introduction	190 cm long, 1 cm i.d. PFA tubing with Teledyne 'SQUID' smoothing device, 2.5 mm quartz injector; Ni cones, high-sensitivity skimmer insert
RF power (W)	1400 W
Make-up gas flow ( $\text{l min}^{-1}$ )	$\sim 0.65 \text{ l min}^{-1}$ Ar and $2 \text{ mL min}^{-1}$ $\text{N}_2$ gas introduced in mixing bulbs between cell and torch
Detection system	single ion-counting SEM
Masses measured and dwell times per peak (ms)	29,91(5); 31,89,93,139,140,141,146,147,153,157,159,163,165,166,169,172,175,177,181(10); 202,204,208,232,238(40); 206(80); 49,207(200)
Total integration time (s)	$\sim 0.895 \text{ s}$
'Sensitivity' as useful yield	0.8% U [(#ions detected/#atoms sampled)*100; Schaltegger et al. 2015]
IC Dead time (ns)	44 ns
Data Processing	
Gas blank	15 s on-peak zero subtracted.
Calibration strategy	Mean of ratios; mass discrimination from interspersed zircon standard materials.
Common-Pb correction	No common-Pb correction applied; sweeps with mass 204 signals above background rejected.

Data processing packages	ThermoElectron Qtegra TRA software for integrated cps acquisition; in-house Microsoft VBA coded spreadsheet for data normalisation, concentration calibration, uncertainty propagation and age calculation.
Uncertainty level and propagation	Ages quoted at 2s absolute; propagation is by quadratic addition. Systematic errors from reproducibility of primary reference material propagated where appropriate.
Discordance criteria	Discordance is the relative difference between the measured 207Pb/235U and 206Pb/238U dates; discordance outside of uncertainty of 5% is flagged with strikethrough font in Table S2.
Interpreted age transition	The transition from preferred interpretation of 207Pb/206Pb to 206Pb/38U dates is set at 1500 Ma; preferred date is flagged with bold font in Table S2.
Mass discrimination corrections	207Pb/206Pb fractionation error (from PL): 0.38% [Zircon_05Apr22_CGS_KH344] 206Pb/238U fractionation error (from PL): 0.68% [Zircon_05Apr22_CGS_KH344] 208Pb/232Th fractionation error (from PL): 1.44% [Zircon_05Apr22_CGS_KH344]
Quality control & validation standards	Plešovice (PL) (Slama et al. 2008); 336.9 Ma Seiland (Kosler et al. 2008); 530.6 Ma Zirconia (Covey et al., 2012); 327.2 Ma FC1 (Schoene et al. 2007); 1095.4 Ma 91500 (Wiedenbeck et al., 1995); 1065.4 Ma
Quality control & validation results	Zircon_05Apr22_CGS_KH344: 91500 (206Pb/238U) = $1051 \pm 17.7$ (95% c.i., MSWD = 0.81, n = 7) Zircon_05Apr22_CGS_KH344: 91500 (207Pb/206Pb) = $1108.8 \pm 50.9$ (95% c.i., MSWD = 1.51, n = 7) Zircon_05Apr22_CGS_KH344: FC1 (206Pb/238U) = $1066 \pm 18.7$ (95% c.i., MSWD = 1.84, n = 7) Zircon_05Apr22_CGS_KH344: FC1 (207Pb/206Pb) = $1088.7 \pm 48.5$ (95% c.i., MSWD = 1.96, n = 7) Zircon_05Apr22_CGS_KH344: PL (206Pb/238U) = $336.4 \pm 2.3$ (95% c.i., MSWD = 0.6, n = 23) Zircon_05Apr22_CGS_KH344: PL (207Pb/206Pb) = $345.5 \pm 21.2$ (95% c.i., MSWD = 1.38, n = 23) Zircon_05Apr22_CGS_KH344: Seiland (206Pb/238U) = $522.9 \pm 13.1$ (95% c.i., MSWD = 1.64, n = 7) Zircon_05Apr22_CGS_KH344: Seiland (207Pb/206Pb) = $516.6 \pm 113$ (95% c.i., MSWD = 1.57, n = 7) Zircon_05Apr22_CGS_KH344: Zirconia (206Pb/238U) = $323.9 \pm 5.7$ (95% c.i., MSWD = 0.39, n = 6) Zircon_05Apr22_CGS_KH344: Zirconia (207Pb/206Pb) = $417.1 \pm 57.8$ (95% c.i., MSWD = 0.56, n = 6)