

## Supplementary table

<b>Laboratory &amp; Sample Preparation</b>	
Laboratory name	Géosciences Rennes, UMR CNRS 6118, Rennes, France
Sample type/mineral	Magmatic zircon
Sample preparation	Polished thin-sections
Imaging	CITL (Cambridge Image Technology Ltd) Mk5 cold-cathode CL unit, University of Mons, Belgium
<b>Laser ablation system</b>	
Make, Model & type	ESI NWR193UC, Excimer
Ablation cell	ESI NWR TwoVol2
Laser wavelength	193 nm
Pulse width	< 5 ns
Fluence	8 J/cm <sup>-2</sup>
Repetition rate	3 Hz
Spot size	20–30 μm
Sampling mode / pattern	Single spot
Carrier gas	100% He, Ar make-up gas and N <sub>2</sub> (3 ml/mn) combined using in-house smoothing device
Background collection	20 s
Ablation duration	60 s
Wash-out delay	15 s
Cell carrier gas flow (He)	0.75 l/min
<b>ICP-MS Instrument</b>	
Make, Model & type	Agilent 7700x, Q-ICP-MS
Sample introduction	Via conventional tubing
RF power	1350 W
Sampler, skimmer cones	Ni
Extraction lenses	X type
Make-up gas flow (Ar)	0.85 l/min
Detection system	Single collector secondary electron multiplier
Data acquisition protocol	Time-resolved analysis
Scanning mode	Peak hopping, one point per peak
Detector mode	Pulse counting, dead time correction applied, and analog mode when signal intensity > ~ 10 <sup>6</sup> cps

Masses measured	$^{204}\text{(Hg + Pb)}$ , $^{206}\text{Pb}$ , $^{207}\text{Pb}$ , $^{208}\text{Pb}$ , $^{232}\text{Th}$ , $^{238}\text{U}$
Integration time per peak	10–30 ms
Sensitivity / Efficiency	28,000 cps/ppm Pb (50 $\mu\text{m}$ , 10Hz)
<b>Data Processing</b>	
Gas blank	20 seconds on-peak
Calibration strategy	GJ1 zircon standard used as primary reference material, Plešovice used as secondary reference material (quality control)
Reference Material info	GJ1 (Jackson et al., 2004) Plešovice (Slama et al., 2008)
Data processing package used	GLITTER ® (van Achterbergh et al., 2001)
Quality control / Validation	Plešovice: concordia age = $337.4 \pm 2.9$ Ma ( $N = 8$ ; MSWD=0.19)

Supplementary Table 1

<b>Magmatic minerals</b>	<b>MMG1</b>	<b>MMG2</b>	<b>MMG3</b>	<b>MS1</b>	<b>MS2</b>	<b>MS3</b>
<i>Phenocrysts</i>						
Qtz	xxx	xxx	xxx	xxx	xxx	xxx
Kfs	xxx	xxx	xxx	xxx	xxx	xxx
Pl	xx	xx	xx	xxx	xx	xx
<i>Groundmass</i>						
Qtz	xx	xx	xx	xxx	xxx	xxx
Kfs	xx	xx	xx	xx	xx	xx
Pl	xx	xx	xx	xx	xx	xx
Bt	x	x	x	xxx	x	x
Ms	xx	xx	x	xx	x	x
<i>Accessories</i>						
Apatite	x	x	xx	x	xx	x
Zircon	xx	x	x	x	x	-
<b>Secondary minerals</b>						
Qtz	x	x	x	x	xxx	xxx
Chl	xxx	xx	xxx	xx	-	-
Carbonate	xxx	xxx	-	xx	-	x
Iron oxides	xx	x	xxx	x	-	-
Sulfide	x	x	xx	-	x	x

xxx= Abundant

xx = Common

x= Rare

- = not observed

Supplementary Table 2

	MMG1	MMG2	MMG3	MS1	MS2	MS3
(%)						
SiO <sub>2</sub>	66.70	70.53	67.87	70.07	74.72	77.64
Al <sub>2</sub> O <sub>3</sub>	14.55	14.40	13.87	13.39	13.71	12.75
Fe <sub>2</sub> O <sub>3</sub> tot	5.24	4.06	6.97	4.21	2.31	1.37
MnO	0.08	0.05	0.11	0.07	0.06	0.02
MgO	1.67	1.31	2.00	1.24	0.93	0.33
CaO	2.34	1.03	0.70	2.14	0.42	0.32
Na <sub>2</sub> O	4.09	4.73	4.54	3.70	6.55	6.57
K <sub>2</sub> O	1.72	1.27	0.69	2.79	0.25	0.68
TiO <sub>2</sub>	0.62	0.78	1.12	0.58	0.23	0.12
P <sub>2</sub> O <sub>5</sub>	0.17	0.14	0.20	0.17	0.17	0.17
LOI	3.21	1.86	2.19	1.43	1.39	0.64
Total	100.37	100.14	100.26	99.77	100.74	100.62
(ppm)						
La	24.60	19.54	12.61	26.59	9.70	5.68
Ce	54.27	40.26	28.38	59.32	22.73	13.96
Pr	6.64	4.99	3.57	7.29	2.81	1.88
Nd	25.17	20.08	13.90	27.42	10.35	7.20
Sm	5.97	5.24	3.43	6.60	2.87	2.46
Eu	1.27	1.15	0.59	1.21	0.42	0.24
Gd	6.06	6.15	3.50	6.37	2.89	2.42
Dy	7.81	8.90	5.15	7.62	4.29	3.98
Ho	1.78	2.03	1.21	1.64	0.93	0.87
Er	4.89	5.47	3.50	4.39	2.63	2.47
Tm	0.72	0.78	0.57	0.66	0.44	0.44
Yb	4.69	4.98	3.74	4.33	3.20	3.14
Lu	0.64	0.70	0.54	0.61	0.45	0.44
LaN/YbN	3.54	2.65	2.28	4.15	2.05	1.22
Eu/Eu*	0.21	0.20	0.17	0.19	0.14	0.10
SumREE	144.51	120.25	80.69	154.05	63.70	45.17
(ppm)						
Rb	56.21	28.48	28.10	80.47	11.36	45.06
Ba	458.70	418.70	242.60	386.10	45.03	28.69
W	1.14	1.34	1.03	1.36	1.65	1.45
Th	13.43	16.11	11.04	12.50	7.17	7.16
U	3.16	3.73	2.77	2.83	4.97	6.03
Nb	12.14	13.21	14.32	10.94	11.60	12.97
Ta	1.20	1.36	1.36	1.15	1.96	2.41
Pb	26.38	6.64	7.34	15.09	17.52	5.92
Sr	166.20	125.30	119.80	133.10	59.57	67.08
Zr	184.90	201.20	186.80	155.70	74.51	62.41
Hf	5.22	5.72	5.22	4.72	2.74	2.53
Y	49.45	56.25	32.30	43.99	24.41	23.39
Nb/Ta	10.10	9.70	10.54	9.55	5.39	5.91
Zr/Hf	35.43	35.16	35.76	32.99	24.66	27.22
A/CNK	1.13	1.31	1.46	1.03	1.05	1.16
A/NK	1.69	1.57	1.69	1.47	1.10	1.24

Supplementary Table 3

Sample	MMG1	MMG2	MMG3	MS1	MS2	MS3
Rb (ppm)	56.2	28.5	28.1	80.5	11.4	45.1
Sr (ppm)	166.2	125.3	119.8	133.1	59.6	67.1
$^{87}\text{Rb}/^{86}\text{Sr}$	0.98	0.66	0.68	1.75	0.55	1.95
$^{87}\text{Sr}/^{86}\text{Sr}$	0.720018	0.718582	0.719396	0.722112	0.719422	0.726686
error	0.000010	0.000012	0.000010	0.000009	0.000011	0.000010
$(^{87}\text{Sr}/^{86}\text{Sr})_{420\text{ Ma}}$	0.7142	0.7146	0.7153	0.7116	0.7161	0.7150
Sm (ppm)	5.4	4.7	3.1	6.3	2.6	2.1
Nd (ppm)	23.8	18.6	13.5	28.0	9.3	6.7
$^{147}\text{Sm}/^{144}\text{Nd}$	0.137108	0.151741	0.140046	0.134935	0.166921	0.191124
$^{143}\text{Nd}/^{144}\text{Nd}$	0.512231	0.512183	0.512214	0.512229	0.512355	0.512385
error	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
$(^{143}\text{Nd}/^{144}\text{Nd})_{420\text{ Ma}}$	0.511854	0.511766	0.511829	0.511858	0.511896	0.511859
$\epsilon\text{Nd}_{420\text{ Ma}}$	-4.8	-6.5	-5.2	-4.7	-3.9	-4.6
$T_{\text{DM}}$ (Ma)	1824	2639	1931	1777	5094	2577

Supplementary Table 4

Analysis_#	Pb ppm Uppm Th/U			ISOTOPIC RATIOS				AGES (Ma)					Conc. %		
				238/206	err%	207/206	err%	207Pb/206Pb	err	206Pb/238U	err	207Pb/235U		err	
<b>Sample MMG1-a</b>															
5060415a	Zr1a	20.7	215.4	0.13	14.728	1.3	0.0546	2.3	397.0	51.0	<b>423.5</b>	<b>5.3</b>	419.4	8.3	<b>101.0</b>
6060415a	Zr1b	16.3	171.5	0.18	15.076	1.4	0.0568	2.6	482.8	56.0	<b>414.0</b>	<b>5.5</b>	424.7	9.2	<b>97.5</b>
7060415a	Zr1c	16.6	164.2	0.32	14.723	1.4	0.0564	2.0	468.0	44.9	<b>423.6</b>	<b>5.5</b>	430.7	7.5	<b>98.4</b>
8060415a	Zr1d	21.1	189.2	0.73	14.782	1.3	0.0558	2.2	442.4	48.6	<b>422.0</b>	<b>5.4</b>	425.2	8.1	<b>99.2</b>
9060415a	Zr1e	21.9	228.7	0.12	14.594	1.3	0.0553	1.9	423.6	41.4	<b>427.2</b>	<b>5.4</b>	426.7	7.1	<b>100.1</b>
11060415a	Zr2	13.6	124.7	0.58	14.658	1.3	0.0585	1.6	546.7	35.5	<b>425.4</b>	<b>5.5</b>	444.9	6.4	<b>95.6</b>
12060415a	Zr3	72.5	795.1	0.13	15.113	1.3	0.0561	1.5	454.8	32.3	<b>413.0</b>	<b>5.2</b>	419.5	5.7	<b>98.5</b>
13060415a	Zr4a	56.8	606.6	0.07	14.674	1.3	0.0562	1.5	458.8	31.7	<b>425.0</b>	<b>5.3</b>	430.4	5.8	<b>98.7</b>
14060415a	Zr4b	41.2	368.1	1.17	15.513	1.3	0.0586	1.5	551.7	33.1	402.7	5.2	425.7	5.9	94.6
6060415b	Zr12	39.6	400.2	0.14	15.119	1.2	0.0563	1.5	461.8	34.1	<b>412.9</b>	<b>4.8</b>	420.4	5.7	<b>98.2</b>
7060415b	Zr13	65.4	512.5	1.01	14.910	1.2	0.0600	1.3	604.5	28.4	418.5	4.9	448.3	5.3	93.4
14060415b	Zr14	147.6	1477.4	0.34	14.835	1.2	0.0602	1.4	609.9	31.0	420.5	5.0	451.0	5.8	93.2
<b>Sample MMG1-b</b>															
20060415a	Zr6	60.1	210.7	0.42	5.581	1.3	0.1193	1.5	1945.6	26.5	1062.5	12.9	1394.3	12.8	71.7
22060415a	Zr8a	132.5	1479.0	0.06	15.133	1.3	0.0557	1.5	439.9	32.9	<b>412.5</b>	<b>5.3</b>	416.9	5.8	<b>98.9</b>
23060415a	Zr8b	80.8	879.3	0.07	14.762	1.3	0.0554	1.6	426.3	33.7	<b>422.6</b>	<b>5.4</b>	423.3	6.0	<b>99.8</b>
8060415b	Zr15a	53.0	691.1	0.28	19.489	1.2	0.0578	1.4	523.3	30.1	322.6	3.8	348.2	4.4	92.6
9060415b	Zr15b	36.3	365.1	0.16	14.879	1.2	0.0556	1.5	437.2	31.5	<b>419.3</b>	<b>4.9</b>	422.0	5.4	<b>99.4</b>
10060415b	Zr16	159.3	448.0	0.24	8.113	1.2	0.2327	1.3	3070.7	20.5	749.3	8.6	1624.8	11.6	52.9
<b>Sample MMG2-b</b>															
24060415a	Zr9	116.2	1266.0	0.06	14.734	1.3	0.0559	1.5	446.1	33.6	<b>423.3</b>	<b>5.4</b>	427.0	6.1	<b>99.1</b>
25060415a	Zr10	21.5	218.9	0.26	14.810	1.4	0.0565	1.8	472.8	38.6	<b>421.2</b>	<b>5.5</b>	429.6	6.7	<b>98.0</b>
26060415a	Zr11a	26.9	284.6	0.19	14.943	1.3	0.0573	1.7	501.8	37.1	<b>417.6</b>	<b>5.5</b>	431.0	6.6	<b>96.9</b>
27060415a	Zr11b	17.3	180.1	0.17	14.596	1.4	0.0581	1.8	532.3	40.0	<b>427.2</b>	<b>5.7</b>	444.3	7.1	<b>96.2</b>
11060415b	Zr17	66.2	683.5	1.44	15.432	1.2	0.0613	1.4	651.3	29.9	404.7	4.8	443.7	5.5	91.2
12060415b	Zr18a	45.5	408.2	0.51	14.863	1.2	0.0578	1.5	522.8	33.1	<b>419.8</b>	<b>5.0</b>	436.0	5.8	<b>96.3</b>
13060415b	Zr18b	27.6	256.5	0.40	14.780	1.2	0.0589	1.6	561.6	35.0	<b>422.0</b>	<b>5.0</b>	444.3	6.2	<b>95.0</b>

Highlighted in green : data used for concordia calculation (97-103 % concordance)

In bold : data used for 206Pb/238U age calculation (95-105 % concordance)

Supplementary Table 5

Analysis_#	Pb ppm Uppm Th/U			ISOTOPIC RATIOS				AGES (Ma)					conc. %		
				238/206	err%	207/206	err%	207Pb/206Pb	err	206Pb/238U	err	207Pb/235U		err	
<b>Sample MS1-1</b>															
6070415	Zr1b	16.0	164.6	0.37	14.863	1.2	0.0563	1.6	463.1	36.1	<b>419.8</b>	<b>5.0</b>	426.6	6.0	<b>98.4</b>
7070415	Zr2	21.6	214.2	0.16	14.879	1.2	0.0570	1.5	490.0	32.2	<b>419.3</b>	<b>4.9</b>	430.4	5.5	<b>97.4</b>
8070415	Zr3a	27.6	256.6	0.39	14.986	1.2	0.0575	1.4	512.1	29.7	<b>416.4</b>	<b>4.9</b>	431.4	5.3	<b>96.5</b>
9070415	Zr3b	28.6	267.2	0.34	14.832	1.2	0.0562	1.4	458.8	30.6	<b>420.6</b>	<b>4.9</b>	426.6	5.3	<b>98.6</b>
18070415	Zr7a	34.9	337.2	0.21	14.607	1.2	0.0556	1.4	436.3	30.7	<b>426.9</b>	<b>5.0</b>	428.4	5.4	<b>99.6</b>
20070415	Zr8a	704.9	1048.3	0.44	2.632	1.2	0.1811	1.2	2662.9	19.4	2075.7	21.3	2386.0	12.2	89.6
21070415	Zr8b	1421.3	1558.9	0.62	2.021	1.2	0.1931	1.2	2768.8	19.3	2591.9	25.6	2692.4	12.6	97.2
<b>Sample MS1-2</b>															
12070415	Zr5a	5.8	49.2	0.70	14.674	1.3	0.0532	2.8	335.6	62.7	<b>425.0</b>	<b>5.3</b>	411.4	9.6	<b>103.3</b>
13070415	Zr5b	64.5	663.0	0.07	14.923	1.2	0.0568	1.2	481.5	27.3	<b>418.1</b>	<b>4.9</b>	428.1	4.8	<b>97.7</b>
14070415	Zr6	50.8	500.7	1.06	15.385	1.2	0.0565	1.3	472.3	29.8	<b>406.0</b>	<b>4.7</b>	416.1	5.0	<b>97.6</b>
22070415	Zr9a	24.4	258.1	0.07	15.389	1.2	0.0579	1.5	524.2	32.0	<b>405.8</b>	<b>4.8</b>	424.0	5.5	<b>95.7</b>
23070415	Zr9b	19.7	199.3	0.08	14.723	1.2	0.0546	1.5	396.4	34.0	<b>423.6</b>	<b>5.0</b>	419.4	5.7	<b>101.0</b>
24070415	Zr10a	99.9	1028.6	0.06	14.839	1.2	0.0555	1.3	431.2	28.6	<b>420.4</b>	<b>4.9</b>	422.1	5.0	<b>99.6</b>
25070415	Zr10b	115.7	604.2	0.01	7.511	1.2	0.0690	1.3	898.7	26.1	805.7	9.1	830.8	8.0	97.0
26070415	Zr10c	123.0	674.6	0.04	7.950	1.2	0.0687	1.3	889.2	26.3	763.8	8.7	796.5	7.8	95.9
<b>Sample MS2-1</b>															
10070415	Zr4	20.8	211.9	0.08	14.837	1.2	0.0571	1.5	493.4	32.6	<b>420.4</b>	<b>4.9</b>	431.9	5.6	<b>97.3</b>
27070415	Zr11	62.0	611.5	0.13	14.699	1.2	0.0554	1.4	427.0	30.0	<b>424.3</b>	<b>5.0</b>	424.7	5.2	<b>99.9</b>

Highlighted in green : data used for concordia calculation (97-103 % concordance)

In bold : data used for 206Pb/238U age calculation (95-105 % concordance)

Supplementary Table 6