

## Supplementary Information 4

A summary of analyses performed on each Altar Stone and Orcadian Basin sample.

*X denotes the analysis undertaken.*

### Altar Stone Samples

Sample	Automated Mineralogy	Zircon U-Pb	Rutile U-Pb	Apatite U-Pb	Apatite Lu-Hf	Apatite Trace Elements
MS3	X	X	X	X		X
2010K.240	X	X			X	

### Orcadian Basin Samples

Sample	Automated Mineralogy	Zircon U-Pb	Rutile U-Pb	Apatite U-Pb	Apatite Lu-Hf	Apatite Trace Elements
Spittal, Caithness (AQ1)	X			X		
Cruaday, Orkney (CQ1)	X			X		

## Supplementary Information 5 . Summary of Zircon U–Pb Reference Material

### Session 1 (MS3)

Reference	Primary Reference	Weighted Mean Age (Ma)*	$\pm 2\sigma$	MSWD*	P*	n
<b>91500</b>		<b>1059</b>	<b>10</b>	<b>0.72</b>	<b>0.69</b>	<b>10</b>
Published age	GJ1	1063.78	0.65	<i>Wiedenbeck et al., 1995</i>		
<b>Plešovice</b>		<b>336</b>	<b>3</b>	<b>0.69</b>	<b>0.78</b>	<b>15</b>
Published age	GJ1	337.13	0.37	<i>Slama et al., 2008</i>		
<b>OG1</b>		<b>3468</b>	<b>4</b>	<b>0.73</b>	<b>0.75</b>	<b>16</b>
Published age	GJ1	3465.40	0.60	<i>Stern et al., 2009</i>		
<b>Maniitsoq</b>		<b>3014</b>	<b>6</b>	<b>0.65</b>	<b>0.85</b>	<b>17</b>
Published age	GJ1	3008.70	0.60	<i>Marsh et al., 2019</i>		

### Session 2 (2010K.240)

Reference	Primary Reference	Weighted Mean Age (Ma)*	$\pm 2\sigma$	MSWD*	P*	n
<b>91500</b>		<b>1060</b>	<b>3</b>	<b>1.20</b>	<b>0.23</b>	<b>24</b>
Published age	GJ1	1063.78	0.65	<i>Wiedenbeck et al., 1995</i>		
<b>Plešovice</b>		<b>338</b>	<b>1</b>	<b>1.20</b>	<b>0.27</b>	<b>18</b>
Published age	GJ1	337.13	0.37	<i>Slama et al., 2008</i>		
<b>OG1</b>		<b>3466</b>	<b>7</b>	<b>0.78</b>	<b>0.79</b>	<b>29</b>
Published age	GJ1	3465.40	0.60	<i>Stern et al., 2009</i>		

\*Where MSWD and P are the mean square of the weighted deviation value and the associated MSWD age homogeneity test chi-squared P-value, both metrics are one-sided measurements.

Supplementary Information 6. KS Test Results. This KS test is two-sided (i.e. this test checks for any difference in distribution). The bottom half shows P-values (Highlighted green values are  $P>0.05$ ). The top table half shows the D-values (Highlighted in blue are the associated D-values for  $P>0.05$ ).

	Altar Stone	East Avalonia	Laurentia	Ganderia	Megumia	West Avalonia	Armorica-Cadomia	Orcadian Basin	Anglo-Welsh Basin	Dingle Peninsula Basin	Midland Valley	Svalbard
Altar Stone		0.51	0.16	0.40	0.68	0.61	0.57	0.10	0.45	0.43	0.32	0.13
East Avalonia	0.00		0.53	0.12	0.21	0.15	0.18	0.50	0.28	0.21	0.33	0.45
Laurentia	0.10	0.00		0.42	0.71	0.63	0.60	0.23	0.47	0.45	0.41	0.21
Ganderia	0.00	0.00	0.00		0.29	0.24	0.18	0.39	0.29	0.27	0.25	0.34
Megumia	0.00	0.00	0.00	0.00		0.23	0.15	0.68	0.30	0.28	0.50	0.63
West Avalonia	0.00	0.00	0.00	0.00	0.00		0.22	0.61	0.25	0.21	0.43	0.55
Armorica-Cadomia	0.00	0.00	0.00	0.00	0.00	0.00		0.57	0.26	0.25	0.39	0.52
Orcadian Basin	0.72	0.00	0.00	0.00	0.00	0.00	0.00		0.44	0.42	0.37	0.11
Anglo-Welsh Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.10	0.26	0.35
Dingle Peninsula Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33		0.25	0.37
Midland Valley	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.34
Svalbard	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	

Supplementary Information 7 . KS Test Results, with Monte-Carlo resampling. This KS test is two-sided (i.e. this test checks for any difference in distribution). The bottom half of the table shows P-values (Highlighted green values are  $P>0.05$ ). The top half of the table shows two standard deviation values on the KS test P-value (highlighted blue values are two standard deviation values for those  $P>0.05$ ).

	Altar Stone	East Avalonia	Laurentia	Ganderia	Megumia	West Avalonia	Armorica-Cadomia	Orcadian Basin	Anglo-Welsh Basin	Dingle Peninsula Basin	Midland Valley	Svalbard
Altar Stone		0.00	0.05	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.00	0.10
East Avalonia	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Laurentia	0.11	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ganderia	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Megumia	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
West Avalonia	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Armorica-Cadomia	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
Orcadian Basin	0.67	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.03
Anglo-Welsh Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.19	0.00	0.00
Dingle Peninsula Basin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38		0.00	0.00
Midland Valley	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Svalbard	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	

## Supplementary Information 8. Summary of Apatite U–Pb Reference Material

### Session 1 (MS3)

Reference	Primary Reference	Age (Ma)	$\pm 2\sigma$	MSWD*	P*	n
<b>Otter Lake</b>		<b>926</b>	<b>7</b>	<b>1.7</b>	<b>0.06</b>	<b>15</b>
Published age	<b>MAD-1</b>	913	7	<i>Barfod et al., 2005</i>		
<b>FC-1</b>		<b>1109</b>	<b>16</b>	<b>1.5</b>	<b>0.08</b>	<b>17</b>
Published age	<b>MAD-1</b>	1099.1	0.6	<i>Schmitz et al., 2003</i>		
<b>Mount McClure</b>		<b>526</b>	<b>8</b>	<b>1.5</b>	<b>0.10</b>	<b>17</b>
Published age	<b>MAD-1</b>	523.5	1.5	<i>Schoene et al., 2006; Thompson et al., 2012</i>		

### Session 2 (Orcadian Basin Samples CQ1 and AQ1)

Reference	Primary Reference	Age (Ma)	$\pm 2\sigma$	MSWD*	P*	n
<b>Durango</b>		<b>28</b>	<b>3</b>	<b>0.55</b>	<b>0.90</b>	<b>15</b>
Published age	<b>MAD-1</b>	31.44	0.18	<i>McDowell et al., 2005</i>		
<b>FC-1</b>		<b>1088</b>	<b>12</b>	<b>1.4</b>	<b>0.13</b>	<b>17</b>
Published age	<b>MAD-1</b>	1099.1	0.6	<i>Schmitz et al., 2003</i>		
<b>Mount McClure</b>		<b>527</b>	<b>5</b>	<b>0.6</b>	<b>0.86</b>	<b>16</b>
Published age	<b>MAD-1</b>	523.5	1.5	<i>Schoene et al., 2006; Thompson et al., 2012</i>		

\*Where MSWD and P are the mean square of the weighted deviation value and the associated MSWD age homogeneity test chi-squared P-value, both metrics are one-sided.