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## Thermo-tectonic evolution of a convergent orogen with low topographic build-up

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## APPENDIX B

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### Apatite (U-Th)/He Analytical Data

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**Table B.1:** (U-Th)/He Analytical Data for SUERC-measurements Apusen Mountains<sup>a</sup>

Sample Code	R / L ( $\mu\text{m}$ )	<sup>4</sup> He <sup>b</sup> (ccSTP)	<sup>4</sup> He blank	<sup>238</sup> U <sup>b</sup> (ng)	<sup>238</sup> U blank	<sup>232</sup> Th <sup>b</sup> (ng)	<sup>232</sup> Th blank	Th/U	eU <sup>c</sup> (ppm)	Uncorr. age (Ma)	F <sub>r</sub> <sup>d</sup>	Corr. age (Ma)	
<b>Carp 97</b>													
p1 <sup>e</sup>	39 / 150	3.45E-10	1%	0.027	3%	0.014	30%	0.5	13	93.7 ± 3.5	0.65	143.1 ± 21.6	
p2 <sup>e</sup>	45 / 159	3.56E-10	1%	0.045	2%	0.017	26%	0.4	16	59.4 ± 2.3	0.66	90.5 ± 18.8	
p3 <sup>e</sup>	38 / 89	2.99E-10	1%	0.025	3%	0.014	31%	0.6	22	86.0 ± 3.3	0.61	140.5 ± 18.2	
<i>Average</i>												-	-
<i>Error weighted average</i>												-	-
<b>Carp 100</b>													
p1	46 / 140	5.08E-10	0%	0.101	1%	0.151	4%	1.5	105	30.5 ± 1.1	0.68	44.6 ± 4.6	
p2	53 / 147	7.21E-10	0%	0.115	1%	0.145	4%	1.3	64	39.7 ± 1.4	0.72	55.4 ± 5.4	
p3	46 / 279	6.92E-10	0%	0.168	1%	0.223	3%	1.4	119	25.8 ± 0.9	0.72	35.9 ± 6.3	
<i>Average</i>												45.3 ± 9.7	
<i>Error weighted average</i>												46.0 ± 3.0	
<b>Carp 105</b>													
p1	35 / 147	1.94E-10	1%	0.042	2%	0.107	5%	2.6	39	23.6 ± 0.8	0.61	38.6 ± 2.6	
p2	39 / 135	2.16E-10	1%	0.038	2%	0.096	6%	2.6	30	29.2 ± 1.1	0.64	45.8 ± 3.5	
p3	33 / 147	2.67E-10	1%	0.045	2%	0.153	4%	3.5	49	27.1 ± 1.0	0.60	45.3 ± 4.3	
<i>Average</i>												45.6 ± 0.4	
<i>Error weighted average</i>												42.0 ± 1.9	

<sup>a</sup>SUERC-measurements 2006 following procedures of *Foeken et al.* [2006]. <sup>4</sup>He concentrations were calculated by peak height comparison against a calibrated standard with a reproducibility of 1.4% (1 $\sigma$ , n = 46, July-August 2006). Following He-extraction, apatites were prepared for U and Th measurements following procedures in *Balestrieri et al.* [2005] and spiked with a calibrated <sup>229</sup>Th/<sup>233</sup>U solution.

<sup>b</sup>Blank corrected values (see Chapter 2 for explanation).

<sup>c</sup>Effective uranium concentration, where eU = U + 0.235 $\times$ Th [*Shuster et al.*, 2006; *Flowers et al.*, 2007].

<sup>d</sup>F<sub>r</sub> is fraction of  $\alpha$  retained [*Farley et al.*, 1996]; "corrected ages" are corrected for this effect using the model for a hexagonal prism geometry (see Chapter 2 for explanation).

<sup>e</sup>Not taken into account for average and error weighted average (see Chapter 2 for explanation).

**Table B.2:** (U-Th)/He Analytical Data for VUA-measurements Apuseni Mountains<sup>a,b</sup>

Sample Code	R / L (µm)	<sup>4</sup> He <sup>c</sup> (ccSTP)	<sup>4</sup> He blank	<sup>238</sup> U <sup>c</sup> (ng)	<sup>238</sup> U blank	<sup>232</sup> Th <sup>c</sup> (ng)	<sup>232</sup> Th blank	Th/U	eU <sup>d</sup> (ppm)	Uncorr. age (Ma)	F <sub>T</sub> <sup>e</sup>	Corr. age (Ma)
<b>Carp 92<sup>a</sup></b>												
p1	39 / 108	1.20E-10	5%	0.018	5%	0.046	2%	2.6	17	34.2 ± 1.8	0.62	54.8 ± 7.5
p2	35 / 107	1.50E-10	4%	0.019	5%	0.062	2%	3.3	25	36.5 ± 1.7	0.59	61.4 ± 10.8
p3	47 / 148	1.88E-10	3%	0.026	3%	0.075	1%	2.9	14	35.0 ± 1.4	0.69	50.9 ± 4.1
Average												55.7 ± 5.3
Error weighted average												52.8 ± 3.4
<b>RO-13<sup>b</sup></b>												
p1	32 / 216	1.28E-10	26%	0.035	1%	0.066	1%	1.9	23	20.8 ± 4.6	0.61	34.0 ± 7.9
p2 <sup>f</sup>	35 / 141	3.77E-11	54%	0.011	4%	0.035	2%	3.3	11	16.0 ± 10.6	0.61	26.3 ± 17.4
p3	38 / 190	4.95E-11	47%	0.017	3%	0.050	2%	3.0	11	14.2 ± 7.2	0.65	21.9 ± 11.1
p4 <sup>f</sup>	31 / 153	9.73E-12	82%	0.010	4%	0.031	3%	3.2	12	4.7 ± 11.9	0.58	8.1 ± 20.6
Average												28.0 ± 8.6
Error weighted average												29.9 ± 6.5
<b>RO-22<sup>b</sup></b>												
p1 <sup>g</sup>	50 / 151	3.44E-10	11%	0.010	4%	0.017	4%	1.8	4	200.9 ± 21.2	0.71	283.7 ± 34.2
p2 <sup>g</sup>	44 / 114	1.11E-10	29%	0.055	1%	0.006	3%	0.1	26	16.3 ± 4.2	0.67	24.3 ± 6.9
p3 <sup>f</sup>	36 / 96	2.72E-11	62%	0.007	6%	0.006	12%	0.9	6	28.1 ± 25.9	0.61	46.5 ± 42.9
Average												-
Error weighted average												-
<b>RO-27<sup>b</sup></b>												
p1	55 / 193	2.63E-10	15%	0.031	1%	0.094	1%	3.1	9	40.4 ± 4.9	0.73	55.1 ± 9.8
p2	51 / 193	3.77E-10	11%	0.031	1%	0.126	1%	4.1	12	50.7 ± 4.6	0.72	70.7 ± 22.7
p3	44 / 136	2.92E-10	13%	0.014	3%	0.144	1%	10.6	18	49.9 ± 4.9	0.65	76.3 ± 20.5
p4	48 / 115	1.54E-10	22%	0.012	4%	0.045	2%	3.8	9	55.9 ± 9.6	0.68	81.9 ± 14.8
Average												71.0 ± 11.5
Error weighted average												65.6 ± 7.2
<b>RO-28<sup>b</sup></b>												
p1 <sup>g</sup>	41 / 133	1.17E-10	28%	0.009	5%	0.023	3%	2.7	6	68.1 ± 15.1	0.65	105.1 ± 28.0
p2 <sup>g</sup>	46 / 121	2.49E-10	15%	0.012	4%	0.033	2%	2.9	8	105.4 ± 12.2	0.67	157.7 ± 21.7
p3 <sup>g</sup>	34 / 128	6.37E-11	41%	0.007	6%	0.022	4%	3.0	9	41.6 ± 16.4	0.60	69.9 ± 29.7
Average												-
Error weighted average												-
<b>RO-34<sup>b</sup></b>												
p1 <sup>f</sup>	51 / 110	2.76E-11	62%	0.012	4%	0.001	48%	0.1	4	18.9 ± 17.1	0.70	27.0 ± 24.5
p2 <sup>f</sup>	48 / 132	1.87E-11	71%	0.002	20%	B.D.	100%	-	1	84.5 ± 113.8	0.70	120.0 ± 162.4
p3 <sup>f</sup>	44 / 135	4.68E-11	49%	0.012	4%	0.001	59%	0.0	4	32.9 ± 17.6	0.68	48.3 ± 26.9
Average												-
Error weighted average												-
<b>RO-35<sup>b</sup></b>												
p1 <sup>f</sup>	41 / 138	4.93E-11	48%	0.016	3%	B.D.	72%	-	7	25.1 ± 12.9	0.67	37.6 ± 19.8
p2 <sup>f</sup>	34 / 178	1.35E-10	25%	0.011	4%	B.D.	100%	-	6	96.8 ± 20.2	0.63	152.9 ± 36.3
p3 <sup>f</sup>	42 / 133	1.02E-10	30%	0.009	5%	B.D.	100%	-	4	94.7 ± 25.9	0.67	141.3 ± 39.4
p4	43 / 115	7.74E-11	37%	0.023	2%	0.002	32%	0.1	11	26.9 ± 8.9	0.66	40.4 ± 13.8
Average												40.4 ± 13.8
Error weighted average												40.4 ± 13.8

<sup>a</sup>VUA-measurements 2005 and <sup>b</sup>VUA-measurements 2008 following procedures of *Foeken et al.* [2003]. <sup>4</sup>He abundances were calibrated against an internal standard with a reproducibility of 1.1% (1σ, n = 16, May-June 2005) and 0.6% (1σ, n = 12, March 2008). Following He-extraction, apatites were prepared for U and Th analyses following procedures in *Foeken et al.* [2003] and spiked with a calibrated <sup>229</sup>Th/<sup>235</sup>U solution.

<sup>c</sup>Blank corrected values (see Chapter 2 for explanation); B.D., below detection limit.

<sup>d</sup>Effective uranium concentration, where eU = U + 0.235×Th [*Shuster et al.*, 2006; *Flowers et al.*, 2007].

<sup>e</sup>F<sub>T</sub> is fraction of α retained [*Farley et al.*, 1996]; "corrected ages" are corrected for this effect using the model for a hexagonal prism geometry (see Chapter 2 for explanation).

<sup>f</sup>Not taken into account for average and error weighted average due to blank/sample ratio over 50% (see Chapter 2 for explanation).

<sup>g</sup>Not taken into account for average and error weighted average (see Chapter 2 for explanation).

**Table B.3:** (U-Th)/He Analytical Data SUERC-measurements SE Carpathians<sup>a</sup>

Sample Code	R / L ( $\mu\text{m}$ )	<sup>4</sup> He <sup>b</sup> (ccSTP)	<sup>4</sup> He blank	<sup>238</sup> U <sup>b</sup> (ng)	<sup>238</sup> U blank	<sup>232</sup> Th <sup>b</sup> (ng)	<sup>232</sup> Th blank	Th/U	eU <sup>c</sup> (ppm)	Uncorr. age (Ma)	F <sub>T</sub> <sup>d</sup>	Corr. age (Ma)
<b>RO-02</b>												
p1-S <sup>e</sup>	38 / 162	1.66E-11	10%	0.016	5%	0.055	10%	3.6	12	4.7 ± 0.2	0.64	7.4 ± 0.6
p2-S	39 / 135	2.83E-11	6%	0.022	4%	0.081	7%	3.8	20	5.7 ± 0.2	0.64	8.9 ± 1.3
p3-S	39 / 126	2.39E-11	7%	0.017	5%	0.069	8%	4.2	17	5.9 ± 0.2	0.63	9.4 ± 1.6
p1-L	41 / 166	4.84E-11	7%	0.044	2%	0.095	6%	2.2	24	6.0 ± 0.2	0.67	9.0 ± 0.9
p2-L	44 / 173	3.60E-11	9%	0.024	4%	0.094	6%	4.0	14	6.4 ± 0.3	0.68	9.5 ± 2.5
p3-L	43 / 156	9.50E-11	3%	0.069	1%	0.169	3%	2.5	37	7.2 ± 0.3	0.67	10.7 ± 2.0
<i>Average</i>												9.1 ± 1.1
<i>Error weighted average</i>												9.2 ± 0.6
<b>RO-04</b>												
p1-S <sup>e</sup>	39 / 133	9.17E-11	2%	0.032	3%	0.032	16%	1.0	19	19.2 ± 0.7	0.65	29.7 ± 2.2
p2-S	36 / 109	3.36E-12	36%	0.002	28%	0.010	36%	4.6	3	5.7 ± 0.4	0.60	9.6 ± 0.8
p3-S	33 / 118	1.60E-10	1%	0.137	1%	0.098	6%	0.7	127	8.2 ± 0.3	0.59	13.9 ± 2.9
<i>Average</i>												11.7 ± 3.0
<i>Error weighted average</i>												9.9 ± 0.8
<b>RO-05</b>												
p1-S	38 / 110	2.08E-11	8%	0.054	2%	0.082	7%	1.6	47	2.3 ± 0.1	0.62	3.7 ± 0.7
p2-S	35 / 114	9.43E-12	16%	0.022	4%	0.049	11%	2.3	25	2.3 ± 0.1	0.60	3.8 ± 0.9
p3-S	32 / 118	6.79E-12	21%	0.017	5%	0.076	7%	4.7	28	1.6 ± 0.1	0.57	2.8 ± 0.5
<i>Average</i>												3.5 ± 0.6
<i>Error weighted average</i>												3.3 ± 0.4
<b>RO-06</b>												
p1-S	41 / 133	1.91E-11	9%	0.081	1%	0.150	4%	1.9	53	1.3 ± 0.1	0.65	2.1 ± 0.3
p2-S	46 / 128	1.84E-12	50%	0.007	11%	0.026	19%	3.6	5	1.1 ± 0.0	0.67	1.7 ± 0.3
p3-S	36 / 109	1.15E-11	14%	0.065	1%	0.089	6%	1.4	61	1.1 ± 0.0	0.61	1.8 ± 0.3
p1-L <sup>e</sup>	56 / 138	6.57E-12	34%	0.008	10%	0.023	20%	2.9	3	3.9 ± 0.2	0.72	5.4 ± 0.5
p2-L <sup>e</sup>	50 / 158	1.12E-10	3%	0.307	0%	0.490	1%	1.6	107	2.2 ± 0.1	0.71	3.1 ± 0.4
p3-L	57 / 147	7.57E-11	4%	0.377	0%	0.295	2%	0.8	93	1.4 ± 0.0	0.74	1.9 ± 0.3
<i>Average</i>												1.9 ± 0.2
<i>Error weighted average</i>												1.9 ± 0.1
<b>RO-07</b>												
p1-S	37 / 110	3.44E-11	5%	0.130	1%	0.160	4%	1.3	110	1.7 ± 0.1	0.62	2.7 ± 0.4
p2-S	38 / 120	5.81E-12	24%	0.013	7%	0.133	4%	10.7	25	1.1 ± 0.0	0.61	1.8 ± 0.2
p3-S	36 / 106	3.30E-11	5%	0.107	1%	0.216	3%	2.1	112	1.7 ± 0.1	0.61	2.8 ± 0.5
p1-L	45 / 155	3.81E-11	8%	0.089	1%	0.342	2%	4.0	55	1.8 ± 0.1	0.68	2.7 ± 0.5
p2-L	45 / 166	5.22E-11	6%	0.105	1%	0.538	1%	5.2	70	1.8 ± 0.1	0.68	2.7 ± 0.4
p3-L	47 / 201	2.69E-11	11%	0.071	1%	0.306	2%	4.5	31	1.5 ± 0.1	0.70	2.2 ± 0.3
<i>Average</i>												2.5 ± 0.4
<i>Error weighted average</i>												2.2 ± 0.1
<b>RO-09</b>												
p1-S <sup>e</sup>	33 / 118	3.35E-10	1%	0.040	2%	0.016	28%	0.4	33	63.5 ± 2.4	0.60	105.6 ± 6.3
p2-S <sup>e</sup>	34 / 149	9.44E-11	2%	0.020	4%	0.014	31%	0.7	13	33.3 ± 1.3	0.62	53.7 ± 5.8
p3-S <sup>e</sup>	37 / 111	6.70E-10	0%	0.051	2%	0.035	15%	0.7	39	92.6 ± 3.3	0.62	149.0 ± 24.3
p1-L <sup>e</sup>	52 / 130	1.31E-11	21%	0.006	13%	0.013	31%	2.2	3	11.4 ± 0.5	0.70	16.3 ± 1.2
p2-L <sup>e</sup>	37 / 121	1.42E-11	20%	0.007	11%	0.016	27%	2.3	7	10.5 ± 0.5	0.62	17.0 ± 3.7
p3-L <sup>e</sup>	41 / 114	4.60E-10	1%	0.051	2%	0.014	30%	0.3	28	69.3 ± 2.5	0.66	105.8 ± 13.4
<i>Average</i>												-
<i>Error weighted average</i>												-
<b>RO-10</b>												
p1-S <sup>f</sup>	37 / 179	2.38E-11	7%	B.D.	84%	0.014	30%	-	1	55.9 ± 95.9	0.62	90.4 ± 155.5
p2-S <sup>f</sup>	34 / 146	3.22E-11	5%	B.D.	69%	0.011	35%	-	2	85.7 ± 8.7	0.58	146.5 ± 22.5
p3-S <sup>f</sup>	43 / 105	2.73E-11	6%	B.D.	100%	0.015	28%	-	2	61.4 ± 5.6	0.62	99.1 ± 11.1
<i>Average</i>												-
<i>Error weighted average</i>												-

Table B.3: Continued

Sample Code	R / L (µm)	<sup>4</sup> He <sup>b</sup> (ccSTP)	<sup>4</sup> He blank	<sup>238</sup> U <sup>b</sup> (ng)	<sup>238</sup> U blank	<sup>232</sup> Th <sup>b</sup> (ng)	<sup>232</sup> Th blank	Th/U	eU <sup>c</sup> (ppm)	Uncorr. age (Ma)	F <sub>T</sub> <sup>d</sup>	Corr. age (Ma)
<b>RO-11</b>												
p1-S	34 / 97	1.96E-10	1%	0.048	2%	0.097	6%	2.1	63	22.5 ± 0.8	0.58	38.7 ± 5.3
p2-S	35 / 117	2.14E-10	1%	0.095	1%	0.017	26%	0.2	69	17.7 ± 0.6	0.62	28.7 ± 3.1
p1-L	38 / 183	2.77E-10	1%	0.062	1%	0.198	3%	3.3	41	20.9 ± 0.8	0.65	32.3 ± 6.7
p2-L <sup>e</sup>	81 / 201	7.32E-10	0%	0.077	1%	0.221	3%	2.9	10	46.3 ± 1.7	0.80	57.7 ± 5.8
p3-L	40 / 116	4.63E-10	1%	0.092	1%	0.268	2%	3.0	83	24.5 ± 0.9	0.63	38.5 ± 8.6
<i>Average</i>												34.6 ± 4.9
<i>Error weighted average</i>												32.0 ± 2.4
<b>RO-12</b>												
p1-S	34 / 106	1.05E-11	15%	0.003	21%	0.040	13%	11.9	10	6.7 ± 0.3	0.57	11.8 ± 2.4
p2-S	34 / 102	2.07E-11	8%	0.014	6%	0.028	18%	2.0	18	8.1 ± 0.3	0.59	13.9 ± 0.8
p1-L	50 / 116	3.07E-11	6%	0.016	5%	0.039	13%	2.5	9	10.1 ± 0.4	0.69	14.8 ± 2.5
<i>Average</i>												13.5 ± 1.5
<i>Error weighted average</i>												13.8 ± 0.8
<b>Carp 31</b>												
p1	63 / 172	1.81E-11	9%	0.036	2%	0.033	15%	0.9	6	3.4 ± 0.1	0.76	4.5 ± 0.4
p2	39 / 110	5.33E-12	29%	0.009	9%	0.017	26%	1.9	8	3.2 ± 0.1	0.63	5.1 ± 0.4
p3	43 / 139	1.62E-11	10%	0.051	2%	0.023	20%	0.5	22	2.4 ± 0.1	0.68	3.5 ± 0.4
<i>Average</i>												4.4 ± 0.8
<i>Error weighted average</i>												4.3 ± 0.2

<sup>a</sup>SUERC-measurements 2006 following procedures in *Foeken et al.* [2006]. <sup>4</sup>He concentrations were calculated by peak height comparison against a calibrated standard with a reproducibility of 1.4% (1σ, n = 46) for the duration of this set of experiments (July-August 2006). Following He-extraction, apatites were prepared for U and Th measurements following procedures in *Balestrieri et al.* [2005] and spiked with a calibrated <sup>229</sup>Th/<sup>233</sup>U solution.

<sup>b</sup>Blank corrected values (see Chapter 2 for explanation); B.D., below detection limit.

<sup>c</sup>Effective uranium concentration, where eU = U + 0.235×Th [*Shuster et al.*, 2006; *Flowers et al.*, 2007].

<sup>d</sup>F<sub>T</sub> is fraction of α retained [*Farley et al.*, 1996]; "corrected ages" are corrected for this effect using the model for a hexagonal prism geometry (see Chapter 2 for explanation).

<sup>e</sup>Not taken into account for average and error weighted average (see Chapter 2 for explanation).

<sup>f</sup>Not taken into account for average and error weighted average due to blank/sample ratio over 50% (see Chapter 2 for explanation).

**Table B.4:** U-Th)/He Analytical Data VUA-measurements SE Carpathians<sup>a</sup>

Sample Code	R / L ( $\mu\text{m}$ )	<sup>4</sup> He <sup>b</sup> (ccSTP)	<sup>4</sup> He blank	<sup>238</sup> U <sup>b</sup> (ng)	<sup>238</sup> U blank	<sup>232</sup> Th <sup>b</sup> (ng)	<sup>232</sup> Th blank	Th/U	eU <sup>c</sup> (ppm)	Uncorr. age (Ma)	F <sub>T</sub> <sup>d</sup>	Corr. age (Ma)
<b>Carp 34</b>												
p1	52 / 155	2.63E-10	3%	0.075	2%	0.005	25%	0.1	18	28.2 ± 1.3	0.73	38.9 ± 6.9
p2	45 / 142	2.67E-10	3%	0.076	2%	0.012	13%	0.2	27	27.9 ± 1.2	0.69	40.4 ± 11.8
Average												39.6 ± 1.1
Error weighted average												39.3 ± 6.0
<b>Carp 45</b>												
p1 <sup>e</sup>	55 / 143	5.99E-11	11%	0.033	4%	0.033	5%	1.0	9	12.1 ± 1.0	0.73	16.6 ± 4.6
p3 <sup>f</sup>	46 / 113	1.36E-11	35%	B.D.	100%	0.016	10%	7.1	2	31.0 ± 16.8	0.64	48.4 ± 29.7
p4 <sup>e</sup>	55 / 132	3.89E-11	17%	0.005	21%	0.037	5%	7.3	3	22.7 ± 3.0	0.71	32.2 ± 5.9
Average												-
Error weighted average												-
<b>Carp 68</b>												
p2	36 / 105	1.69E-11	31%	0.004	24%	0.066	3%	15.1	15	7.0 ± 1.4	0.58	11.9 ± 2.8
p3	35 / 93	1.86E-11	11%	0.007	16%	0.060	3%	8.2	18	7.1 ± 1.4	0.57	12.4 ± 4.2
p4 <sup>e</sup>	35 / 105	3.37E-11	7%	0.004	26%	0.085	2%	21.7	18	11.5 ± 1.4	0.57	19.9 ± 6.1
Average												12.2 ± 0.3
Error weighted average												12.1 ± 2.3
<b>Carp 67</b>												
p1	64 / 221	2.45E-10	2%	1.218	0%	0.866	0%	0.7	159	1.4 ± 0.1	0.78	1.8 ± 0.2
p2	59 / 253	1.42E-10	3%	0.602	0%	0.643	0%	1.1	86	1.6 ± 0.1	0.77	2.0 ± 0.2
p4 <sup>e</sup>	42 / 149	1.19E-11	28%	0.007	17%	0.070	2%	10.2	9	4.2 ± 1.1	0.65	6.4 ± 1.7
p5	39 / 155	5.93E-11	7%	0.245	1%	0.223	1%	0.9	128	1.6 ± 0.1	0.65	2.5 ± 0.5
Average												2.1 ± 0.3
Error weighted average												2.0 ± 0.1
<b>Carp 66</b>												
p1	30 / 137	3.33E-11	12%	0.035	4%	0.183	1%	5.4	63	3.5 ± 0.3	0.56	6.3 ± 4.5
p2 <sup>e</sup>	35 / 130	1.00E-10	5%	0.014	9%	0.075	2%	5.5	19	26.1 ± 1.7	0.60	43.3 ± 11.0
p4	44 / 152	5.37E-11	8%	0.097	1%	0.483	0%	5.1	72	2.1 ± 0.1	0.67	3.1 ± 0.5
Average												4.7 ± 2.2
Error weighted average												3.2 ± 0.5
<b>Carp 64</b>												
p1	34 / 140	2.47E-11	17%	0.037	4%	0.117	2%	3.3	40	3.2 ± 0.3	0.60	5.3 ± 1.4
p2	33 / 120	3.74E-11	7%	0.124	1%	0.113	2%	0.9	112	2.0 ± 0.1	0.60	3.4 ± 1.3
p4	43 / 136	4.84E-11	6%	0.162	1%	0.110	2%	0.7	75	2.1 ± 0.1	0.67	3.2 ± 0.4
Average												3.9 ± 1.2
Error weighted average												3.4 ± 0.4

<sup>a</sup>VUA-measurements 2004 following procedures in *Foeken et al.* [2003]. <sup>4</sup>He abundances were calibrated against an internal standard with a reproducibility of 1.4% ( $1\sigma$ ,  $n = 18$ , November 2004). Following He-extraction, apatites were prepared for U and Th analyses following procedures in *Foeken et al.* [2003] and spiked with a calibrated <sup>229</sup>Th/<sup>233</sup>U solution.

<sup>b</sup>Blank corrected values (see Chapter 2 for explanation); B.D., below detection limit.

<sup>c</sup>Effective uranium concentration, where  $eU = U + 0.235 \times Th$  [*Shuster et al.*, 2006; *Flowers et al.*, 2007].

<sup>d</sup>F<sub>T</sub> is fraction of  $\alpha$  retained [*Farley et al.*, 1996]; "corrected ages" are corrected for this effect using the model for a hexagonal prism geometry (see Chapter 2 for explanation).

<sup>e</sup>Not taken into account for average and error weighted average (see Chapter 2 for explanation).

<sup>f</sup>Not taken into account for average and error weighted average due to blank/sample ratio over 50% (see Chapter 2 for explanation).

**Table B.5:** U-(Th)/He Analytical Data VUA-measurements East Carpathians<sup>a</sup>

Sample Code	R / L (µm)	<sup>4</sup> He <sup>b</sup> (ccSTP)	<sup>4</sup> He blank	<sup>238</sup> U <sup>b</sup> (ng)	<sup>238</sup> U blank	<sup>232</sup> Th <sup>b</sup> (ng)	<sup>232</sup> Th blank	Th/U	eU <sup>c</sup> (ppm)	Uncorr. age (Ma)	F <sub>T</sub> <sup>d</sup>	Corr. age (Ma)
<b>Carp 5</b>												
p1 <sup>e</sup>	32 / 131	1.82E-11	25%	0.005	22%	0.025	7%	5.0	8	13.7 ± 2.0	0.58	23.8 ± 3.6
p2	33 / 137	9.87E-11	6%	0.071	2%	0.110	2%	1.6	67	8.3 ± 0.4	0.60	14.0 ± 1.4
p3	33 / 136	1.67E-10	4%	0.094	1%	0.315	1%	3.4	116	8.1 ± 0.3	0.59	13.8 ± 3.1
Average												13.9 ± 0.1
Error weighted average												14.0 ± 1.3
<b>Carp 6</b>												
p1	38 / 198	3.15E-11	20%	0.011	11%	0.042	4%	3.7	7	12.2 ± 2.0	0.65	18.8 ± 4.5
p2	33 / 201	1.96E-11	26%	0.008	14%	0.023	7%	2.9	6	11.7 ± 1.3	0.61	19.1 ± 4.7
p3	38 / 129	3.66E-11	16%	0.013	10%	0.033	5%	2.7	11	14.6 ± 1.1	0.63	23.2 ± 4.7
p4	41 / 152	2.14E-11	30%	0.006	18%	0.031	6%	5.0	5	13.0 ± 1.8	0.65	19.9 ± 4.2
Average												20.3 ± 2.0
Error weighted average												20.2 ± 2.2
<b>Carp 107</b>												
p1	45 / 130	1.49E-10	6%	0.048	3%	0.151	1%	3.2	32	14.6 ± 0.7	0.67	21.8 ± 1.2
p2 <sup>e</sup>	53 / 126	4.36E-10	3%	0.008	14%	0.154	1%	18.9	13	80.0 ± 4.9	0.69	116.4 ± 9.1
p3	59 / 165	7.80E-11	8%	0.007	16%	0.228	1%	31.6	11	10.5 ± 1.0	0.72	14.5 ± 1.4
Average												18.1 ± 5.1
Error weighted average												18.7 ± 0.9
<b>Carp 60</b>												
p1 <sup>f</sup>	26 / 118	9.27E-12	57%	0.001	60%	0.005	28%	5.1	3	37.5 ± 44.2	0.50	75.4 ± 89.0
p2 <sup>e</sup>	39 / 157	1.72E-11	28%	0.003	32%	0.010	16%	3.3	2	26.6 ± 10.9	0.64	41.2 ± 13.3
p3 <sup>e</sup>	32 / 214	1.83E-10	4%	0.002	46%	0.015	11%	9.3	2	283.8 ± 79.9	0.60	475.5 ± 192.7
Average												-
Error weighted average												-
<b>Carp 19b</b>												
p1	57 / 190	2.40E-10	4%	0.125	1%	0.266	1%	2.2	30	10.5 ± 0.5	0.74	14.1 ± 2.6
p2	41 / 127	9.64E-11	9%	0.021	6%	0.181	1%	8.8	29	12.4 ± 0.7	0.64	19.5 ± 4.3
Average												16.8 ± 3.8
Error weighted average												15.5 ± 2.2
<b>Carp 19</b>												
p1 <sup>f</sup>	23 / 89	7.12E-12	35%	0.001	51%	0.005	26%	3.9	5	22.9 ± 17.4	0.45	51.3 ± 41.3
p2	20 / 111	3.94E-11	19%	0.022	6%	0.002	42%	0.1	49	14.3 ± 1.5	0.44	32.4 ± 4.8
Average												32.4 ± 4.8
Error weighted average												32.4 ± 4.8

<sup>a</sup>VUA-measurements 2004 following procedures in *Foeken et al.* [2003]. <sup>4</sup>He abundances were calibrated against an internal standard with a reproducibility of 1.4% (1σ, n = 18, November 2004). Following He-extraction, apatites were prepared for U and Th analyses following procedures in *Foeken et al.* [2003] and spiked with a calibrated <sup>229</sup>Th/<sup>233</sup>U solution.

<sup>b</sup>Blank corrected values (see Chapter 2 for explanation).

<sup>c</sup>Effective uranium concentration, where eU = U + 0.235×Th [*Shuster et al.*, 2006; *Flowers et al.*, 2007].

<sup>d</sup>F<sub>T</sub> is fraction of α retained [*Farley et al.*, 1996]; "corrected ages" are corrected for this effect using the model for a hexagonal prism geometry (see Chapter 2 for explanation).

<sup>e</sup>Not taken into account for average and error weighted average (see Chapter 2 for explanation).

<sup>f</sup>Not taken into account for average and error weighted average due to blank/sample ratio over 50% (see Chapter 2 for explanation).



**Table B.6:** U-(Th)/He Analytical Data SUERC-measurements Transition Zone East / SE Carpathians<sup>a</sup>

Sample Code	R / L ( $\mu\text{m}$ )	<sup>4</sup> He <sup>b</sup> (ccSTP)	<sup>4</sup> He blank	<sup>238</sup> U <sup>b</sup> (ng)	<sup>238</sup> U blank	<sup>232</sup> Th <sup>b</sup> (ng)	<sup>232</sup> Th blank	Th/U	eU <sup>c</sup> (ppm)	Uncorr. age (Ma)	F <sub>T</sub> <sup>d</sup>	Corr. age (Ma)
<b>Carp69</b>												
p1 <sup>e</sup>	34 / 94	5.88E-11	5%	0.056	2%	0.213	3%	3.9	98	4.6 ± 0.2	0.57	8.0 ± 1.8
p2	38 / 111	1.01E-10	3%	0.236	0%	0.240	2%	1.0	181	2.8 ± 0.1	0.63	4.5 ± 1.0
p3	37 / 118	1.52E-11	17%	0.008	10%	0.114	5%	14.8	22	3.6 ± 0.1	0.60	6.0 ± 0.6
<i>Average</i>												5.3 ± 1.1
<i>Error weighted average</i>												5.7 ± 0.5

<sup>a</sup>SUERC-measurements 2006 following procedures in *Foeken et al.* [2006]. <sup>4</sup>He concentrations were calculated by peak height comparison against a calibrated standard with a reproducibility of 1.4% ( $1\sigma$ , n = 46, July-August 2006) for the duration of this set of experiments (July-August 2006). Following He-extraction, apatites were prepared for U and Th measurements following procedures in *Balestrieri et al.* [2005] and spiked with a calibrated <sup>229</sup>Th/<sup>233</sup>U solution.

<sup>b</sup>Blank corrected values (see Chapter 2 for explanation).

<sup>c</sup>Effective uranium concentration, where  $eU = U + 0.235 \times Th$  [*Shuster et al.*, 2006; *Flowers et al.*, 2007].

<sup>d</sup>F<sub>T</sub> is fraction of  $\alpha$  retained [*Farley et al.*, 1996]; "corrected ages" are corrected for this effect using the model for a hexagonal prism geometry (see Chapter 2 for explanation).

<sup>e</sup>Not taken into account for average and error weighted average (see Chapter 2 for explanation).

**Table B.7:** U-(Th)/He Analytical Data VUA-measurements South Carpathians<sup>a</sup>

Sample Code	R / L ( $\mu\text{m}$ )	<sup>4</sup> He <sup>b</sup> (ccSTP)	<sup>4</sup> He blank	<sup>238</sup> U <sup>b</sup> (ng)	<sup>238</sup> U blank	<sup>232</sup> Th <sup>b</sup> (ng)	<sup>232</sup> Th blank	Th/U	eU <sup>c</sup> (ppm)	Uncorr. age (Ma)	F <sub>T</sub> <sup>d</sup>	Corr. age (Ma)
<b>Carp 36</b>												
p1	54 / 227	9.48E-10	1%	0.179	1%	0.006	16%	0.0	27	43.1 ± 1.2	0.75	57.3 ± 4.3
p2	45 / 181	6.45E-10	1%	0.115	1%	0.004	22%	0.0	31	45.5 ± 1.2	0.70	64.6 ± 4.2
p3	39 / 195	6.19E-10	1%	0.100	1%	0.003	25%	0.0	34	50.4 ± 1.7	0.67	74.9 ± 7.6
<i>Average</i>												65.6 ± 8.8
<i>Error weighted average</i>												62.9 ± 2.8

<sup>a</sup>VUA-measurements 2005 following procedures in *Foeken et al.* [2003]. <sup>4</sup>He abundances were calibrated against an internal standard with a reproducibility of 1.1% ( $1\sigma$ , n = 16, May-June 2005). Following He-extraction, apatites were prepared for U and Th analyses following procedures in *Foeken et al.* [2003] and spiked with a calibrated <sup>229</sup>Th/<sup>233</sup>U solution.

<sup>b</sup>Blank corrected values (see Chapter 2 for explanation).

<sup>c</sup>Effective uranium concentration, where  $eU = U + 0.235 \times Th$  [*Shuster et al.*, 2006; *Flowers et al.*, 2007].

<sup>d</sup>F<sub>T</sub> is fraction of  $\alpha$  retained [*Farley et al.*, 1996]; "corrected ages" are corrected for this effect using the model for a hexagonal prism geometry (see Chapter 2 for explanation).

**Table B.8:** U-Th)/He Analytical Data SUERC-measurements Durango apatite<sup>a</sup>

Sample Code	<sup>4</sup> He <sup>b</sup> (ccSTP)	<sup>4</sup> He blank	<sup>238</sup> U <sup>b</sup> (ng)	<sup>238</sup> U blank	<sup>232</sup> Th <sup>b</sup> (ng)	<sup>232</sup> Th blank	Th/U	Uncorr. age (Ma)	
Durango D11 <sup>c</sup>	8.90E-10	0%	0.044	2%	0.773	1%	18.0	32.3	± 1.7
Durango D13 <sup>c</sup>	1.43E-09	0%	0.063	1%	1.216	0%	19.7	33.5	± 1.4
Durango D1 <sup>c</sup>	1.13E-09	0%	0.042	2%	1.023	1%	25.1	32.7	± 1.4
Durango D2 <sup>c</sup>	2.33E-09	0%	0.097	1%	2.078	0%	22.0	32.6	± 1.4
<i>Average ± standard deviation</i>								32.8	± 0.6
Durango D5 <sup>d</sup>	3.62E-09	0%	0.161	1%	2.888	0%	18.3	35.3	± 1.5
<i>Total average SUERC-measurements ± standard deviation</i>								33.3	± 1.2

<sup>a</sup>SUERC-measurements 2006 following procedures of *Foeken et al.* [2006]. <sup>4</sup>He concentrations were calculated by peak height comparison against a calibrated standard with a reproducibility of 1.4% (1σ, n = 46, July-August 2006). Following He-extraction, apatites were prepared for U and Th measurements following procedures in *Balestrieri et al.* [2005] and spiked with a calibrated <sup>229</sup>Th/<sup>233</sup>U solution.

<sup>b</sup>Blank corrected values (see Chapter 2 for explanation).

<sup>c</sup>Samples Apuseni Mountains (Table B.1) and SE Carpathians (Table B.3).

<sup>d</sup>Samples transition zone East / SE Carpathians (Table B.6).

**Table B.9:** U-Th)/He Analytical Data VUA-measurements Durango apatite<sup>a</sup>

Sample Code	<sup>4</sup> He <sup>b</sup> (ccSTP)	<sup>4</sup> He blank	<sup>238</sup> U <sup>b</sup> (ng)	<sup>238</sup> U blank	<sup>232</sup> Th <sup>b</sup> (ng)	<sup>232</sup> Th blank	Th/U	Uncorr. age (Ma)	
<b>VUA-measurements 2004<sup>c</sup></b>									
Durango C11	2.44E-09	0%	0.091	2%	2.002	0.1%	22.6	35.6	± 1.8
Durango C12	1.61E-09	1%	0.058	2%	1.335	0.1%	23.8	35.6	± 2.0
Durango C13	1.14E-09	1%	0.044	3%	0.924	0.2%	21.6	35.8	± 2.0
Durango C14	1.70E-09	0%	0.068	2%	1.387	0.1%	20.8	35.2	± 1.8
Durango C15	1.23E-09	0%	0.047	3%	0.981	0.2%	21.5	36.4	± 1.9
<i>Average ± standard deviation</i>								35.7	± 0.4
<b>VUA-measurements 2005<sup>d</sup></b>									
Durango 6	2.99E-09	0%	0.122	1%	2.551	0%	21.5	34.0	± 1.1
<b>VUA-measurements 2008<sup>e</sup></b>									
Durango 1	2.01E-09	2%	0.069	1%	1.753	0%	26.0	34.2	± 1.7
Durango 2	1.80E-09	2%	0.075	1%	1.545	0%	21.2	33.7	± 1.6
Durango 3	2.66E-09	2%	0.100	0%	2.339	0%	24.1	33.6	± 1.6
<i>Average ± standard deviation</i>								33.8	± 0.3
<i>Total average VUA-measurements ± standard deviation</i>								34.9	± 1.1

<sup>a</sup>VUA-measurements following procedures of *Foeken et al.* [2003]. <sup>4</sup>He abundances were calibrated against an internal standard. Following He-extraction, apatites were prepared for U and Th analyses following procedures in *Foeken et al.* [2003] and spiked with a calibrated <sup>229</sup>Th/<sup>233</sup>U solution.

<sup>b</sup>Blank corrected values (see Chapter 2 for explanation).

<sup>c</sup>Samples SE Carpathians (Table B.4) and East Carpathians (Table B.5). Reproducibility of internal <sup>4</sup>He standard is 1.4% (1σ, n = 18, November 2004).

<sup>d</sup>Samples South Carpathians (Table B.7). Reproducibility of internal <sup>4</sup>He standard is 1.1% (1σ, n = 16, May-June 2005).

<sup>e</sup>Samples Apuseni Mountains (Table B.2). Reproducibility of internal <sup>4</sup>He standard is 0.6% (1σ, n = 12, March 2008).



Southward view from Cindrel's Peak (2244 m). The South Carpathians represent one of the highest elevated areas of the Romanian Carpathians, but record some of the oldest AFT and AHe ages (latest Cretaceous - Paleogene).

Fieldwork 2005, South Carpathians.