|  |
| --- |
| Table S1. U-Pb data and trace element compositions of zircons from Merrimac and nearby plutons. 206Pb/238U dates include correction for common Pb using a 207Pb correction (Ludwig, 2003) and values from the Stacey and Kramers (1975) crustal Pb evolution model. Struck-through data have been excluded from calculated mean dates. Trace element concentrations are calibrated to the MAD559 zircon standard (Coble et al., 2018). Concentrations are in ppm. Ti-in-zircon temperatures are derived assuming SiO2 activity = 1.0 and TiO2 activity of 0.7 (see text for details). Decay constant used: λ238U=1.55125 X 10-10 yr-1 (Steiger and Jäger, 1977). |
| **Sample/Grain/Spot** | **207Pb/206Pb** | **±1σ (%)** | **208Pb/206Pb** | **±1σ (%)** | **206Pb/238U** | **±1σ (%)** | **208Pb/232Th** | **±1σ (%)** | **206Pb/238U****date (Ma)** | **±1σ (Ma)** | **U** | **Th** | **Ti** | **Y** |
| Cascade Pluton center |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 011-13.1 | 0.0637 | 9.5 | 0.0640 | 7.4 | 0.0224 | 3.9 | 0.0033 | 8.4 | ~~140~~ | ~~6~~ | 129 | 55 | 2.19 | 177 |
| 011-8.1 | 0.0686 | 4.6 | 0.0954 | 8.0 | 0.0228 | 4.6 | 0.0073 | 9.5 | 142 | 7 | 97 | 28 | 1.87 | 147 |
| 011-9.2 | 0.0736 | 4.3 | 0.0912 | 20.2 | 0.0230 | 1.0 | 0.0053 | 20.2 | ~~142~~ | ~~2~~ | 83 | 32 | 3.53 | 230 |
| 011-15.1 | 0.0613 | 4.0 | 0.0785 | 7.4 | 0.0227 | 5.8 | 0.0056 | 9.4 | 142 | 8 | 125 | 38 | 2.27 | 170 |
| 011-3.1 | 0.0839 | 4.5 | 0.0822 | 8.9 | 0.0236 | 5.0 | 0.0071 | 10.3 | 144 | 7 | 81 | 21 | 2.10 | 186 |
| 011-16.1 | 0.0699 | 3.5 | 0.1078 | 5.9 | 0.0232 | 4.2 | 0.0050 | 8.1 | 144 | 6 | 147 | 71 | 2.81 | 377 |
| 011-9.1 | 0.0572 | 3.0 | 0.1328 | 6.9 | 0.0230 | 4.0 | 0.0053 | 8.0 | 145 | 6 | 234 | 132 | 2.29 | 270 |
| 011-1.2 | 0.0686 | 7.2 | 0.0585 | 8.3 | 0.0235 | 6.7 | 0.0037 | 10.8 | 146 | 10 | 116 | 41 | 2.46 | 285 |
| 011-11.1 | 0.0662 | 3.5 | 0.0631 | 8.3 | 0.0235 | 3.7 | 0.0040 | 9.5 | 146 | 6 | 133 | 47 | 2.28 | 288 |
| 011-14.1 | 0.0576 | 2.8 | 0.0627 | 5.8 | 0.0235 | 5.0 | 0.0035 | 7.7 | 148 | 8 | 222 | 91 | 2.62 | 245 |
| 011-6.1 | 0.0618 | 3.7 | 0.0814 | 13.0 | 0.0237 | 4.1 | 0.0049 | 13.7 | 148 | 6 | 124 | 48 | 2.19 | 166 |
| 011-5.1 | 0.0653 | 2.7 | 0.0700 | 12.3 | 0.0238 | 2.9 | 0.0036 | 12.8 | 149 | 5 | 219 | 98 | 3.54 | 376 |
| 011-21.1 | 0.0613 | 3.3 | 0.0642 | 6.8 | 0.0237 | 3.4 | 0.0035 | 7.7 | 149 | 5 | 167 | 71 | 2.86 | 181 |
| 011-2.1 | 0.0603 | 3.4 | 0.1113 | 5.7 | 0.0239 | 3.9 | 0.0045 | 6.9 | 150 | 6 | 150 | 86 | 4.54 | 585 |
| 11-30.1 | 0.0520 | 3.1 | 0.1413 | 4.0 | 0.0238 | 3.0 | 0.0076 | 5.2 | 151 | 5 | 189 | 81 | 2.66 | 324 |
| 011-19.1 | 0.0609 | 2.7 | 0.0833 | 5.4 | 0.0242 | 4.9 | 0.0045 | 7.6 | 152 | 8 | 204 | 89 | 2.61 | 391 |
| 011-17.1 | 0.0603 | 5.5 | 0.0604 | 11.4 | 0.0243 | 4.3 | 0.0028 | 12.5 | 152 | 7 | 168 | 84 | 2.82 | 341 |
| 011-20.1 | 0.0578 | 7.8 | 0.0401 | 15.7 | 0.0242 | 2.9 | 0.0028 | 16.1 | 153 | 5 | 154 | 51 | 2.21 | 197 |
| 011-26.1 | 0.0719 | 3.6 | 0.1064 | 14.0 | 0.0249 | 5.8 | 0.0080 | 15.1 | 154 | 9 | 116 | 37 | 2.55 | 248 |
| 011-12.1 | 0.0506 | 6.8 | 0.1275 | 13.7 | 0.0243 | 8.0 | 0.0054 | 15.9 | 154 | 12 | 179 | 99 | 2.54 | 456 |
| 011-7.1 | 0.0620 | 3.3 | 0.0822 | 5.9 | 0.0247 | 4.1 | 0.0052 | 7.2 | 155 | 7 | 139 | 53 | 2.36 | 367 |
| 011-1.1 | 0.0693 | 4.0 | 0.0823 | 6.8 | 0.0249 | 3.5 | 0.0054 | 7.7 | 155 | 6 | 150 | 55 | 2.53 | 345 |
| 11-32.1 | 0.0530 | 2.6 | 0.1857 | 6.7 | 0.0245 | 1.1 | 0.0079 | 6.8 | 155 | 2 | 257 | 144 | 3.15 | 669 |
| 011-4.1 | 0.0580 | 6.6 | 0.0319 | 14.8 | 0.0247 | 3.7 | 0.0019 | 15.3 | 155 | 6 | 194 | 77 | 3.59 | 463 |
| 11-26.1 | 0.0505 | 3.2 | 0.1423 | 4.0 | 0.0245 | 1.7 | 0.0078 | 4.4 | 156 | 3 | 171 | 74 | 3.51 | 431 |
| 11-37.1 | 0.0521 | 3.3 | 0.1093 | 4.7 | 0.0246 | 1.2 | 0.0085 | 4.9 | 156 | 2 | 164 | 50 | 2.86 | 445 |
| 11-28.1 | 0.0526 | 4.2 | 0.1292 | 5.7 | 0.0248 | 2.1 | 0.0080 | 6.1 | 157 | 4 | 90 | 35 | 3.74 | 244 |
| 011-18.1 | 0.0560 | 2.7 | 0.1051 | 4.4 | 0.0249 | 3.3 | 0.0042 | 5.6 | 157 | 6 | 241 | 145 | 2.44 | 354 |
| 11-33.1 | 0.0502 | 3.7 | 0.1329 | 4.8 | 0.0249 | 1.7 | 0.0081 | 5.1 | 158 | 3 | 125 | 50 | 2.76 | 262 |
| 11-34.1 | 0.0503 | 2.9 | 0.1503 | 3.6 | 0.0249 | 1.1 | 0.0087 | 3.8 | 159 | 2 | 189 | 79 | 3.33 | 396 |
| 11-27.1 | 0.0528 | 2.8 | 0.2428 | 2.8 | 0.0254 | 1.1 | 0.0087 | 3.0 | 161 | 2 | 205 | 141 | 3.10 | 415 |
| 11-31.1 | 0.0539 | 2.9 | 0.1371 | 6.4 | 0.0255 | 1.2 | 0.0084 | 6.5 | 162 | 2 | 183 | 74 | 3.53 | 593 |
| 11-29.1 | 0.0514 | 3.4 | 0.1334 | 4.4 | 0.0257 | 1.2 | 0.0084 | 4.7 | ~~163~~ | ~~2~~ | 149 | 58 | 3.52 | 441 |
| 11-25.1 | 0.0517 | 4.8 | 0.1645 | 5.9 | 0.0257 | 1.6 | 0.0087 | 6.3 | ~~163~~ | ~~3~~ | 184 | 87 | 3.35 | 529 |
| 11-36.1 | 0.0507 | 3.2 | 0.1172 | 4.4 | 0.0257 | 1.2 | 0.0077 | 4.6 | ~~164~~ | ~~2~~ | 170 | 65 | 1.93 | 295 |
| 11-35.1 | 0.0503 | 2.7 | 0.1984 | 6.8 | 0.0261 | 1.8 | 0.0090 | 7.1 | ~~166~~ | ~~3~~ | 221 | 124 | 3.08 | 491 |
| 11-24.1 | 0.0509 | 3.0 | 0.1623 | 3.6 | 0.0270 | 3.7 | 0.0081 | 5.5 | ~~171~~ | ~~7~~ | 199 | 104 | 4.01 | 764 |

|  |
| --- |
| Cascade Pluton rim |
| 069-2.1 | 0.1075 | 5.0 | 0.0450 | 8.8 | 0.0213 | 4.8 | 0.0042 | 10.0 | ~~126~~ | ~~6~~ | 201 | 44 | 2.69 | 184 |
| 069-1.1 | 0.0852 | 4.6 | 0.0649 | 21.9 | 0.0215 | 3.4 | 0.0082 | 22.2 | ~~131~~ | ~~5~~ | 88 | 15 | 1.35 | 206 |
| 069-4.1 | 0.0936 | 9.1 | 0.0790 | 17.6 | 0.0231 | 1.5 | 0.0076 | 17.7 | ~~139~~ | ~~3~~ | 155 | 36 | 2.15 | 485 |
| 069-10.1 | 0.0857 | 10.5 | 0.0934 | 15.0 | 0.0235 | 2.8 | 0.0090 | 15.3 | 143 | 5 | 178 | 42 | 2.29 | 481 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table S1 cont.**Sample/Grain/Spot** | **207Pb/206Pb** | **±1σ (%)** | **208Pb/206Pb** | **±1σ (%)** | **206Pb/238U** | **±1σ (%)** | **208Pb/232Th** | **±1σ (%)** | **206Pb/238U****date (Ma)** | **±1σ (Ma)** | **U** | **Th** | **Ti** | **Y** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 069-7.1 | 0.1157 | 14.3 | 0.0895 | 8.7 | 0.0250 | 3.6 | 0.0110 | 9.5 | 146 | 6 | 98 | 19 | 2.64 | 335 |
| 069-21.1 | 0.0853 | 5.1 | 0.0733 | 17.6 | 0.0245 | 2.0 | 0.0061 | 17.7 | 149 | 4 | 187 | 53 | 3.90 | 781 |
| 069-16.1 | 0.0787 | 7.3 | 0.0531 | 14.9 | 0.0244 | 1.6 | 0.0057 | 15.1 | 150 | 3 | 210 | 46 | 1.97 | 404 |
| 69-47.1 | 0.0512 | 2.4 | 0.1335 | 3.1 | 0.0237 | 1.3 | 0.0075 | 3.3 | 150 | 2 | 279 | 114 | 3.02 | 560 |
| 069-6.1 | 0.0646 | 3.3 | 0.0663 | 12.1 | 0.0243 | 2.3 | 0.0052 | 12.3 | 152 | 4 | 262 | 78 | 2.47 | 479 |
| 69-44.1 | 0.0516 | 2.6 | 0.0625 | 5.0 | 0.0239 | 1.1 | 0.0078 | 5.2 | 152 | 2 | 255 | 47 | 3.78 | 850 |
| 069-9.2 | 0.0785 | 6.3 | 0.0369 | 15.1 | 0.0248 | 2.2 | 0.0060 | 15.2 | 152 | 4 | 197 | 29 | 1.64 | 389 |
| 069-13.1 | 0.0741 | 2.7 | 0.0609 | 12.1 | 0.0247 | 0.7 | 0.0043 | 12.5 | 152 | 2 | 303 | 103 | 2.00 | 339 |
| 069-40.1 | 0.0830 | 10.2 | 0.0355 | 11.4 | 0.0252 | 1.3 | 0.0053 | 11.5 | 154 | 3 | 130 | 21 | 1.42 | 263 |
| 069-9.1 | 0.1028 | 4.1 | 0.0495 | 27.9 | 0.0260 | 3.8 | 0.0065 | 28.2 | 154 | 6 | 100 | 19 | 2.40 | 281 |
| 69-40.1 | 0.0502 | 2.1 | 0.1252 | 2.8 | 0.0243 | 1.2 | 0.0080 | 3.1 | 155 | 2 | 460 | 170 | 5.34 | 1078 |
| 069-5.1 | 0.0849 | 3.0 | 0.0925 | 15.7 | 0.0255 | 1.9 | 0.0078 | 16.0 | 155 | 4 | 205 | 60 | 2.00 | 233 |
| 069-11.1 | 0.0775 | 7.0 | 0.0485 | 7.7 | 0.0253 | 3.0 | 0.0051 | 8.3 | 155 | 5 | 227 | 53 | 4.08 | 732 |
| 069-20.1 | 0.1331 | 8.0 | 0.1526 | 6.8 | 0.0273 | 2.9 | 0.0202 | 7.5 | 156 | 5 | 80 | 16 | 2.01 | 134 |
| 69-38.1 | 0.0496 | 1.6 | 0.1390 | 2.0 | 0.0246 | 1.1 | 0.0080 | 2.4 | 156 | 2 | 599 | 247 | 3.52 | 882 |
| 69-48.1 | 0.0492 | 2.1 | 0.1058 | 3.0 | 0.0248 | 1.1 | 0.0079 | 3.2 | 158 | 2 | 369 | 119 | 4.99 | 1345 |
| 69-43.1 | 0.0479 | 3.5 | 0.0956 | 5.2 | 0.0248 | 2.1 | 0.0084 | 5.7 | 158 | 4 | 139 | 38 | 2.59 | 264 |
| 69-45.1 | 0.0513 | 3.1 | 0.0657 | 5.9 | 0.0251 | 1.9 | 0.0081 | 6.2 | 159 | 3 | 174 | 34 | 3.17 | 672 |
| 69-39.1 | 0.0480 | 5.2 | 0.1521 | 2.3 | 0.0250 | 1.6 | 0.0081 | 2.8 | 159 | 3 | 474 | 215 | 3.06 | 556 |
| 69-42.1 | 0.0531 | 3.4 | 0.0620 | 6.5 | 0.0254 | 1.6 | 0.0083 | 6.8 | 161 | 3 | 140 | 26 | 2.59 | 544 |
| 069-12.1 | 0.0951 | 10.4 | 0.0994 | 7.8 | 0.0269 | 2.8 | 0.0184 | 8.3 | 162 | 5 | 106 | 15 | 1.35 | 161 |
| 069-34.1 | 0.0668 | 2.7 | 0.0884 | 5.0 | 0.0260 | 0.8 | 0.0078 | 5.1 | ~~162~~ | ~~2~~ | 250 | 71 | 3.12 | 793 |
| 69-50.1 | 0.0510 | 2.6 | 0.1031 | 3.8 | 0.0259 | 1.3 | 0.0080 | 4.1 | ~~165~~ | ~~3~~ | 255 | 83 | 3.26 | 676 |
| 069-19.2 | 0.0771 | 8.1 | 0.0710 | 6.3 | 0.0269 | 3.0 | 0.0093 | 7.2 | ~~165~~ | ~~5~~ | 210 | 42 | 2.82 | 566 |
| 69-49.1 | 0.0490 | 3.3 | 0.0821 | 5.3 | 0.0259 | 1.6 | 0.0092 | 5.5 | ~~165~~ | ~~3~~ | 157 | 35 | 3.95 | 735 |
| 069-19.1 | 0.0683 | 2.4 | 0.0794 | 4.3 | 0.0271 | 3.2 | 0.0041 | 5.3 | ~~168~~ | ~~6~~ | 312 | 159 | 2.41 | 579 |
| 69-46.1 | 0.0457 | 4.0 | 0.0694 | 6.1 | 0.0265 | 1.9 | 0.0079 | 6.4 | ~~169~~ | ~~4~~ | 138 | 31 | 2.37 | 405 |
| 69-41.1 | 0.0511 | 2.8 | 0.1165 | 3.9 | 0.0276 | 3.2 | 0.0095 | 5.1 | ~~175~~ | ~~6~~ | 198 | 65 | 2.40 | 350 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bucks Lake pluton center |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 076-8.1 | 0.2415 | 4.9 | 0.2898 | 14.4 | 0.0233 | 14.2 | 0.0155 | 20.3 | ~~113~~ | ~~16~~ | 31 | 13 | 8.37 | 290 |
| 076-3.1 | 0.1516 | 7.9 | 0.2047 | 8.3 | 0.0229 | 3.9 | 0.0097 | 9.2 | 127 | 6 | 41 | 19 | 8.49 | 226 |
| 076-1.1 | 0.1518 | 4.6 | 0.3613 | 5.9 | 0.0235 | 3.6 | 0.0126 | 7.3 | 130 | 5 | 45 | 29 | 8.08 | 547 |
| 076-21.1 | 0.1445 | 14.2 | 0.1670 | 9.1 | 0.0234 | 3.0 | 0.0053 | 9.6 | 131 | 6 | 46 | 33 | 7.98 | 577 |
| 076-4.1 | 0.1552 | 5.3 | 0.2351 | 9.2 | 0.0238 | 1.6 | 0.0112 | 9.4 | 131 | 3 | 32 | 15 | 7.61 | 258 |
| 076-10.1 | 0.2045 | 14.3 | 0.2673 | 16.8 | 0.0256 | 2.9 | 0.0143 | 17.1 | 131 | 7 | 36 | 17 | 10.30 | 358 |
| 076-9.1 | 0.2017 | 4.3 | 0.2330 | 20.7 | 0.0260 | 5.7 | 0.0111 | 21.5 | 134 | 8 | 29 | 16 | 8.10 | 297 |
| 076-22.1 | 0.1722 | 8.0 | 0.1379 | 10.3 | 0.0250 | 5.8 | 0.0067 | 11.8 | 135 | 8 | 37 | 19 | 8.68 | 245 |
| 076-2.1 | 0.1831 | 4.8 | 0.3182 | 17.7 | 0.0255 | 4.4 | 0.0156 | 18.3 | 135 | 6 | 31 | 16 | 8.62 | 311 |
| 076-30.2 | 0.2101 | 10.9 | 0.1539 | 8.7 | 0.0269 | 5.3 | 0.0055 | 10.2 | 137 | 9 | 41 | 29 | 9.41 | 569 |
| 076-30.1 | 0.1433 | 9.1 | 0.1373 | 10.3 | 0.0244 | 3.9 | 0.0074 | 11.1 | 137 | 6 | 38 | 17 | 6.80 | 229 |
| 076-7.1 | 0.1789 | 4.5 | 0.2642 | 7.4 | 0.0258 | 6.7 | 0.0120 | 10.2 | 138 | 9 | 40 | 22 | 10.89 | 301 |
| 076-12.1 | 0.1740 | 4.9 | 0.2600 | 7.2 | 0.0257 | 3.3 | 0.0118 | 8.2 | 138 | 5 | 37 | 20 | 9.63 | 333 |
| 076-16.1 | 0.1779 | 12.7 | 0.1944 | 19.9 | 0.0260 | 4.0 | 0.0111 | 20.3 | 139 | 7 | 36 | 16 | 8.81 | 232 |
| 076-14.1 | 0.1736 | 4.1 | 0.1261 | 10.7 | 0.0259 | 4.7 | 0.0048 | 11.9 | 139 | 7 | 43 | 29 | 9.47 | 544 |
| 076-13.1 | 0.1638 | 8.1 | 0.1473 | 19.1 | 0.0256 | 1.4 | 0.0084 | 19.2 | 140 | 4 | 41 | 18 | 8.25 | 216 |
| 076-17.1 | 0.1807 | 11.7 | 0.1925 | 8.2 | 0.0265 | 1.2 | 0.0086 | 8.3 | 141 | 5 | 39 | 22 | 8.77 | 438 |
| 76-29.2 | 0.0561 | 7.9 | 0.1486 | 10.0 | 0.0225 | 1.7 | 0.0062 | 10.1 | 142 | 3 | 29 | 15 | 8.68 | 373 |
| 076-5.1 | 0.1709 | 4.4 | 0.1904 | 8.9 | 0.0268 | 5.3 | 0.0109 | 10.5 | 145 | 8 | 34 | 15 | 8.40 | 210 |
| 76-34.1 | 0.0563 | 6.6 | 0.1534 | 8.5 | 0.0233 | 3.1 | 0.0076 | 9.1 | 147 | 5 | 36 | 16 | 9.15 | 297 |
| 076-29.1 | 0.1317 | 5.0 | 0.1708 | 8.9 | 0.0259 | 1.4 | 0.0095 | 9.0 | 148 | 3 | 38 | 17 | 7.72 | 216 |
| 76-33.1 | 0.0527 | 7.0 | 0.1838 | 8.0 | 0.0234 | 1.6 | 0.0084 | 8.2 | ~~149~~ | ~~3~~ | 34 | 17 | 9.67 | 350 |
| 76-31.1 | 0.0582 | 6.6 | 0.1624 | 8.4 | 0.0237 | 1.6 | 0.0087 | 8.6 | ~~149~~ | ~~3~~ | 33 | 14 | 8.10 | 300 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table S1 cont.**Sample/Grain/Spot** | **207Pb/206Pb** | **±1σ (%)** | **208Pb/206Pb** | **±1σ (%)** | **206Pb/238U** | **±1σ (%)** | **208Pb/232Th** | **±1σ (%)** | **206Pb/238U****date (Ma)** | **±1σ (Ma)** | **U** | **Th** | **Ti** | **Y** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 76-30.1 | 0.0535 | 7.0 | 0.1503 | 9.0 | 0.0238 | 2.3 | 0.0068 | 9.3 | ~~151~~ | ~~4~~ | 35 | 18 | 8.91 | 392 |
| 76-32.1 | 0.0593 | 6.9 | 0.1651 | 8.7 | 0.0249 | 2.7 | 0.0081 | 9.1 | ~~156~~ | ~~4~~ | 31 | 15 | 9.94 | 382 |

|  |
| --- |
| Buck Lakes pluton rim |
| 109-35.1 | 0.0628 | 3.6 | 0.1015 | 5.5 | 0.0202 | 7.6 | 0.0026 | 9.6 | 127 | 10 | 134 | 102 | 10.6 | 964 |
| 109-37.1 | 0.0775 | 4.6 | 0.1524 | 6.9 | 0.0209 | 6.8 | 0.0048 | 9.7 | 128 | 9 | 74 | 47 | 9.1 | 518 |
| 109-1.1 | 0.1630 | 9.0 | 0.2348 | 16.4 | 0.0234 | 6.9 | 0.0087 | 17.8 | 128 | 9 | 53 | 32 | 9.4 | 429 |
| 109-12.1 | 0.0660 | 4.2 | 0.0573 | 24.1 | 0.0209 | 4.2 | 0.0028 | 24.6 | 131 | 6 | 106 | 44 | 11.3 | 575 |
| 109-40.1 | 0.0873 | 5.4 | 0.1046 | 10.3 | 0.0216 | 7.2 | 0.0053 | 12.7 | 131 | 9 | 43 | 18 | 10.3 | 255 |
| 109-27.1 | 0.0899 | 8.3 | 0.1284 | 8.8 | 0.0222 | 5.1 | 0.0047 | 10.2 | 135 | 7 | 48 | 29 | 7.7 | 323 |
| 109-14.1 | 0.0857 | 5.8 | 0.1966 | 8.0 | 0.0223 | 7.2 | 0.0104 | 10.8 | 136 | 10 | 39 | 16 | 7.1 | 145 |
| 109-11.1 | 0.0849 | 5.5 | 0.0607 | 13.6 | 0.0224 | 4.6 | 0.0022 | 14.5 | 137 | 6 | 40 | 24 | 9.1 | 326 |
| 109-33.1 | 0.0755 | 9.7 | 0.0829 | 10.9 | 0.0225 | 4.0 | 0.0044 | 11.7 | 139 | 6 | 45 | 19 | 6.4 | 177 |
| 109-2.1 | 0.1610 | 9.6 | 0.1973 | 9.2 | 0.0255 | 1.4 | 0.0130 | 9.5 | 139 | 4 | 30 | 11 | 7.5 | 184 |
| 109-4.1 | 0.1028 | 12.7 | 0.1294 | 19.3 | 0.0238 | 6.1 | 0.0071 | 20.3 | 141 | 9 | 32 | 13 | 7.4 | 173 |
| 109-30.1 | 0.0822 | 4.9 | 0.1263 | 14.5 | 0.0232 | 5.6 | 0.0057 | 15.5 | 142 | 8 | 55 | 27 | 7.6 | 127 |
| 109-9.1 | 0.0837 | 7.8 | 0.0508 | 13.1 | 0.0233 | 3.8 | 0.0020 | 13.7 | 142 | 6 | 57 | 33 | 7.3 | 361 |
| 109-16.1 | 0.0990 | 5.0 | 0.1200 | 9.7 | 0.0239 | 3.1 | 0.0064 | 10.2 | 142 | 5 | 38 | 16 | 7.0 | 181 |
| 109-7.1 | 0.0739 | 5.1 | 0.1287 | 7.5 | 0.0232 | 7.0 | 0.0050 | 10.4 | 143 | 10 | 61 | 35 | 7.9 | 399 |
| 109-18.1 | 0.0654 | 3.9 | 0.1593 | 13.4 | 0.0231 | 4.5 | 0.0049 | 14.1 | 144 | 7 | 110 | 80 | 10.8 | 787 |
| 109-8.1 | 0.1375 | 5.5 | 0.1582 | 10.4 | 0.0255 | 6.9 | 0.0115 | 12.6 | 145 | 10 | 26 | 9 | 6.2 | 84 |
| 109-23.1 | 0.1082 | 16.9 | 0.1297 | 10.7 | 0.0246 | 5.2 | 0.0076 | 13.0 | 145 | 8 | 27 | 11 | 7.3 | 175 |
| 109-26.1 | 0.1114 | 4.5 | 0.1543 | 8.1 | 0.0252 | 5.2 | 0.0092 | 9.6 | 148 | 8 | 43 | 18 | 6.2 | 155 |
| 109-17.1 | 0.0625 | 6.0 | 0.1182 | 13.5 | 0.0240 | 3.6 | 0.0036 | 14.0 | 151 | 5 | 168 | 129 | 13.5 | 936 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Northern Merrimac |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 060-12.1 | 0.0514 | 6.8 | 0.1154 | 9.8 | 0.0202 | 5.9 | 0.0062 | 11.5 | 129 | 8 | 47 | 17.0 | 9.9 | 425 |
| 060-1.1 | 0.0457 | 6.8 | 0.1453 | 8.1 | 0.0204 | 4.6 | 0.0073 | 9.3 | 131 | 6 | 57 | 22.4 | 8.6 | 449 |
| 060-3.1 | 0.0453 | 12.2 | 0.1229 | 6.9 | 0.0208 | 4.5 | 0.0058 | 9.1 | 133 | 6 | 85 | 35.9 | 6.7 | 362 |
| 060-5.1 | 0.0554 | 4.1 | 0.1683 | 5.0 | 0.0212 | 5.5 | 0.0080 | 7.7 | 134 | 7 | 139 | 59.9 | 4.3 | 298 |
| 060-4.1 | 0.0481 | 4.9 | 0.1327 | 6.4 | 0.0219 | 4.7 | 0.0072 | 7.9 | 140 | 7 | 80 | 31.3 | 4.7 | 265 |
| 060-15.1 | 0.0450 | 5.9 | 0.1067 | 8.2 | 0.0230 | 4.5 | 0.0074 | 9.4 | 147 | 7 | 113 | 36.3 | 5.1 | 268 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 060-27.1 | 0.0442 | 6.7 | 0.1373 | 15.2 | 0.0209 | 2.9 | 0.0056 | 15.4 | 134 | 4 | 100 | 50.0 | 5.1 | 438 |
| 060-26.1 | 0.0604 | 9.3 | 0.0878 | 15.5 | 0.0214 | 2.2 | 0.0046 | 15.7 | 134 | 3 | 48 | 19.0 | 6.9 | 357 |
| 060-22.1 | 0.0350 | 13.5 | 0.0942 | 16.1 | 0.0208 | 2.3 | 0.0044 | 16.3 | 135 | 3 | 37 | 16.1 | 8.2 | 389 |
| 060-23.1 | 0.0517 | 9.4 | 0.1075 | 13.9 | 0.0216 | 2.2 | 0.0052 | 14.1 | 138 | 3 | 46 | 20.0 | 8.9 | 452 |
| 060-7.1 | 0.0447 | 17.2 | 0.1300 | 12.1 | 0.0215 | 4.9 | 0.0068 | 13.1 | 138 | 7 | 57 | 22.5 | 6.0 | 210 |
| 060-21.1 | 0.0375 | 21.3 | 0.1687 | 11.4 | 0.0215 | 2.2 | 0.0070 | 11.7 | 139 | 3 | 53 | 26.4 | 8.9 | 434 |
| 060-6.1 | 0.0447 | 10.1 | 0.1434 | 11.8 | 0.0219 | 3.7 | 0.0074 | 12.4 | 140 | 5 | 45 | 18.4 | 7.5 | 342 |
| 060-25.1 | 0.0419 | 8.1 | 0.0970 | 11.0 | 0.0228 | 3.1 | 0.0062 | 11.6 | 146 | 5 | 72 | 25.0 | 4.5 | 143 |
| 060-24.1 | 0.0368 | 10.3 | 0.1208 | 11.6 | 0.0233 | 3.9 | 0.0065 | 12.2 | 151 | 6 | 53 | 21.9 | 8.5 | 329 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 060.30-1 | 0.0379 | 9.3 | 0.1290 | 10.3 | 0.0201 | 2.6 | 0.0061 | 10.7 | ~~131~~ | ~~2~~ | 47 | 19 | 8.7 | 440 |
| 060.34-1 | 0.0472 | 7.9 | 0.0775 | 12.8 | 0.0209 | 4.0 | 0.0038 | 13.9 | 135 | 5 | 53 | 22 | 6.4 | 275 |
| 060.16-2 | 0.0441 | 7.1 | 0.1116 | 9.1 | 0.0214 | 3.6 | 0.0043 | 10.2 | 138 | 2 | 70 | 37 | 8.3 | 527 |
| 060.32-1 | 0.0416 | 11.8 | 0.0807 | 12.3 | 0.0213 | 2.4 | 0.0043 | 12.5 | 140 | 2 | 59 | 23 | 7.8 | 439 |
| 060.14-2 | 0.0484 | 7.7 | 0.1126 | 10.6 | 0.0215 | 2.7 | 0.0056 | 10.9 | 141 | 2 | 54 | 22 | 7.5 | 440 |
| 060-10.2 | 0.0489 | 7.1 | 0.1125 | 9.7 | 0.0215 | 2.5 | 0.0051 | 10.0 | 142 | 2 | 59 | 27 | 9.0 | 535 |
| 060.29-1 | 0.0466 | 7.3 | 0.0938 | 11.6 | 0.0215 | 2.5 | 0.0048 | 11.9 | 144 | 2 | 50 | 20 | 5.3 | 110 |
| 060.15-2 | 0.0474 | 12.4 | 0.1055 | 12.0 | 0.0217 | 4.0 | 0.0052 | 12.6 | 144 | 6 | 58 | 25 | 7.3 | 271 |
| 060.17-2 | 0.0494 | 7.8 | 0.1079 | 18.5 | 0.0218 | 4.1 | 0.0057 | 19.0 | 145 | 4 | 47 | 19 | 8.3 | 512 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table S1 cont.**Sample/Grain/Spot** | **207Pb/206Pb** | **±1σ (%)** | **208Pb/206Pb** | **±1σ (%)** | **206Pb/238U** | **±1σ (%)** | **208Pb/232Th** | **±1σ (%)** | **206Pb/238U****date (Ma)** | **±1σ (Ma)** | **U** | **Th** | **Ti** | **Y** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 060.31-1 | 0.0444 | 9.7 | 0.0955 | 13.9 | 0.0223 | 2.8 | 0.0075 | 14.2 | 146 | 6 | 33 | 9 | 8.2 | 400 |
| 060.33-1 | 0.0396 | 15.9 | 0.0779 | 13.8 | 0.0227 | 3.1 | 0.0042 | 14.1 | 147 | 3 | 58 | 23 | 7.6 | 368 |
| 060-9.2 | 0.0466 | 8.1 | 0.0958 | 11.8 | 0.0232 | 5.0 | 0.0069 | 12.9 | 148 | 8 | 47 | 15 | 5.6 | 204 |
| 060-11.2 | 0.0466 | 9.4 | 0.0910 | 14.2 | 0.0235 | 9.0 | 0.0047 | 16.9 | 153 | 9 | 48 | 21 | 8.7 | 595 |
| 060.35-1 | 0.0351 | 14.8 | 0.1292 | 9.8 | 0.0250 | 2.5 | 0.0060 | 11.2 | ~~158~~ | ~~3~~ | 56 | 29 | 7.8 | 310 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Southern Merrimac |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 135-7.1 | 0.0493 | 4.7 | 0.1743 | 5.1 | 0.0193 | 4.7 | 0.0068 | 7.1 | 123 | 6 | 98 | 47.1 | 5.8 | 315 |
| 135-4.1 | 0.0508 | 4.5 | 0.1586 | 13.0 | 0.0197 | 6.3 | 0.0060 | 14.7 | 125 | 8 | 96 | 48.7 | 6.7 | 466 |
| 135-5.1 | 0.0499 | 8.8 | 0.1788 | 5.7 | 0.0197 | 5.7 | 0.0076 | 11.3 | 126 | 7 | 80 | 36.2 | 6.4 | 362 |
| 135-1.1 | 0.0483 | 3.3 | 0.0830 | 5.3 | 0.0201 | 4.7 | 0.0060 | 7.1 | 128 | 6 | 171 | 46.0 | 2.7 | 203 |
| 135-2.1 | 0.0487 | 4.5 | 0.1646 | 5.2 | 0.0205 | 4.5 | 0.0065 | 7.0 | 131 | 6 | 89 | 44.7 | 5.6 | 339 |
| 135-13.1 | 0.0464 | 9.1 | 0.1328 | 6.0 | 0.0205 | 4.5 | 0.0062 | 7.9 | 131 | 6 | 99 | 42.1 | 4.9 | 274 |
| 135-6.1 | 0.0449 | 4.6 | 0.1213 | 5.9 | 0.0204 | 4.5 | 0.0072 | 7.4 | 131 | 6 | 98 | 32.4 | 4.5 | 232 |
| 135-10.1 | 0.0466 | 5.1 | 0.1375 | 6.3 | 0.0205 | 4.5 | 0.0065 | 8.0 | 131 | 6 | 77 | 32.4 | 5.9 | 283 |
| 135-3.1 | 0.0481 | 8.4 | 0.1553 | 7.3 | 0.0208 | 4.9 | 0.0070 | 8.8 | 133 | 6 | 147 | 65.9 | 4.2 | 389 |
| 135-9.1 | 0.0419 | 7.5 | 0.0963 | 10.6 | 0.0207 | 4.5 | 0.0058 | 11.5 | 133 | 6 | 49 | 16.3 | 6.4 | 265 |
| 135-14.1 | 0.0423 | 5.0 | 0.1246 | 6.2 | 0.0209 | 5.3 | 0.0073 | 8.1 | 134 | 7 | 129 | 44.6 | 4.8 | 175 |
| 135-11.1 | 0.0431 | 8.3 | 0.1283 | 6.2 | 0.0215 | 5.2 | 0.0060 | 8.1 | 138 | 7 | 78 | 34.5 | 6.9 | 452 |
| 135-8.1 | 0.0441 | 5.4 | 0.0866 | 8.1 | 0.0219 | 7.3 | 0.0069 | 12.5 | 140 | 10 | 72 | 19.2 | 4.0 | 135 |
| 135-12.1 | 0.0518 | 5.3 | 0.1838 | 6.1 | 0.0234 | 8.6 | 0.0076 | 11.1 | 149 | 13 | 78 | 42.8 | 8.5 | 651 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 135.27-1 | 0.0485 | 6.8 | 0.0950 | 17.8 | 0.0210 | 3.4 | 0.0050 | 18.2 | 134 | 4 | 62 | 24 | 9.3 | 498 |
| 135.28-1 | 0.0533 | 4.7 | 0.0681 | 9.0 | 0.0216 | 2.5 | 0.0049 | 9.4 | 137 | 3 | 115 | 34 | 4.0 | 217 |
| 135.29-1 | 0.0476 | 4.8 | 0.0686 | 8.6 | 0.0212 | 3.7 | 0.0048 | 9.4 | 135 | 5 | 130 | 38 | 3.1 | 189 |
| 135.30-1 | 0.0432 | 9.7 | 0.1384 | 5.8 | 0.0213 | 0.9 | 0.0055 | 5.9 | 137 | 1 | 136 | 71 | 5.3 | 472 |
| 135.31-1 | 0.0486 | 4.9 | 0.1185 | 6.7 | 0.0219 | 2.7 | 0.0045 | 7.2 | 140 | 4 | 117 | 65 | 7.0 | 656 |
| 135.32-1 | 0.0433 | 7.2 | 0.0904 | 10.9 | 0.0206 | 1.2 | 0.0061 | 11.1 | 132 | 2 | 64 | 19 | 4.8 | 151 |
| 135.33-1 | 0.0471 | 5.8 | 0.1284 | 7.2 | 0.0209 | 3.4 | 0.0054 | 8.0 | 133 | 5 | 85 | 41 | 6.9 | 580 |
| 135.34-1 | 0.0500 | 5.7 | 0.1508 | 7.3 | 0.0213 | 4.2 | 0.0061 | 8.4 | 136 | 6 | 83 | 43 | 6.1 | 569 |
| 135-24.1 | 0.0405 | 20.3 | 0.1029 | 13.1 | 0.0196 | 6.5 | 0.0048 | 14.6 | 127 | 8 | 51 | 20.9 | 8.1 | 442 |
| 135-20.1 | 0.0549 | 15.1 | 0.0779 | 11.9 | 0.0200 | 2.1 | 0.0047 | 12.1 | 127 | 3 | 85 | 27.1 | 4.0 | 179 |
| 135-19.1 | 0.0418 | 20.3 | 0.1102 | 14.8 | 0.0202 | 2.2 | 0.0054 | 15.0 | 130 | 3 | 51 | 20.1 | 7.7 | 386 |
| 135-22.1 | 0.0530 | 6.3 | 0.1688 | 7.3 | 0.0208 | 2.8 | 0.0061 | 7.9 | 132 | 4 | 97 | 54.2 | 7.3 | 637 |
| 135-21.1 | 0.0403 | 9.8 | 0.1320 | 11.5 | 0.0209 | 2.1 | 0.0073 | 11.7 | 135 | 3 | 52 | 18.9 | 7.4 | 398 |
| 135-25.1 | 0.0379 | 12.9 | 0.1482 | 9.0 | 0.0213 | 1.9 | 0.0066 | 9.2 | 137 | 3 | 90 | 41.9 | 5.7 | 422 |
| 135-23.1 | 0.0438 | 7.0 | 0.1052 | 9.3 | 0.0222 | 4.4 | 0.0070 | 10.3 | 142 | 6 | 92 | 29.7 | 4.9 | 237 |

|  |
| --- |
| Bald Rock 1 km from edge |
| FF1-2.1 | 0.0506 | 3.2 | 0.0765 | 12.9 | 0.0205 | 3.6 | 0.0066 | 13.5 | 131 | 5 | 102 | 23 | 2.2 | 121 |
| FF1-3.1 | 0.0490 | 4.3 | 0.1753 | 9.4 | 0.0206 | 2.2 | 0.0065 | 9.7 | ~~131~~ | ~~3~~ | 58 | 31 | 4.3 | 338 |
| FF1-19.1 | 0.0479 | 4.7 | 0.1527 | 5.6 | 0.0212 | 4.7 | 0.0071 | 7.4 | 136 | 6 | 45 | 20 | 4.7 | 341 |
| FF1-4.1 | 0.0503 | 2.8 | 0.0763 | 4.9 | 0.0216 | 3.6 | 0.0077 | 6.1 | 137 | 5 | 115 | 24 | 2.1 | 120 |
| FF1-5.1 | 0.0496 | 4.1 | 0.1164 | 5.6 | 0.0218 | 2.7 | 0.0079 | 6.4 | 139 | 4 | 60 | 19 | 2.7 | 152 |
| FF1-15.1 | 0.0498 | 7.8 | 0.0892 | 6.3 | 0.0219 | 2.6 | 0.0061 | 6.8 | 139 | 4 | 57 | 18 | 3.3 | 137 |
| FF1-17.1 | 0.0504 | 6.1 | 0.0718 | 4.8 | 0.0219 | 3.1 | 0.0068 | 5.7 | 139 | 4 | 124 | 28 | 1.6 | 122 |
| FF1-1.1 | 0.0512 | 4.2 | 0.1032 | 11.5 | 0.0219 | 3.3 | 0.0076 | 12.0 | 139 | 5 | 60 | 17 | 3.5 | 154 |
| FF1-27.1 | 0.0440 | 6.5 | 0.0730 | 10.7 | 0.0218 | 2.5 | 0.0055 | 11.1 | 140 | 4 | 69 | 19 | 4.2 | 150 |
| FF1-21.1 | 0.0511 | 6.4 | 0.0866 | 10.3 | 0.0220 | 1.6 | 0.0064 | 10.5 | 140 | 2 | 57 | 16 | 3.7 | 234 |
| FF1-25.1 | 0.0481 | 7.0 | 0.1507 | 4.9 | 0.0221 | 1.3 | 0.0067 | 5.4 | 141 | 2 | 61 | 29 | 3.5 | 271 |
| FF1-22.1 | 0.0493 | 3.1 | 0.0954 | 4.7 | 0.0222 | 3.6 | 0.0076 | 5.9 | 141 | 5 | 92 | 25 | 2.8 | 142 |
| FF1-20.1 | 0.0528 | 5.7 | 0.1303 | 7.7 | 0.0223 | 2.3 | 0.0077 | 8.0 | 141 | 3 | 71 | 26 | 4.9 | 269 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table S1 cont.**Sample/Grain/Spot** | **207Pb/206Pb** | **±1σ (%)** | **208Pb/206Pb** | **±1σ (%)** | **206Pb/238U** | **±1σ (%)** | **208Pb/232Th** | **±1σ (%)** | **206Pb/238U****date (Ma)** | **±1σ (Ma)** | **U** | **Th** | **Ti** | **Y** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| FF1-16.1 | 0.0510 | 4.2 | 0.0954 | 6.5 | 0.0223 | 2.9 | 0.0085 | 7.2 | 142 | 4 | 52 | 13 | 2.4 | 104 |
| FF1-14.1 | 0.0495 | 4.7 | 0.1251 | 6.2 | 0.0224 | 3.3 | 0.0068 | 7.0 | 143 | 5 | 41 | 16 | 3.6 | 174 |
| FF1-11.1 | 0.0490 | 4.4 | 0.1342 | 5.6 | 0.0226 | 3.5 | 0.0080 | 6.7 | 144 | 5 | 47 | 17 | 3.7 | 190 |
| FF1-26.1 | 0.0429 | 5.4 | 0.0930 | 7.9 | 0.0226 | 2.7 | 0.0075 | 8.4 | 145 | 4 | 102 | 28 | 3.3 | 178 |
| FF1-8.1 | 0.0469 | 4.9 | 0.1122 | 6.7 | 0.0229 | 3.6 | 0.0068 | 7.7 | 146 | 5 | 40 | 15 | 4.1 | 163 |
| FF1-24.1 | 0.0532 | 5.6 | 0.1019 | 9.0 | 0.0234 | 1.5 | 0.0076 | 9.2 | 148 | 2 | 32 | 10 | 3.6 | 166 |
| FF1-10.1 | 0.0510 | 4.2 | 0.0901 | 6.6 | 0.0234 | 2.9 | 0.0068 | 7.2 | 149 | 4 | 48 | 14 | 3.2 | 187 |
| FF1-18.1 | 0.0484 | 10.4 | 0.1150 | 13.3 | 0.0235 | 3.3 | 0.0073 | 13.8 | 150 | 5 | 49 | 17 | 3.9 | 167 |
| FF1-9.1 | 0.0454 | 4.1 | 0.1172 | 5.5 | 0.0237 | 3.8 | 0.0072 | 6.7 | 152 | 6 | 56 | 21 | 3.0 | 188 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bald Rock center |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| BBR-22.1 | 0.5242 | 95.6 | 0.550 | 91.5 | 1.0000 | 61.6 | 0.5076 | 98.5 |  |  | 7092 | 5095 | 4444.3 | 763 |
| BBR-3.2 | 0.0437 | 8.3 | 0.116 | 10.5 | 0.0281 | 6.6 | 0.0119 | 11.1 | ~~114~~ | ~~3~~ | 110 | 41 | 5.4 | 423 |
| BBR-19.1 | 0.0781 | 2.1 | 0.116 | 3.6 | 0.0357 | 5.4 | 0.0257 | 2.1 | ~~115~~ | ~~4~~ | 1593 | 370 | 55.3 | 1869 |
| BBR-5.1 | 0.0491 | 3.2 | 0.089 | 5.1 | 0.0379 | 0.8 | 0.0157 | 5.2 | ~~120~~ | ~~3~~ | 343 | 104 | 5.1 | 3006 |
| BBR-1.1 | 0.0484 | 3.2 | 0.042 | 7.2 | 0.0373 | 2.9 | 0.0146 | 7.2 | ~~121~~ | ~~3~~ | 304 | 48 | 3.7 | 1864 |
| BBR-1.2 | 0.0450 | 6.8 | 0.107 | 9.3 | 0.0356 | 4.3 | 0.0158 | 9.3 | 121 | 5 | 108 | 36 | 7.1 | 412 |
| BBR-26.1 | 0.0471 | 2.5 | 0.167 | 2.9 | 0.0370 | 3.8 | 0.0173 | 2.9 | ~~124~~ | ~~3~~ | 501 | 256 | 4.2 | 2852 |
| BBR-3.1 | 0.0500 | 2.0 | 0.099 | 3.0 | 0.0406 | 2.0 | 0.0180 | 3.1 | 126 | 3 | 726 | 221 | 8.7 | 4503 |
| BBR-2.1 | 0.0492 | 3.7 | 0.073 | 6.6 | 0.0415 | 2.3 | 0.0172 | 6.7 | 129 | 3 | 218 | 55 | 4.2 | 246 |
| BBR-14.1 | 0.0486 | 3.9 | 0.106 | 5.4 | 0.0394 | 3.5 | 0.0171 | 8.9 | 131 | 4 | 297 | 100 | 3.1 | 2347 |
| BBR-12.1 | 0.0495 | 5.7 | 0.160 | 6.9 | 0.0414 | 2.8 | 0.0168 | 6.9 | 131 | 3 | 161 | 93 | 50.3 | 4106 |
| BBR-14.2 | 0.0471 | 4.4 | 0.085 | 6.9 | 0.0437 | 1.0 | 0.0224 | 7.1 | 132 | 3 | 154 | 35 | 2.2 | 1060 |
| BBR-20.1 | 0.0481 | 5.6 | 0.172 | 6.3 | 0.0426 | 1.4 | 0.0191 | 6.4 | 132 | 3 | 122 | 65 | 14.9 | 977 |
| BBR-11.1 | 0.0472 | 2.7 | 0.058 | 8.7 | 0.0420 | 1.7 | 0.0191 | 9.6 | 133 | 3 | 531 | 91 | 8.3 | 1617 |
| BBR-9.1 | 0.0487 | 3.2 | 0.119 | 4.3 | 0.0402 | 1.9 | 0.0182 | 4.4 | 133 | 3 | 290 | 108 | 3.5 | 473 |
| BBR-23.2 | 0.0473 | 2.0 | 0.081 | 5.4 | 0.0470 | 0.5 | 0.0209 | 3.4 | 134 | 3 | 687 | 171 | 3.7 | 5797 |
| BBR-13.1 | 0.0525 | 6.5 | 0.148 | 8.1 | 0.0426 | 1.6 | 0.0212 | 8.3 | 134 | 4 | 95 | 39 | 16.0 | 1181 |
| BBR-23.1 | 0.0442 | 7.4 | 0.094 | 10.6 | 0.0401 | 1.7 | 0.0192 | 11.3 | 134 | 5 | 87 | 25 | 3.2 | 895 |
| BBR-21.1 | 0.0414 | 5.6 | 0.162 | 6.1 | 0.0423 | 1.3 | 0.0194 | 6.1 | 135 | 4 | 135 | 69 | 8.7 | 463 |
| BBR-10.1 | 0.0491 | 4.1 | 0.063 | 7.5 | 0.0424 | 1.0 | 0.0177 | 7.7 | 135 | 3 | 183 | 40 | 4.5 | 239 |
| BBR-6.1 | 0.0457 | 6.5 | 0.151 | 7.7 | 0.0417 | 1.7 | 0.0176 | 7.7 | 135 | 3 | 103 | 51 | 9.2 | 625 |
| BBR-27.1 | 0.0454 | 5.1 | 0.193 | 5.3 | 0.0426 | 1.2 | 0.0200 | 5.3 | 136 | 3 | 149 | 85 | 11.1 | 1184 |
| BBR-25.1 | 0.0470 | 5.6 | 0.100 | 8.0 | 0.0373 | 1.3 | 0.0151 | 8.3 | 137 | 4 | 188 | 68 | 37.4 | 3138 |
| BBR-7.1 | 0.0493 | 4.8 | 0.175 | 5.5 | 0.0414 | 2.7 | 0.0189 | 10.8 | 137 | 3 | 161 | 84 | 7.6 | 754 |
| BBR-15.1 | 0.0506 | 3.8 | 0.096 | 5.3 | 0.0429 | 1.8 | 0.0170 | 5.4 | 137 | 3 | 237 | 84 | 5.1 | 314 |
| BBR-4.1 | 0.0490 | 2.1 | 0.070 | 3.8 | 0.0411 | 1.9 | 0.0180 | 3.9 | 137 | 3 | 598 | 133 | 1.8 | 639 |
| BBR-16.1 | 0.0433 | 6.0 | 0.159 | 6.4 | 0.0419 | 1.4 | 0.0223 | 6.6 | 138 | 3 | 129 | 62 | 10.5 | 743 |
| BBR-8.1 | 0.0545 | 4.5 | 0.214 | 4.9 | 0.0409 | 2.5 | 0.0197 | 5.0 | 138 | 4 | 200 | 126 | 16.7 | 2711 |
| BBR-18.1 | 0.0528 | 4.3 | 0.220 | 4.4 | 0.0410 | 3.6 | 0.0183 | 4.5 | 138 | 3 | 199 | 143 | 9.3 | 1528 |
| BBR-24.1 | 0.0495 | 1.7 | 0.012 | 7.4 | 0.0476 | 0.4 | 0.0185 | 7.6 | ~~144~~ | ~~3~~ | 723 | 33 | 1.9 | 581 |
| BBR-17.1 | 0.0472 | 8.3 | 0.081 | 6.9 | 0.0432 | 1.0 | 0.0215 | 7.0 | ~~150~~ | ~~3~~ | 188 | 43 | 5.0 | 250 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Granite Basin rim |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 103-2.2 | 0.0523 | 5.0 | 0.0714 | 7.8 | 0.0200 | 1.1 | 0.0057 | 7.8 | ~~127~~ | ~~1~~ | 110 | 27 | 3.1 | 319 |
| 103-5.1 | 0.0555 | 3.8 | 0.0861 | 5.5 | 0.0211 | 1.4 | 0.0065 | 5.7 | ~~133~~ | ~~2~~ | 152 | 41 | 4.2 | 410 |
| 103-2.1 | 0.0459 | 3.7 | 0.0934 | 4.2 | 0.0213 | 2.5 | 0.0063 | 4.9 | 136 | 3 | 264 | 81 | 4.4 | 609 |
| 103-3.1 | 0.0486 | 4.7 | 0.0784 | 7.0 | 0.0214 | 2.1 | 0.0060 | 7.3 | 136 | 3 | 109 | 29 | 4.1 | 331 |
| 103-7.1 | 0.0460 | 4.5 | 0.0836 | 11.0 | 0.0216 | 1.8 | 0.0069 | 11.2 | 138 | 2 | 149 | 38 | 2.6 | 350 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table S1 cont.**Sample/Grain/Spot** | **207Pb/206Pb** | **±1σ (%)** | **208Pb/206Pb** | **±1σ (%)** | **206Pb/238U** | **±1σ (%)** | **208Pb/232Th** | **±1σ (%)** | **206Pb/238U****date (Ma)** | **±1σ (Ma)** | **U** | **Th** | **Ti** | **Y** |

 Granite Basin rim cont.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 103-4.1 | 0.0506 | 3.1 | 0.0915 | 4.2 | 0.0218 | 2.6 | 0.0074 | 5.0 | 139 | 4 | 267 | 70 | 3.7 | 542 |
| 103-19.2 | 0.0508 | 9.6 | 0.0625 | 8.5 | 0.0218 | 2.4 | 0.0073 | 9.2 | 139 | 3 | 91 | 17 | 1.8 | 179 |
| 103-9.1 | 0.0511 | 2.7 | 0.0685 | 4.2 | 0.0219 | 2.2 | 0.0072 | 4.8 | 139 | 3 | 327 | 66 | 1.7 | 606 |
| 103-6.2 | 0.0418 | 9.8 | 0.0545 | 10.4 | 0.0217 | 0.9 | 0.0061 | 15.0 | 140 | 1 | 146 | 28 | 3.3 | 303 |
| 103-17.1 | 0.0474 | 4.0 | 0.0815 | 5.4 | 0.0220 | 1.7 | 0.0064 | 5.7 | 140 | 2 | 170 | 46 | 3.0 | 407 |
| 103-11.1 | 0.0497 | 5.0 | 0.1031 | 3.6 | 0.0220 | 1.1 | 0.0071 | 3.8 | 140 | 2 | 321 | 99 | 5.4 | 927 |
| 103-16.2 | 0.0488 | 4.9 | 0.0737 | 14.5 | 0.0220 | 1.0 | 0.0069 | 14.6 | 141 | 1 | 106 | 24 | 2.9 | 304 |
| 103-10.1 | 0.0477 | 4.1 | 0.0712 | 6.0 | 0.0221 | 0.9 | 0.0060 | 6.1 | 141 | 1 | 150 | 38 | 3.2 | 423 |
| 103-18.1 | 0.0521 | 2.9 | 0.0986 | 3.9 | 0.0222 | 1.4 | 0.0065 | 4.2 | 141 | 2 | 278 | 91 | 5.4 | 690 |
| 103-13.1 | 0.0487 | 4.8 | 0.1032 | 5.2 | 0.0221 | 1.2 | 0.0073 | 5.3 | 141 | 2 | 177 | 54 | 5.4 | 520 |
| 103-9.2 | 0.0514 | 4.8 | 0.0678 | 7.4 | 0.0222 | 2.1 | 0.0061 | 7.9 | 141 | 3 | 115 | 27 | 3.1 | 339 |
| 103-8.2 | 0.0486 | 3.2 | 0.1160 | 6.9 | 0.0224 | 2.1 | 0.0071 | 7.6 | 143 | 3 | 234 | 83 | 4.6 | 604 |
| 103-19.1 | 0.0468 | 4.1 | 0.0872 | 11.3 | 0.0225 | 1.7 | 0.0070 | 11.5 | 144 | 2 | 146 | 39 | 2.8 | 270 |
| 103-14.1 | 0.0472 | 3.5 | 0.1070 | 8.7 | 0.0225 | 1.4 | 0.0067 | 8.8 | 144 | 2 | 296 | 103 | 5.1 | 763 |
| 103-12.1 | 0.0467 | 3.3 | 0.0977 | 4.1 | 0.0225 | 0.7 | 0.0069 | 4.6 | 144 | 1 | 242 | 75 | 3.4 | 563 |
| 103-8.1 | 0.0449 | 3.4 | 0.1044 | 4.1 | 0.0226 | 1.6 | 0.0066 | 4.4 | 145 | 2 | 235 | 81 | 4.1 | 745 |
| 103-17.2 | 0.0477 | 2.8 | 0.1308 | 11.2 | 0.0227 | 2.7 | 0.0081 | 11.6 | 145 | 4 | 352 | 125 | 3.7 | 756 |
| 103-16.1 | 0.0458 | 4.1 | 0.1245 | 3.9 | 0.0227 | 1.3 | 0.0081 | 4.1 | 145 | 2 | 232 | 78 | 3.5 | 377 |
| 103-15.1 | 0.0459 | 2.4 | 0.1279 | 2.6 | 0.0227 | 1.4 | 0.0071 | 3.1 | 145 | 2 | 465 | 183 | 4.6 | 1115 |
| 103-6.1 | 0.0481 | 2.1 | 0.0672 | 1.7 | 0.0229 | 4.0 | 0.0076 | 4.6 | 146 | 6 | 1676 | 329 | 1.7 | 997 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Granite Basin center |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 127-10.2 | 0.0527 | 4.2 | 0.0822 | 5.6 | 0.0198 | 0.9 | 0.0065 | 6.2 | ~~125~~ | ~~1~~ | 169 | 41 | 2.4 | 410 |
| 127-10.1 | 0.0490 | 3.0 | 0.0967 | 6.6 | 0.0213 | 1.1 | 0.0069 | 6.7 | ~~136~~ | ~~1~~ | 285 | 82 | 3.7 | 755 |
| 127-11.1 | 0.0499 | 2.8 | 0.1020 | 3.5 | 0.0214 | 1.6 | 0.0070 | 3.9 | ~~136~~ | ~~2~~ | 290 | 87 | 5.4 | 706 |
| 127-6.1 | 0.0517 | 3.9 | 0.0956 | 5.3 | 0.0215 | 0.9 | 0.0068 | 5.4 | ~~137~~ | ~~1~~ | 158 | 46 | 4.6 | 490 |
| 127-8.2 | 0.0516 | 3.7 | 0.0833 | 5.4 | 0.0217 | 0.8 | 0.0068 | 5.5 | ~~138~~ | ~~1~~ | 175 | 45 | 3.9 | 406 |
| 127-5.1 | 0.0491 | 2.7 | 0.1164 | 3.2 | 0.0217 | 1.7 | 0.0067 | 3.6 | 138 | 2 | 331 | 122 | 6.1 | 747 |
| 127-2.1 | 0.0493 | 2.4 | 0.2330 | 1.9 | 0.0218 | 0.9 | 0.0066 | 2.2 | 139 | 1 | 528 | 395 | 13.6 | 2178 |
| 127-8.1 | 0.0494 | 2.7 | 0.0735 | 4.1 | 0.0219 | 1.9 | 0.0069 | 4.6 | 139 | 3 | 334 | 75 | 1.7 | 384 |
| 127-4.1 | 0.0482 | 3.2 | 0.0695 | 10.4 | 0.0220 | 0.8 | 0.0062 | 10.4 | 140 | 1 | 233 | 56 | 3.4 | 522 |
| 127-15.1 | 0.0487 | 2.8 | 0.1298 | 2.8 | 0.0221 | 0.7 | 0.0068 | 3.1 | 141 | 1 | 425 | 174 | 6.7 | 948 |
| 127-9.1 | 0.0468 | 3.9 | 0.0955 | 8.9 | 0.0222 | 0.9 | 0.0070 | 8.9 | 142 | 1 | 179 | 53 | 4.0 | 580 |
| 127-7.1 | 0.0489 | 1.3 | 0.0711 | 5.8 | 0.0223 | 3.1 | 0.0071 | 6.7 | 142 | 4 | 1360 | 294 | 10.2 | 974 |
| 127-12.1 | 0.0464 | 3.7 | 0.0882 | 4.3 | 0.0226 | 1.6 | 0.0074 | 4.6 | 144 | 2 | 281 | 73 | 3.9 | 585 |
| 127-7.2 | 0.0486 | 2.8 | 0.0819 | 7.5 | 0.0226 | 1.5 | 0.0069 | 7.7 | 144 | 2 | 332 | 87 | 2.6 | 561 |
| 127-3.1 | 0.0491 | 1.9 | 0.2224 | 1.7 | 0.0227 | 1.4 | 0.0070 | 2.3 | 144 | 2 | 636 | 446 | 12.3 | 2183 |
| 127-1.1 | 0.0483 | 3.8 | 0.0942 | 9.8 | 0.0228 | 1.8 | 0.0069 | 10.0 | 145 | 3 | 171 | 52 | 4.6 | 471 |
| 127-14.1 | 0.0494 | 2.9 | 0.0928 | 3.9 | 0.0228 | 1.2 | 0.0068 | 4.1 | 145 | 2 | 314 | 94 | 3.3 | 660 |
| 127-13.1 | 0.0460 | 3.7 | 0.0748 | 5.1 | 0.0228 | 1.9 | 0.0067 | 5.5 | 146 | 3 | 214 | 53 | 5.2 | 532 |

Table S1 cont.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **La** | **Ce** | **Nd** | **Sm** | **Eu** | **Gd** | **Dy** | **Er** | **Yb** | **Hf** | **Ti\_Zircon T (°C)** | **Sample/Grain/Spot** |
|  |  |  |  |  |  |  |  |  |  |  | Cascade Pluton center |
| 0.0014 | 9.6 | 0.102 | 0.40 | 0.25 | 3.2 | 14.9 | 34 | 88 | 9970 | 647 | 011-13.1 |
| 0.0060 | 7.4 | 0.136 | 0.31 | 0.20 | 2.4 | 11.3 | 28 | 77 | 10020 | 635 | 011-8.1 |
| 0.0044 | 7.0 | 0.222 | 0.59 | 0.42 | 4.3 | 17.7 | 40 | 110 | 7553 | 685 | 011-9.2 |
| 0.0011 | 8.1 | 0.084 | 0.33 | 0.26 | 2.8 | 12.3 | 30 | 84 | 9006 | 650 | 011-15.1 |
| 0.0018 | 5.7 | 0.093 | 0.37 | 0.26 | 3.0 | 13.9 | 35 | 97 | 10008 | 644 | 011-3.1 |
| 0.0035 | 11.1 | 0.609 | 1.49 | 0.94 | 9.3 | 33.8 | 65 | 151 | 9106 | 667 | 011-16.1 |
| 0.0011 | 16.0 | 0.177 | 0.63 | 0.41 | 5.2 | 21.4 | 49 | 116 | 10274 | 651 | 011-9.1 |
| 0.0033 | 8.5 | 0.173 | 0.60 | 0.44 | 5.3 | 22.2 | 54 | 143 | 9038 | 656 | 011-1.2 |
| 0.0033 | 9.6 | 0.203 | 0.63 | 0.43 | 4.8 | 23.0 | 56 | 148 | 8972 | 650 | 011-11.1 |
| 0.0012 | 12.2 | 0.171 | 0.57 | 0.36 | 4.1 | 19.7 | 44 | 111 | 9059 | 661 | 011-14.1 |
| 0.0011 | 8.8 | 0.105 | 0.36 | 0.19 | 2.8 | 12.8 | 30 | 77 | 9634 | 647 | 011-6.1 |
| 0.0026 | 13.4 | 0.263 | 0.79 | 0.54 | 7.0 | 30.7 | 69 | 173 | 8755 | 686 | 011-5.1 |
| 0.0012 | 10.1 | 0.148 | 0.47 | 0.30 | 3.8 | 14.7 | 32 | 80 | 8848 | 668 | 011-21.1 |
| 0.0140 | 12.7 | 1.599 | 2.91 | 1.73 | 16.4 | 56.0 | 102 | 232 | 7690 | 707 | 011-2.1 |
| 0.0198 | 13.3 | 0.40 | 0.70 | 0.39 | 4.3 | 22.9 | 46 | 123 | 11544 | 663 | 11-30.1 |
| 0.0013 | 15.3 | 0.216 | 0.74 | 0.49 | 6.5 | 31.7 | 71 | 176 | 8864 | 661 | 011-19.1 |
| 0.0035 | 11.0 | 0.159 | 0.68 | 0.39 | 5.1 | 28.2 | 60 | 144 | 8780 | 667 | 011-17.1 |
| 0.0008 | 9.7 | 0.158 | 0.44 | 0.24 | 3.4 | 16.0 | 35 | 88 | 8909 | 648 | 011-20.1 |
| 0.0014 | 8.2 | 0.167 | 0.48 | 0.33 | 4.0 | 19.1 | 46 | 122 | 8364 | 659 | 011-26.1 |
| 0.0047 | 16.0 | 0.776 | 1.68 | 0.82 | 10.8 | 41.1 | 83 | 204 | 9339 | 659 | 011-12.1 |
| 0.0015 | 11.2 | 0.207 | 0.65 | 0.45 | 5.9 | 29.6 | 70 | 179 | 8978 | 653 | 011-7.1 |
| 0.0018 | 12.7 | 0.242 | 0.69 | 0.47 | 5.7 | 27.1 | 65 | 174 | 9752 | 659 | 011-1.1 |
| 0.0161 | 21.0 | 0.87 | 1.53 | 0.70 | 9.8 | 46.0 | 95 | 233 | 9582 | 676 | 11-32.1 |
| 0.0017 | 14.9 | 0.286 | 0.87 | 0.60 | 7.9 | 36.3 | 83 | 221 | 8881 | 687 | 011-4.1 |
| 0.0143 | 11.2 | 0.56 | 0.96 | 0.50 | 6.3 | 29.8 | 63 | 165 | 10542 | 685 | 11-26.1 |
| 0.0051 | 10.2 | 0.58 | 0.98 | 0.49 | 5.6 | 28.2 | 66 | 173 | 9790 | 668 | 11-37.1 |
| 0.0133 | 5.9 | 0.38 | 0.57 | 0.31 | 3.6 | 16.3 | 35 | 91 | 8950 | 690 | 11-28.1 |
| 0.0095 | 14.2 | 0.238 | 0.69 | 0.42 | 6.0 | 28.9 | 62 | 155 | 9104 | 656 | 011-18.1 |
| 0.0099 | 8.9 | 0.48 | 0.64 | 0.33 | 4.0 | 17.2 | 37 | 97 | 9560 | 665 | 11-33.1 |
| 0.0119 | 10.7 | 0.55 | 0.96 | 0.49 | 5.7 | 26.9 | 56 | 144 | 9380 | 681 | 11-34.1 |
| 0.0168 | 15.8 | 0.80 | 1.27 | 0.55 | 6.6 | 28.7 | 57 | 147 | 10135 | 675 | 11-27.1 |
| 0.0056 | 13.0 | 0.65 | 1.29 | 0.64 | 7.9 | 38.9 | 82 | 221 | 9340 | 685 | 11-31.1 |
| 0.0059 | 11.1 | 0.65 | 0.96 | 0.51 | 6.6 | 31.6 | 64 | 160 | 9567 | 685 | 11-29.1 |
| 0.0372 | 14.3 | 0.73 | 1.08 | 0.60 | 7.3 | 35.2 | 74 | 197 | 10312 | 681 | 11-25.1 |
| 0.0071 | 10.3 | 0.32 | 0.69 | 0.29 | 3.8 | 19.2 | 42 | 114 | 10638 | 638 | 11-36.1 |
| 0.0058 | 16.7 | 0.82 | 1.13 | 0.64 | 7.0 | 33.3 | 68 | 171 | 9770 | 674 | 11-35.1 |
| 0.0132 | 18.0 | 0.97 | 1.57 | 0.70 | 10.1 | 51.8 | 106 | 285 | 11272 | 696 | 11-24.1 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  | Cascade Pluton rim |
| 0.1387 | 7.0 | 0.592 | 0.58 | 0.33 | 3.7 | 15.5 | 34 | 88 | 10361 | 663 | 069-2.1 |
| 0.0017 | 3.5 | 0.093 | 0.33 | 0.23 | 3.1 | 16.0 | 39 | 107 | 10142 | 612 | 069-1.1 |
| 0.0031 | 8.4 | 0.180 | 0.76 | 0.50 | 7.4 | 38.4 | 99 | 264 | 12306 | 646 | 069-4.1 |
| 0.0015 | 10.6 | 0.204 | 0.72 | 0.44 | 7.0 | 38.7 | 86 | 222 | 11230 | 651 | 069-10.1 |

Table S1 cont.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **La** | **Ce** | **Nd** | **Sm** | **Eu** | **Gd** | **Dy** | **Er** | **Yb** | **Hf** | **Ti\_Zircon T (°C)** | **Sample/Grain/Spot** |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0.0024 | 4.4 | 0.166 | 0.68 | 0.51 | 5.0 | 27.0 | 63 | 167 | 9162 | 662 | 069-7.1 |
| 0.0036 | 7.6 | 0.451 | 1.45 | 0.89 | 11.6 | 63.8 | 145 | 339 | 8077 | 694 | 069-21.1 |
| 0.0016 | 9.6 | 0.170 | 0.64 | 0.36 | 5.5 | 32.4 | 75 | 191 | 10450 | 639 | 069-16.1 |
| 0.0058 | 10.5 | 0.55 | 1.30 | 0.60 | 9.0 | 41.7 | 83 | 199 | 11566 | 673 | 69-47.1 |
| 0.0019 | 9.9 | 0.178 | 0.65 | 0.44 | 7.9 | 38.3 | 85 | 216 | 11518 | 657 | 069-6.1 |
| 0.0123 | 9.0 | 0.70 | 1.19 | 0.70 | 8.9 | 54.0 | 126 | 316 | 11093 | 691 | 69-44.1 |
| 0.0025 | 7.5 | 0.132 | 0.61 | 0.34 | 5.7 | 31.2 | 73 | 197 | 12061 | 626 | 069-9.2 |
| 0.0015 | 10.4 | 0.117 | 0.66 | 0.33 | 5.9 | 28.4 | 60 | 146 | 10954 | 640 | 069-13.1 |
| 0.0013 | 5.8 | 0.094 | 0.44 | 0.26 | 4.1 | 20.8 | 48 | 140 | 11523 | 615 | 069-40.1 |
| 0.0012 | 5.0 | 0.093 | 0.42 | 0.28 | 4.3 | 22.8 | 55 | 134 | 10409 | 655 | 069-9.1 |
| 0.0127 | 17.0 | 1.64 | 2.70 | 1.45 | 16.5 | 78.2 | 145 | 315 | 9773 | 721 | 69-40.1 |
| 0.0020 | 7.2 | 0.122 | 0.42 | 0.28 | 3.7 | 19.5 | 40 | 105 | 11200 | 640 | 069-5.1 |
| 0.0031 | 9.0 | 0.208 | 0.95 | 0.74 | 9.9 | 55.5 | 134 | 326 | 8973 | 697 | 069-11.1 |
| 0.0014 | 3.7 | 0.060 | 0.35 | 0.21 | 2.2 | 10.8 | 24 | 65 | 10225 | 641 | 069-20.1 |
| 0.0106 | 18.2 | 0.91 | 2.32 | 1.08 | 13.3 | 67.3 | 130 | 306 | 11596 | 685 | 69-38.1 |
| 0.0107 | 17.7 | 1.29 | 2.44 | 1.20 | 18.2 | 95.7 | 182 | 410 | 9935 | 715 | 69-48.1 |
| 0.0031 | 4.7 | 0.25 | 0.60 | 0.28 | 3.6 | 18.1 | 37 | 95 | 9629 | 660 | 69-43.1 |
| 0.0058 | 7.6 | 0.53 | 1.19 | 0.58 | 8.3 | 43.5 | 98 | 235 | 10273 | 677 | 69-45.1 |
| 0.0050 | 13.5 | 0.62 | 1.44 | 0.75 | 8.6 | 41.4 | 77 | 186 | 12164 | 674 | 69-39.1 |
| 0.0107 | 6.1 | 0.37 | 0.86 | 0.45 | 5.7 | 33.8 | 79 | 219 | 10949 | 660 | 69-42.1 |
| 0.0015 | 4.9 | 0.079 | 0.28 | 0.17 | 2.0 | 12.0 | 29 | 81 | 11225 | 612 | 069-12.1 |
| 0.0017 | 13.7 | 0.331 | 1.25 | 0.87 | 13.9 | 67.0 | 141 | 331 | 10541 | 675 | 069-34.1 |
| 0.0044 | 10.4 | 0.59 | 1.30 | 0.67 | 9.3 | 46.8 | 98 | 241 | 10993 | 679 | 69-50.1 |
| 0.0016 | 7.5 | 0.245 | 0.94 | 0.66 | 8.1 | 41.7 | 105 | 281 | 9271 | 667 | 069-19.2 |
| 0.0098 | 7.7 | 0.49 | 1.16 | 0.69 | 9.1 | 48.8 | 106 | 262 | 9460 | 695 | 69-49.1 |
| 0.0013 | 14.1 | 0.333 | 1.15 | 0.64 | 10.4 | 49.4 | 104 | 239 | 10333 | 655 | 069-19.1 |
| 0.0066 | 5.9 | 0.42 | 0.80 | 0.40 | 5.1 | 27.0 | 60 | 158 | 10957 | 653 | 69-46.1 |
| 0.0079 | 6.9 | 0.32 | 0.99 | 0.43 | 5.6 | 24.9 | 51 | 126 | 10581 | 654 | 69-41.1 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  | Bucks Lake pluton center |
| 0.0019 | 8.4 | 0.244 | 0.87 | 0.44 | 6.6 | 26.3 | 51 | 105 | 8941 | 763 | 076-8.1 |
| 0.0013 | 9.0 | 0.136 | 0.54 | 0.30 | 4.1 | 21.2 | 43 | 88 | 9117 | 764 | 076-3.1 |
| 0.0040 | 11.3 | 0.990 | 2.71 | 1.35 | 18.2 | 59.6 | 93 | 166 | 8041 | 760 | 076-1.1 |
| 0.0030 | 11.9 | 1.118 | 2.81 | 1.51 | 18.4 | 61.6 | 94 | 170 | 8294 | 758 | 076-21.1 |
| 0.0023 | 9.2 | 0.164 | 0.68 | 0.37 | 5.2 | 23.3 | 43 | 95 | 8869 | 754 | 076-4.1 |
| 0.0023 | 9.0 | 0.462 | 1.33 | 0.60 | 9.3 | 34.7 | 64 | 124 | 7538 | 783 | 076-10.1 |
| 0.0017 | 8.4 | 0.291 | 0.90 | 0.50 | 6.8 | 28.9 | 51 | 102 | 8030 | 760 | 076-9.1 |
| 0.0028 | 8.5 | 0.203 | 0.63 | 0.34 | 5.3 | 23.3 | 43 | 79 | 7972 | 766 | 076-22.1 |
| 0.0021 | 8.8 | 0.246 | 1.00 | 0.51 | 7.0 | 30.0 | 54 | 110 | 8261 | 766 | 076-2.1 |
| 0.0021 | 9.6 | 0.598 | 1.98 | 1.19 | 16.8 | 51.1 | 88 | 163 | 8514 | 774 | 076-30.2 |
| 0.0013 | 9.4 | 0.164 | 0.52 | 0.31 | 4.9 | 20.6 | 41 | 83 | 8570 | 743 | 076-30.1 |
| 0.0013 | 10.4 | 0.279 | 0.99 | 0.56 | 7.9 | 30.7 | 52 | 102 | 8470 | 789 | 076-7.1 |
| 0.0019 | 9.1 | 0.303 | 1.04 | 0.57 | 8.9 | 33.7 | 57 | 113 | 8286 | 777 | 076-12.1 |
| 0.0016 | 9.2 | 0.137 | 0.61 | 0.35 | 5.3 | 20.9 | 39 | 78 | 8405 | 768 | 076-16.1 |
| 0.0047 | 10.7 | 1.141 | 2.73 | 1.26 | 17.1 | 57.8 | 94 | 172 | 7993 | 775 | 076-14.1 |
| 0.0018 | 10.0 | 0.102 | 0.46 | 0.31 | 3.8 | 19.4 | 39 | 79 | 8748 | 762 | 076-13.1 |
| 0.0031 | 8.9 | 0.764 | 1.98 | 1.03 | 13.6 | 44.2 | 76 | 139 | 7931 | 768 | 076-17.1 |
| 0.0195 | 7.6 | 0.55 | 1.26 | 0.53 | 6.9 | 30.1 | 52 | 103 | 8697 | 767 | 76-29.2 |
| 0.0011 | 9.1 | 0.159 | 0.55 | 0.29 | 4.8 | 19.7 | 38 | 74 | 8433 | 763 | 076-5.1 |
| 0.0384 | 7.9 | 0.63 | 0.85 | 0.37 | 5.1 | 23.2 | 42 | 87 | 9362 | 772 | 76-34.1 |
| 0.0011 | 7.8 | 0.116 | 0.47 | 0.31 | 4.3 | 17.0 | 32 | 69 | 8291 | 755 | 076-29.1 |
| 0.0213 | 8.4 | 0.38 | 0.94 | 0.45 | 6.1 | 27.0 | 50 | 97 | 9898 | 777 | 76-33.1 |
| 0.0043 | 8.3 | 0.38 | 0.80 | 0.34 | 4.9 | 23.5 | 42 | 88 | 9908 | 760 | 76-31.1 |

Table S1 cont.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **La** | **Ce** | **Nd** | **Sm** | **Eu** | **Gd** | **Dy** | **Er** | **Yb** | **Hf** | **Ti\_Zircon T (°C)** | **Sample/Grain/Spot** |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0.0150 | 8.2 | 0.86 | 1.40 | 0.53 | 7.3 | 31.0 | 51 | 101 | 9165 | 769 | 76-30.1 |
| 0.0089 | 7.5 | 0.68 | 1.23 | 0.54 | 7.2 | 32.0 | 53 | 110 | 9164 | 780 | 76-32.1 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  | Buck Lakes pluton rim |
| 0.0185 | 10.4 | 1.651 | 3.30 | 2.24 | 26.5 | 92.6 | 173 | 351 | 6798 | 787 | 109-35.1 |
| 0.0025 | 3.6 | 0.910 | 1.04 | 1.23 | 10.7 | 45.1 | 87 | 182 | 7441 | 771 | 109-37.1 |
| 0.0069 | 5.7 | 0.716 | 1.47 | 0.92 | 11.5 | 39.8 | 77 | 156 | 7671 | 774 | 109-1.1 |
| 0.0039 | 8.4 | 0.640 | 1.42 | 0.87 | 9.2 | 44.0 | 111 | 254 | 6949 | 793 | 109-12.1 |
| 0.0032 | 4.7 | 0.237 | 0.70 | 0.45 | 5.8 | 21.0 | 48 | 114 | 6904 | 784 | 109-40.1 |
| 0.0021 | 5.4 | 0.562 | 1.37 | 0.95 | 9.3 | 31.3 | 56 | 120 | 7446 | 755 | 109-27.1 |
| 0.0011 | 4.4 | 0.149 | 0.39 | 0.26 | 3.0 | 13.1 | 26 | 62 | 7305 | 747 | 109-14.1 |
| 0.0028 | 5.4 | 0.574 | 1.40 | 0.93 | 9.7 | 33.4 | 57 | 117 | 7233 | 771 | 109-11.1 |
| 0.0016 | 3.9 | 0.137 | 0.43 | 0.32 | 3.4 | 15.4 | 32 | 80 | 7223 | 738 | 109-33.1 |
| 0.0017 | 3.9 | 0.129 | 0.49 | 0.31 | 3.8 | 16.6 | 34 | 82 | 7818 | 752 | 109-2.1 |
| 0.0012 | 4.1 | 0.134 | 0.35 | 0.26 | 3.3 | 14.3 | 31 | 72 | 7414 | 751 | 109-4.1 |
| 0.0012 | 4.5 | 0.094 | 0.28 | 0.22 | 2.7 | 11.3 | 23 | 53 | 7088 | 754 | 109-30.1 |
| 0.0053 | 5.7 | 1.012 | 1.97 | 1.06 | 11.5 | 32.9 | 59 | 130 | 6833 | 750 | 109-9.1 |
| 0.0013 | 4.3 | 0.181 | 0.53 | 0.36 | 3.8 | 16.6 | 33 | 75 | 7077 | 746 | 109-16.1 |
| 0.0045 | 5.9 | 1.009 | 2.06 | 1.20 | 11.7 | 38.5 | 70 | 142 | 7116 | 758 | 109-7.1 |
| 0.0098 | 7.5 | 1.445 | 2.62 | 1.85 | 21.7 | 74.7 | 138 | 258 | 6617 | 789 | 109-18.1 |
| 0.0017 | 3.1 | 0.057 | 0.17 | 0.14 | 1.5 | 6.3 | 15 | 38 | 7379 | 734 | 109-8.1 |
| 0.0015 | 3.8 | 0.139 | 0.42 | 0.26 | 3.7 | 15.3 | 32 | 70 | 7439 | 750 | 109-23.1 |
| 0.0013 | 3.8 | 0.121 | 0.39 | 0.29 | 3.3 | 13.1 | 27 | 67 | 6765 | 735 | 109-26.1 |
| 0.0103 | 12.1 | 1.152 | 2.18 | 1.49 | 18.4 | 80.9 | 165 | 296 | 6781 | 812 | 109-17.1 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  | Northern Merrimac |
| 0.0055 | 9.8 | 0.31 | 1.04 | 0.58 | 8.7 | 23.3 | 86 | 166 | 9998 | 780 | 060-12.1 |
| 0.0039 | 10.5 | 0.33 | 1.16 | 0.62 | 9.4 | 24.8 | 81 | 155 | 9385 | 766 | 060-1.1 |
| 0.0067 | 11.4 | 0.32 | 0.96 | 0.65 | 8.0 | 18.6 | 63 | 146 | 10278 | 742 | 060-3.1 |
| 0.0056 | 9.0 | 0.22 | 0.74 | 0.62 | 5.7 | 16.1 | 60 | 146 | 10116 | 702 | 060-5.1 |
| 0.0051 | 7.5 | 0.32 | 0.80 | 0.56 | 6.0 | 14.7 | 48 | 110 | 10844 | 710 | 060-4.1 |
| 0.0059 | 9.0 | 0.14 | 0.55 | 0.36 | 4.7 | 11.8 | 48 | 122 | 12701 | 717 | 060-15.1 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0.0052 | 9.4 | 0.89 | 1.95 | 1.42 | 12.4 | 26.2 | 75 | 165 | 9681 | 717 | 060-27.1 |
| 0.0033 | 9.5 | 0.30 | 0.92 | 0.60 | 8.0 | 19.5 | 66 | 145 | 9445 | 745 | 060-26.1 |
| 0.0043 | 9.5 | 0.27 | 0.94 | 0.49 | 9.2 | 22.1 | 73 | 136 | 9190 | 761 | 060-22.1 |
| 0.0064 | 10.9 | 0.40 | 1.06 | 0.71 | 10.3 | 26.1 | 83 | 157 | 9225 | 769 | 060-23.1 |
| 0.0037 | 8.2 | 0.21 | 0.54 | 0.39 | 3.5 | 10.5 | 39 | 102 | 9825 | 732 | 060-7.1 |
| 0.0025 | 12.6 | 0.40 | 1.46 | 0.77 | 11.2 | 26.6 | 77 | 139 | 9099 | 769 | 060-21.1 |
| 0.0034 | 9.8 | 0.22 | 0.88 | 0.56 | 8.0 | 20.0 | 62 | 113 | 9468 | 752 | 060-6.1 |
| 0.0029 | 6.6 | 0.10 | 0.27 | 0.21 | 2.7 | 6.8 | 25 | 69 | 9990 | 706 | 060-25.1 |
| 0.0062 | 9.4 | 0.20 | 0.69 | 0.49 | 7.0 | 18.5 | 62 | 122 | 9577 | 764 | 060-24.1 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0.0022 | 9 | 0.31 | 1.09 | 0.54 | 9.9 | 42 | 79 | 159 | 8186 | 767 | 060.30-1 |
| 0.0829 | 9 | 0.43 | 0.89 | 0.41 | 6.4 | 25 | 47 | 98 | 9526 | 738 | 060.34-1 |
| 0.0017 | 11 | 0.32 | 1.17 | 0.49 | 10.3 | 48 | 95 | 183 | 9275 | 762 | 060.16-2 |
| 0.0022 | 11 | 0.39 | 1.26 | 0.55 | 10.6 | 44 | 78 | 152 | 9123 | 756 | 060.32-1 |
| 0.0019 | 9 | 0.41 | 1.05 | 0.59 | 10.7 | 42 | 78 | 156 | 8272 | 752 | 060.14-2 |
| 0.0022 | 11 | 0.39 | 1.27 | 0.67 | 11.2 | 51 | 96 | 189 | 9289 | 770 | 060-10.2 |
| 0.0023 | 5 | 0.08 | 0.21 | 0.12 | 1.7 | 9 | 21 | 55 | 9186 | 720 | 060.29-1 |
| 0.0076 | 8 | 0.23 | 0.64 | 0.34 | 4.1 | 23 | 41 | 114 | 10459 | 750 | 060.15-2 |
| 0.0007 | 12 | 0.41 | 1.37 | 0.57 | 11.6 | 49 | 92 | 184 | 10136 | 762 | 060.17-2 |

Table S1 cont.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **La** | **Ce** | **Nd** | **Sm** | **Eu** | **Gd** | **Dy** | **Er** | **Yb** | **Hf** | **Ti\_Zircon T (°C)** | **Sample/Grain/Spot** |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0.0025 | 10 | 0.26 | 0.90 | 0.46 | 8.3 | 37 | 71 | 145 | 9744 | 761 | 060.31-1 |
| 0.0011 | 11 | 0.32 | 0.86 | 0.43 | 8.6 | 33 | 64 | 129 | 8776 | 754 | 060.33-1 |
| 0.0024 | 6 | 0.19 | 0.50 | 0.30 | 3.6 | 15 | 36 | 94 | 8708 | 725 | 060-9.2 |
| 0.0031 | 11 | 1.21 | 2.58 | 1.22 | 18.2 | 60 | 100 | 175 | 8136 | 767 | 060-11.2 |
| 0.0024 | 9 | 0.25 | 0.76 | 0.32 | 8.1 | 34 | 66 | 124 | 9901 | 756 | 060.35-1 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  | Southern Merrimac |
| 0.0051 | 9.0 | 0.61 | 1.36 | 0.96 | 7.7 | 17.5 | 58 | 138 | 10190 | 729 | 135-7.1 |
| 0.0103 | 10.9 | 0.75 | 1.64 | 1.06 | 11.6 | 24.4 | 82 | 176 | 9749 | 742 | 135-4.1 |
| 0.0065 | 11.0 | 0.35 | 1.25 | 0.80 | 10.8 | 22.4 | 73 | 155 | 8767 | 738 | 135-5.1 |
| 0.0044 | 6.7 | 0.13 | 0.40 | 0.32 | 3.8 | 9.6 | 38 | 101 | 10703 | 664 | 135-1.1 |
| 0.0067 | 8.9 | 0.61 | 1.43 | 1.03 | 8.7 | 18.1 | 60 | 141 | 9878 | 725 | 135-2.1 |
| 0.0036 | 8.3 | 0.24 | 0.68 | 0.52 | 5.9 | 14.6 | 52 | 117 | 11001 | 713 | 135-13.1 |
| 0.0032 | 7.3 | 0.20 | 0.51 | 0.39 | 3.8 | 11.2 | 45 | 117 | 10330 | 706 | 135-6.1 |
| 0.0047 | 8.0 | 0.36 | 0.88 | 0.59 | 6.9 | 15.0 | 53 | 125 | 10138 | 730 | 135-10.1 |
| 0.0056 | 9.1 | 0.66 | 1.48 | 1.04 | 10.4 | 21.2 | 69 | 156 | 10591 | 700 | 135-3.1 |
| 0.0053 | 7.8 | 0.25 | 0.60 | 0.37 | 5.1 | 13.6 | 50 | 114 | 10625 | 738 | 135-9.1 |
| 0.0040 | 8.9 | 0.16 | 0.43 | 0.31 | 2.7 | 8.0 | 34 | 91 | 11835 | 712 | 135-14.1 |
| 0.0052 | 9.1 | 0.59 | 1.39 | 0.81 | 10.8 | 24.5 | 81 | 162 | 9599 | 745 | 135-11.1 |
| 0.0040 | 5.3 | 0.08 | 0.27 | 0.18 | 2.0 | 6.1 | 25 | 67 | 11849 | 696 | 135-8.1 |
| 0.0061 | 11.7 | 0.94 | 2.34 | 1.14 | 18.5 | 40.1 | 116 | 197 | 9330 | 764 | 135-12.1 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0.0023 | 10 | 0.4 | 1.3 | 0.58 | 11.8 | 47 | 91 | 174 | 8634 | 773 | 135.27-1 |
| 0.0014 | 7 | 0.2 | 0.5 | 0.29 | 3.3 | 19 | 38 | 102 | 8889 | 696 | 135.28-1 |
| 0.0021 | 6 | 0.2 | 0.4 | 0.25 | 3.4 | 14 | 34 | 94 | 9764 | 675 | 135.29-1 |
| 0.0074 | 10 | 1.0 | 1.8 | 0.96 | 11.1 | 39 | 78 | 182 | 9401 | 720 | 135.30-1 |
| 0.0054 | 12 | 1.5 | 2.8 | 1.44 | 19.2 | 65 | 119 | 237 | 9476 | 746 | 135.31-1 |
| 0.0018 | 6 | 0.1 | 0.4 | 0.17 | 2.6 | 11 | 29 | 79 | 10398 | 712 | 135.32-1 |
| 0.0036 | 11 | 0.9 | 2.0 | 0.89 | 14.1 | 54 | 104 | 204 | 9006 | 745 | 135.33-1 |
| 0.0051 | 10 | 0.9 | 2.3 | 0.89 | 16.2 | 53 | 95 | 179 | 7783 | 733 | 135.34-1 |
| 0.0047 | 10.5 | 0.33 | 1.05 | 0.53 | 10.3 | 25.4 | 82 | 162 | 9493 | 760 | 135-24.1 |
| 0.0038 | 6.4 | 0.11 | 0.33 | 0.23 | 3.0 | 8.2 | 35 | 89 | 11479 | 696 | 135-20.1 |
| 0.0020 | 9.1 | 0.26 | 0.90 | 0.54 | 9.2 | 22.3 | 74 | 148 | 9813 | 755 | 135-19.1 |
| 0.0115 | 12.6 | 1.28 | 2.53 | 1.36 | 18.8 | 36.4 | 115 | 228 | 9973 | 750 | 135-22.1 |
| 0.0045 | 9.2 | 0.25 | 0.79 | 0.45 | 7.7 | 22.2 | 76 | 148 | 9997 | 751 | 135-21.1 |
| 0.0027 | 9.6 | 0.59 | 1.45 | 0.82 | 11.0 | 23.7 | 75 | 159 | 10321 | 727 | 135-25.1 |
| 0.0035 | 5.0 | 0.17 | 0.45 | 0.37 | 4.0 | 11.0 | 44 | 122 | 10390 | 713 | 135-23.1 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  | Bald Rock 1 km from edge |
| 0.0053 | 5.4 | 0.107 | 0.26 | 0.158 | 1.6 | 7.8 | 18 | 53 | 9554 | 648 | FF1-2.1 |
| 0.0066 | 7.0 | 1.764 | 2.24 | 1.051 | 8.5 | 26.4 | 44 | 107 | 8047 | 703 | FF1-3.1 |
| 0.0064 | 5.9 | 0.923 | 1.38 | 0.572 | 6.5 | 25.3 | 47 | 110 | 7739 | 711 | FF1-19.1 |
| 0.0028 | 5.8 | 0.155 | 0.23 | 0.129 | 1.6 | 7.9 | 18 | 51 | 9620 | 645 | FF1-4.1 |
| 0.0022 | 5.0 | 0.249 | 0.47 | 0.234 | 2.1 | 10.3 | 22 | 66 | 9091 | 665 | FF1-5.1 |
| 0.0027 | 5.0 | 0.278 | 0.44 | 0.238 | 2.2 | 9.2 | 20 | 57 | 8428 | 681 | FF1-15.1 |
| 0.0044 | 6.4 | 0.156 | 0.28 | 0.128 | 1.5 | 7.8 | 17 | 52 | 10002 | 622 | FF1-17.1 |
| 0.0034 | 5.7 | 0.258 | 0.44 | 0.190 | 2.3 | 10.8 | 23 | 58 | 8911 | 684 | FF1-1.1 |
| 0.0113 | 5.8 | 0.191 | 0.36 | 0.209 | 1.8 | 10.0 | 22 | 68 | 11920 | 700 | FF1-27.1 |
| 0.0062 | 5.6 | 0.335 | 0.68 | 0.346 | 3.2 | 14.6 | 34 | 107 | 11549 | 689 | FF1-21.1 |
| 0.0050 | 6.3 | 0.810 | 1.29 | 0.728 | 6.0 | 21.2 | 39 | 97 | 8989 | 684 | FF1-25.1 |
| 0.0094 | 5.3 | 0.200 | 0.37 | 0.153 | 2.0 | 9.2 | 21 | 57 | 9511 | 667 | FF1-22.1 |
| 0.0071 | 7.2 | 0.735 | 1.06 | 0.492 | 4.6 | 19.4 | 38 | 92 | 10996 | 713 | FF1-20.1 |

Table S1 cont.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **La** | **Ce** | **Nd** | **Sm** | **Eu** | **Gd** | **Dy** | **Er** | **Yb** | **Hf** | **Ti\_Zircon T (°C)** | **Sample/Grain/Spot** |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0.0035 | 3.3 | 0.104 | 0.29 | 0.131 | 1.5 | 7.2 | 16 | 45 | 10008 | 653 | FF1-16.1 |
| 0.0049 | 4.8 | 0.413 | 0.63 | 0.344 | 3.0 | 12.1 | 25 | 69 | 7586 | 688 | FF1-14.1 |
| 0.0046 | 5.2 | 0.458 | 0.66 | 0.309 | 3.1 | 13.0 | 27 | 75 | 8229 | 688 | FF1-11.1 |
| 0.0048 | 6.3 | 0.289 | 0.49 | 0.219 | 2.7 | 11.3 | 27 | 70 | 13201 | 681 | FF1-26.1 |
| 0.0041 | 4.8 | 0.306 | 0.51 | 0.270 | 2.7 | 10.9 | 23 | 57 | 7732 | 698 | FF1-8.1 |
| 0.0037 | 4.1 | 0.315 | 0.49 | 0.251 | 2.4 | 10.8 | 24 | 65 | 8596 | 688 | FF1-24.1 |
| 0.0042 | 4.5 | 0.437 | 0.70 | 0.314 | 3.4 | 13.1 | 25 | 64 | 9524 | 676 | FF1-10.1 |
| 0.0055 | 5.1 | 0.325 | 0.52 | 0.262 | 3.0 | 12.5 | 25 | 63 | 8273 | 694 | FF1-18.1 |
| 0.0048 | 5.1 | 0.373 | 0.66 | 0.312 | 3.1 | 12.4 | 27 | 71 | 8241 | 671 | FF1-9.1 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  | Bald Rock center |
| 0.0227 | 990.0 | 5014.507 | 3089.09 | 778.756 | 6160.6 | 4280.8 | 3487 | 8496 | 17198 | 2242 | BBR-22.1 |
| 0.0469 | 8.8 | 1.132 | 1.64 | 0.920 | 9.5 | 33.4 | 58 | 145 | 11067 | 722 | BBR-3.2 |
| 25.5199 | 80.0 | 68.264 | 29.78 | 18.977 | 55.7 | 179.9 | 266 | 679 | 17279 | 986 | BBR-19.1 |
| 0.0176 | 40.1 | 1.311 | 3.85 | 1.108 | 35.5 | 239.7 | 423 | 831 | 14866 | 717 | BBR-5.1 |
| 0.1937 | 20.4 | 0.626 | 2.41 | 1.014 | 21.8 | 140.3 | 261 | 566 | 15857 | 689 | BBR-1.1 |
| 0.0096 | 10.7 | 0.653 | 1.07 | 0.517 | 6.1 | 29.9 | 59 | 150 | 10701 | 747 | BBR-1.2 |
| 0.0724 | 50.0 | 2.125 | 5.53 | 1.329 | 44.9 | 245.6 | 388 | 676 | 15825 | 700 | BBR-26.1 |
| 1.0892 | 68.9 | 6.297 | 9.59 | 3.044 | 67.5 | 381.8 | 620 | 1129 | 14979 | 767 | BBR-3.1 |
| 0.0074 | 13.5 | 0.310 | 0.47 | 0.237 | 3.1 | 16.8 | 37 | 116 | 13625 | 700 | BBR-2.1 |
| 0.0197 | 29.0 | 1.757 | 4.55 | 1.409 | 33.1 | 182.8 | 331 | 665 | 12238 | 675 | BBR-14.1 |
| 0.0317 | 27.5 | 4.045 | 8.70 | 7.848 | 88.5 | 380.8 | 552 | 896 | 9571 | 972 | BBR-12.1 |
| 0.0056 | 13.3 | 0.437 | 1.41 | 0.531 | 13.0 | 80.7 | 156 | 326 | 14010 | 648 | BBR-14.2 |
| 0.0465 | 24.5 | 1.266 | 2.50 | 0.742 | 15.4 | 81.2 | 146 | 293 | 11211 | 822 | BBR-20.1 |
| 0.0159 | 5.6 | 0.795 | 2.15 | 0.993 | 17.7 | 111.6 | 227 | 549 | 11125 | 762 | BBR-11.1 |
| 0.0202 | 12.3 | 0.659 | 1.08 | 0.504 | 6.1 | 31.3 | 67 | 176 | 15427 | 685 | BBR-9.1 |
| 0.0188 | 43.3 | 1.366 | 5.72 | 1.229 | 63.6 | 456.5 | 795 | 1464 | 14712 | 689 | BBR-23.2 |
| 0.0350 | 18.4 | 2.324 | 4.16 | 1.551 | 21.6 | 95.9 | 173 | 357 | 10134 | 830 | BBR-13.1 |
| 0.0240 | 10.6 | 0.730 | 1.76 | 0.827 | 12.6 | 70.6 | 131 | 303 | 11714 | 677 | BBR-23.1 |
| 0.0534 | 17.5 | 1.176 | 1.60 | 0.655 | 8.0 | 36.2 | 69 | 171 | 10876 | 767 | BBR-21.1 |
| 0.0094 | 11.3 | 0.252 | 0.40 | 0.239 | 3.0 | 16.9 | 35 | 100 | 11625 | 706 | BBR-10.1 |
| 0.0266 | 15.5 | 1.938 | 2.84 | 1.315 | 12.2 | 48.5 | 86 | 210 | 13911 | 772 | BBR-6.1 |
| 0.0408 | 20.8 | 4.078 | 5.06 | 1.899 | 23.7 | 96.6 | 165 | 366 | 10590 | 791 | BBR-27.1 |
| 0.0925 | 14.5 | 2.978 | 6.88 | 5.724 | 56.2 | 268.0 | 402 | 697 | 6638 | 932 | BBR-25.1 |
| 0.0573 | 15.7 | 1.341 | 2.32 | 1.281 | 15.1 | 59.8 | 99 | 256 | 10675 | 754 | BBR-7.1 |
| 0.0287 | 15.0 | 0.394 | 0.62 | 0.342 | 3.5 | 19.3 | 46 | 146 | 16090 | 717 | BBR-15.1 |
| 0.0104 | 17.0 | 0.447 | 1.47 | 0.474 | 10.4 | 52.7 | 93 | 225 | 12227 | 633 | BBR-4.1 |
| 0.0190 | 17.8 | 1.276 | 2.16 | 0.840 | 12.2 | 58.4 | 111 | 256 | 11404 | 785 | BBR-16.1 |
| 0.2496 | 32.6 | 10.286 | 12.82 | 4.201 | 60.4 | 231.7 | 383 | 677 | 9254 | 835 | BBR-8.1 |
| 0.0627 | 29.8 | 3.746 | 5.82 | 2.013 | 30.3 | 124.5 | 207 | 398 | 12549 | 773 | BBR-18.1 |
| 0.1408 | 5.4 | 0.312 | 0.65 | 0.369 | 4.2 | 36.0 | 87 | 240 | 18389 | 637 | BBR-24.1 |
| 0.0091 | 11.0 | 0.259 | 0.54 | 0.267 | 2.9 | 16.6 | 35 | 108 | 12866 | 715 | BBR-17.1 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  | Granite Basin rim |
| 0.0079 | 6.8 | 0.25 | 0.74 | 0.44 | 6.5 | 29 | 57 | 135 | 9859 | 674 | 103-2.2 |
| 0.0157 | 10.3 | 0.27 | 0.89 | 0.54 | 6.9 | 37 | 77 | 181 | 11207 | 700 | 103-5.1 |
| 0.0039 | 16.7 | 0.34 | 1.25 | 0.72 | 11.2 | 51 | 110 | 258 | 10078 | 705 | 103-2.1 |
| 0.0085 | 6.8 | 0.34 | 0.83 | 0.53 | 6.3 | 29 | 59 | 140 | 9326 | 697 | 103-3.1 |
| 0.0107 | 8.7 | 0.20 | 0.77 | 0.50 | 7.1 | 32 | 64 | 149 | 10963 | 660 | 103-7.1 |

Table S1 cont.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **La** | **Ce** | **Nd** | **Sm** | **Eu** | **Gd** | **Dy** | **Er** | **Yb** | **Hf** | **Ti\_Zircon T (°C)** | **Sample/Grain/Spot** |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0.0109 | 15.1 | 0.30 | 1.10 | 0.62 | 9.2 | 44 | 96 | 239 | 9731 | 689 | 103-4.1 |
| 0.0071 | 6.4 | 0.11 | 0.28 | 0.21 | 3.0 | 14 | 32 | 89 | 12223 | 634 | 103-19.2 |
| 0.0064 | 17.7 | 0.21 | 0.83 | 0.49 | 9.2 | 47 | 112 | 296 | 11557 | 629 | 103-9.1 |
| 0.0020 | 6.9 | 0.16 | 0.74 | 0.40 | 5.7 | 25 | 56 | 142 | 10551 | 680 | 103-6.2 |
| 0.0104 | 12.4 | 0.24 | 0.83 | 0.47 | 7.8 | 34 | 73 | 176 | 10381 | 673 | 103-17.1 |
| 0.0064 | 23.9 | 0.66 | 1.70 | 1.02 | 15.7 | 81 | 168 | 395 | 10691 | 722 | 103-11.1 |
| 0.0052 | 6.8 | 0.22 | 0.69 | 0.44 | 5.9 | 26 | 55 | 130 | 10955 | 671 | 103-16.2 |
| 0.0074 | 9.8 | 0.28 | 0.91 | 0.54 | 8.4 | 37 | 77 | 191 | 10917 | 677 | 103-10.1 |
| 0.0092 | 17.4 | 0.46 | 1.32 | 0.84 | 13.6 | 59 | 125 | 280 | 9663 | 722 | 103-18.1 |
| 0.0075 | 10.9 | 0.31 | 1.19 | 0.66 | 9.8 | 44 | 93 | 219 | 10126 | 722 | 103-13.1 |
| 0.0032 | 7.9 | 0.22 | 0.66 | 0.44 | 7.0 | 30 | 60 | 150 | 10534 | 676 | 103-9.2 |
| 0.0124 | 12.9 | 0.54 | 1.58 | 1.02 | 12.9 | 53 | 109 | 263 | 9288 | 708 | 103-8.2 |
| 0.0480 | 9.1 | 0.21 | 0.82 | 0.44 | 5.2 | 23 | 49 | 126 | 11892 | 667 | 103-19.1 |
| 0.0161 | 20.4 | 0.40 | 1.23 | 0.71 | 13.4 | 67 | 138 | 316 | 11327 | 717 | 103-14.1 |
| 0.0093 | 7.6 | 0.35 | 1.06 | 0.79 | 10.3 | 47 | 99 | 238 | 10034 | 682 | 103-12.1 |
| 0.0042 | 18.8 | 0.39 | 1.58 | 0.85 | 13.8 | 65 | 133 | 303 | 10632 | 697 | 103-8.1 |
| 0.0119 | 18.9 | 0.48 | 1.75 | 0.97 | 15.0 | 64 | 134 | 327 | 10713 | 688 | 103-17.2 |
| 0.0064 | 14.1 | 0.26 | 0.85 | 0.46 | 6.2 | 33 | 65 | 153 | 9880 | 684 | 103-16.1 |
| 0.0130 | 27.6 | 0.90 | 2.74 | 1.66 | 22.1 | 95 | 202 | 475 | 10219 | 708 | 103-15.1 |
| 0.0214 | 29.1 | 0.23 | 1.33 | 0.65 | 13.6 | 73 | 184 | 513 | 13085 | 628 | 103-6.1 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  | Granite Basin center |
| 0.0042 | 9.9 | 0.26 | 0.87 | 0.55 | 7.2 | 35 | 76 | 193 | 11421 | 655 | 127-10.2 |
| 0.0070 | 21.8 | 0.41 | 1.60 | 0.79 | 14.8 | 66 | 140 | 332 | 12681 | 689 | 127-10.1 |
| 0.0097 | 18.5 | 0.47 | 1.38 | 0.93 | 12.9 | 61 | 132 | 313 | 10518 | 722 | 127-11.1 |
| 0.0186 | 8.9 | 0.47 | 1.13 | 0.89 | 9.6 | 42 | 88 | 200 | 8570 | 708 | 127-6.1 |
| 0.0115 | 9.8 | 0.23 | 0.91 | 0.57 | 7.3 | 35 | 74 | 191 | 10893 | 695 | 127-8.2 |
| 0.0080 | 20.6 | 0.63 | 1.71 | 1.12 | 16.5 | 65 | 131 | 299 | 9634 | 733 | 127-5.1 |
| 0.0238 | 47.8 | 1.93 | 7.69 | 4.94 | 70.3 | 226 | 363 | 698 | 9130 | 812 | 127-2.1 |
| 0.0073 | 15.9 | 0.18 | 0.70 | 0.44 | 6.9 | 31 | 70 | 182 | 11352 | 630 | 127-8.1 |
| 0.0044 | 15.5 | 0.25 | 0.87 | 0.63 | 10.1 | 44 | 100 | 239 | 12217 | 681 | 127-4.1 |
| 0.0293 | 29.0 | 0.70 | 2.65 | 1.55 | 24.1 | 90 | 162 | 344 | 10472 | 741 | 127-15.1 |
| 0.0098 | 14.1 | 0.31 | 1.14 | 0.69 | 11.3 | 51 | 105 | 244 | 10810 | 695 | 127-9.1 |
| 2.6760 | 35.2 | 6.35 | 4.20 | 1.47 | 17.7 | 75 | 175 | 480 | 13380 | 782 | 127-7.1 |
| 0.0010 | 17.4 | 0.40 | 1.39 | 0.67 | 9.9 | 48 | 103 | 266 | 10333 | 695 | 127-12.1 |
| 0.0437 | 17.0 | 0.32 | 1.12 | 0.62 | 10.4 | 47 | 101 | 260 | 13298 | 662 | 127-7.2 |
| 0.0328 | 54.7 | 1.75 | 6.95 | 4.22 | 65.4 | 226 | 351 | 681 | 9579 | 802 | 127-3.1 |
| 0.0084 | 10.2 | 0.44 | 1.26 | 0.80 | 9.6 | 41 | 84 | 207 | 9263 | 708 | 127-1.1 |
| 0.0129 | 22.7 | 0.43 | 1.15 | 0.68 | 12.4 | 54 | 116 | 282 | 11123 | 680 | 127-14.1 |
| 0.0079 | 12.2 | 0.37 | 1.06 | 0.71 | 9.9 | 46 | 95 | 231 | 10088 | 718 | 127-13.1 |

Data shown in red denotes bad analysis affected by inclusion. Median uncertainties for trace elements are U (± 4.0%), Th (± 4.0%), Ti (± 2.5%), Y (± 2.8%), La (± 21.4%), Ce (± 2.3%), Nd (± 8.9%), Sm (± 5.4%), Eu (± 4.6%), Gd (± 6.7%), Dy (± 2.5%), Er (± 2.7%), Yb (± 3.6%), Hf (± 2.9%).

References

Coble, M.A., Vazquez, J.A., Barth, A.P., Wooden, J., Burns, D., Kylander‐Clark, A., Jackson, S. and Vennari, C.E., 2018, Trace element characterization of MAD‐559 zircon reference material for ion microprobe analysis: Geostandards and Geoanalytical Research, v. 42, p. 481-497.

Ferry, J. M. and Watson, E. B., 2007, New thermodynamic models and revised calibrations for the Ti-in-zircon and Zr-in-rutile thermometers. Contributions to Mineralogy and Petrology, v. 154, p. 429–437.

Ludwig, K.R., 2003. Isoplot 3.00: A geochronological toolkit for Microsoft Excel. Berkeley Geochronology Center Special Publication 4, 70 p.

Stacey, J.S., and Kramers, J.D., 1975, Approximation of terrestrial lead isotope evolution by a two-stage model: Earth and Planetary Science Letters, v. 26, p. 207-221.

Steiger, R., and Jäger, E., 1977, Subcommission on geochronology, convention on the use of decay constants in geo-and cosmochronology: Earth and Planetary Science Letters, v. 36, p. 359–362