Supporting Information for

**New evidence from heavy minerals and detrital zircons in Quaternary fluvial sediments for the evolution of the upper Yangtze River, South China**

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**Introduction**

[The file of Supporting information included a figure and three tables for supplementing additional information about research samples. This figure is U-Pb age concordant diagrams of the detrital zircons, this table S1 introduce sample locations and the table S2 and S3 list zircon U-Pb geochronologic data and trace element concentration of each sample respectively. The data was measured by LA-ICP-MS at the State Key Laboratory of Geological Processes and Mineral Resources, China University of Geosciences (Wuhan) around 2013, using an Agilent HP7500a inductively coupled plasma−mass spectrometer equipped with a 213 nm laser ablation device (Geo Las 2005). Helium was used as the carrier for the ablation material. The experimental data were processed by the ICPMS Data Cal software using GJ and 91500 as external standards by applying Anderson's normal lead correction procedure. The number of this group zircon might be too few. According to the proposition of Dodson et al. (1988), more than 60 grains in each sample were analyzed. But due to the low abundance of zircons in the sample PT02, the practical number of zircons analyzed in the sample PT02 was only 46 grains. Whereas, we tried our best to select all types of zircons within a finite grain number according to their color, size, degree of roundness and crystal morphology on purpose, instead of random selected, for coverage of all potential sources.

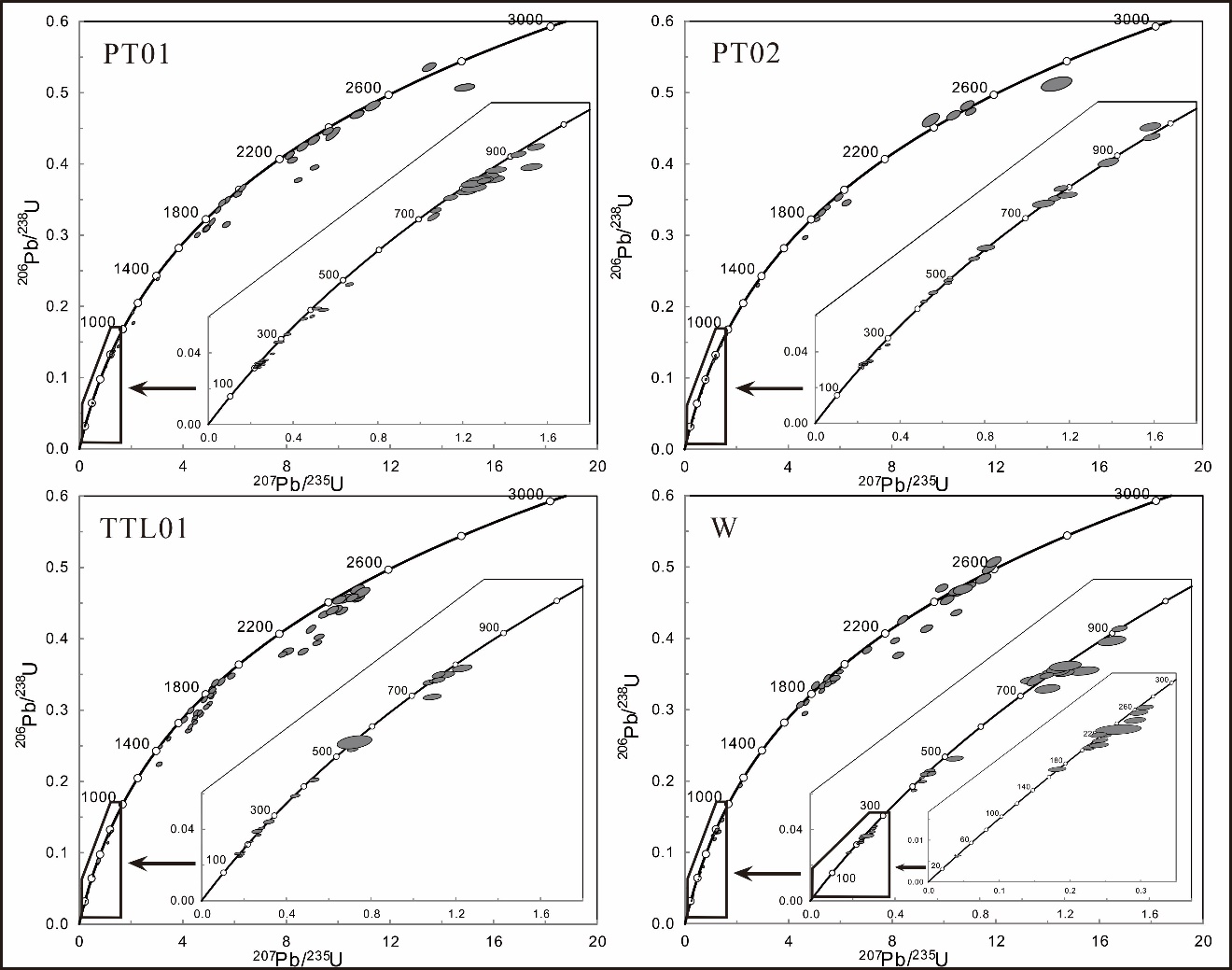


Figure S1. U-Pb concordant diagrams of the detrital zircons from the four samples.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sedimentary site | Age | Sampling site | Heavy mineral analyses | Zircon U-Pb dating |
| Modern point bar | Now | Wanzhou | W | W |
| 2nd terrace | 0.03-0.05 Ma | WTL01 |  |
| 5th terrace | 0.7-0.73 Ma | Chongqing | TTL01 | TTL01 |
| Planation surface | 0.75 Ma | Fengjie | PT01 | PT01 |
| PT02 | PT02 |

Table S1. Information for samples analyzed (age data from Xiang et al., 2020)

Table S2. Zircon LA-ICP-MS U-Pb geochronologic data for samples analyzed.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | Isotopic ratios | | | | | | rho | Apparent ages (Ma) | | | | | | Morphologic classification |
| Spots | Pb | Th | U | Th/U | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ |
| **PT-01** | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 89 | 307 | 606 | 0.51 | 0.0526 | 0.0013 | 0.2352 | 0.0058 | 0.0324 | 0.0003 | 0.4019 | 322 | 55.6 | 214 | 4.8 | 206 | 2.0 | 1C |
| 2 | 103 | 86.8 | 105 | 0.83 | 0.0711 | 0.0019 | 1.3472 | 0.0356 | 0.1372 | 0.0013 | 0.3649 | 961 | 53.7 | 866 | 15.4 | 829 | 7.5 | 1C |
| 3 | 72 | 226 | 493 | 0.46 | 0.0563 | 0.0015 | 0.2588 | 0.0073 | 0.0334 | 0.0004 | 0.4067 | 465 | 28.7 | 234 | 5.9 | 212 | 2.4 | 1B |
| 4 | 270 | 341 | 286 | 1.19 | 0.0848 | 0.0016 | 1.7562 | 0.0295 | 0.1507 | 0.0017 | 0.6594 | 1310 | 35.2 | 1029 | 10.9 | 905 | 9.4 | 1D |
| 5 | 202 | 128 | 368 | 0.35 | 0.0792 | 0.0019 | 1.5102 | 0.0401 | 0.1371 | 0.0011 | 0.3056 | 1189 | 48.1 | 935 | 16.2 | 828 | 6.3 | 1A |
| 6 | 58 | 185 | 323 | 0.57 | 0.0520 | 0.0018 | 0.2431 | 0.0081 | 0.0339 | 0.0004 | 0.3102 | 283 | 80.5 | 221 | 6.7 | 215 | 2.2 | 1B |
| 7 | 76 | 241 | 431 | 0.56 | 0.0509 | 0.0016 | 0.2322 | 0.0072 | 0.0332 | 0.0003 | 0.3174 | 235 | 72.2 | 212 | 5.9 | 210 | 2.0 | 1D |
| 8 | 49.2 | 95.4 | 229 | 0.42 | 0.0892 | 0.0031 | 0.4368 | 0.0146 | 0.0358 | 0.0005 | 0.3919 | 1409 | 67.0 | 368 | 10.4 | 227 | 2.9 | 1A |
| 9 | 69 | 193 | 351 | 0.55 | 0.0517 | 0.0016 | 0.2536 | 0.0083 | 0.0355 | 0.0004 | 0.3711 | 272 | 67.6 | 230 | 6.7 | 225 | 2.7 | 1A |
| 10 | 781 | 341 | 197 | 1.73 | 0.1100 | 0.0015 | 4.5744 | 0.0714 | 0.3005 | 0.0025 | 0.5343 | 1800 | 24.5 | 1745 | 13.1 | 1694 | 12.5 | 1D |
| 11 | 96 | 303 | 612 | 0.49 | 0.0519 | 0.0014 | 0.2389 | 0.0064 | 0.0335 | 0.0003 | 0.3328 | 280 | 61.1 | 218 | 5.2 | 212 | 1.9 | 1A |
| 12 | 521 | 189 | 673 | 0.28 | 0.1143 | 0.0016 | 4.9218 | 0.1005 | 0.3098 | 0.0036 | 0.5708 | 1869 | 25.9 | 1806 | 17.3 | 1740 | 17.8 | 3 |
| 13 | 96 | 284 | 564 | 0.50 | 0.0547 | 0.0014 | 0.2615 | 0.0064 | 0.0348 | 0.0003 | 0.3692 | 398 | 55.6 | 236 | 5.2 | 220 | 2.0 | 1A |
| 14 | 815 | 67.4 | 230 | 0.29 | 0.2117 | 0.0032 | 14.8907 | 0.2605 | 0.5078 | 0.0034 | 0.3779 | 2918 | 24.2 | 2808 | 16.8 | 2647 | 14.4 | 2 |
| 15 | 620 | 129 | 263 | 0.49 | 0.1824 | 0.0022 | 13.5251 | 0.1762 | 0.5364 | 0.0041 | 0.5843 | 2676 | 19.8 | 2717 | 12.5 | 2768 | 17.2 | 3 |
| 16 | 479 | 491 | 823 | 0.60 | 0.0663 | 0.0009 | 1.0643 | 0.0187 | 0.1162 | 0.0015 | 0.7365 | 817 | 34.3 | 736 | 9.2 | 709 | 8.7 | 1A |
| 17 | 706 | 559 | 345 | 1.62 | 0.0723 | 0.0013 | 1.5500 | 0.0262 | 0.1553 | 0.0012 | 0.4729 | 994 | 36.3 | 951 | 10.5 | 931 | 7.0 | 3 |
| 18 | 99 | 329 | 603 | 0.55 | 0.0520 | 0.0013 | 0.2407 | 0.0066 | 0.0334 | 0.0003 | 0.3734 | 287 | 54.6 | 219 | 5.4 | 212 | 2.1 | 1A |
| 19 | 153 | 524 | 842 | 0.62 | 0.0507 | 0.0013 | 0.2256 | 0.0056 | 0.0323 | 0.0003 | 0.3415 | 233 | 59.2 | 207 | 4.7 | 205 | 1.7 | 1A |

Table S2 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | Isotopic ratios | | | | | | rho | Apparent ages (Ma) | | | | | | Morphologic classification |
| Spots | Pb | Th | U | Th/U | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ |
| 20 | 124 | 113 | 94.8 | 1.19 | 0.0681 | 0.0018 | 1.2237 | 0.0316 | 0.1305 | 0.0012 | 0.3705 | 870 | 53.7 | 811 | 14.4 | 790 | 7.1 | 1C |
| 21 | 787 | 176 | 1346 | 0.13 | 0.1598 | 0.0019 | 9.7983 | 0.1807 | 0.4427 | 0.0062 | 0.7640 | 2453 | 19.0 | 2416 | 17.1 | 2363 | 27.9 | 2 |
| 22 | 68 | 219 | 282 | 0.78 | 0.0512 | 0.0019 | 0.2440 | 0.0090 | 0.0347 | 0.0004 | 0.3169 | 250 | 91.7 | 222 | 7.4 | 220 | 2.5 | 3 |
| 23 | 222 | 183 | 851 | 0.21 | 0.0651 | 0.0010 | 1.0772 | 0.0166 | 0.1198 | 0.0009 | 0.5056 | 789 | 31.5 | 742 | 8.1 | 730 | 5.4 | 1A |
| 24 | 146 | 141 | 66.4 | 2.12 | 0.0694 | 0.0023 | 1.2553 | 0.0396 | 0.1324 | 0.0016 | 0.3811 | 911 | 66.7 | 826 | 17.8 | 801 | 9.1 | 1A |
| 25 | 240 | 129 | 387 | 0.33 | 0.0860 | 0.0014 | 2.1006 | 0.0365 | 0.1770 | 0.0015 | 0.4795 | 1339 | 31.3 | 1149 | 12.0 | 1050 | 8.1 | 3 |
| 26 | 60 | 206 | 479 | 0.43 | 0.0553 | 0.0014 | 0.2430 | 0.0062 | 0.0319 | 0.0003 | 0.3787 | 433 | 55.6 | 221 | 5.1 | 202 | 1.9 | 1A |
| 27 | 769 | 275 | 169 | 1.63 | 0.1241 | 0.0017 | 6.1925 | 0.0886 | 0.3618 | 0.0027 | 0.5175 | 2017 | 24.7 | 2003 | 12.6 | 1991 | 12.7 | 2 |
| 28 | 2728 | 1043 | 971 | 1.07 | 0.1622 | 0.0019 | 8.4611 | 0.1034 | 0.3776 | 0.0021 | 0.4561 | 2480 | 19.5 | 2282 | 11.2 | 2065 | 9.9 | 1B |
| 29 | 107 | 361 | 660 | 0.55 | 0.0503 | 0.0013 | 0.2300 | 0.0057 | 0.0332 | 0.0003 | 0.3759 | 209 | 91.7 | 210 | 4.7 | 211 | 1.9 | 1G |
| 30 | 332 | 84.7 | 119 | 0.71 | 0.1653 | 0.0025 | 10.7376 | 0.1774 | 0.4702 | 0.0041 | 0.5231 | 2511 | 25.6 | 2501 | 15.4 | 2484 | 17.9 | 1A |
| 31 | 377 | 331 | 416 | 0.80 | 0.0664 | 0.0012 | 1.2465 | 0.0229 | 0.1359 | 0.0011 | 0.4292 | 820 | 35.2 | 822 | 10.4 | 821 | 6.1 | 1A |
| 32 | 1151 | 527 | 757 | 0.70 | 0.0922 | 0.0012 | 3.0437 | 0.0430 | 0.2388 | 0.0017 | 0.4892 | 1472 | 21.3 | 1419 | 10.9 | 1380 | 8.6 | 2 |
| 33 | 260 | 228 | 180 | 1.27 | 0.0693 | 0.0016 | 1.3257 | 0.0316 | 0.1388 | 0.0013 | 0.3787 | 906 | 48.6 | 857 | 13.8 | 838 | 7.1 | 1A |
| 34 | 874 | 313 | 320 | 0.98 | 0.1180 | 0.0016 | 5.7074 | 0.0860 | 0.3495 | 0.0032 | 0.6100 | 1928 | 23.8 | 1932 | 13.1 | 1932 | 15.4 | 1C |
| 35 | 259 | 221 | 149 | 1.48 | 0.0693 | 0.0017 | 1.3611 | 0.0322 | 0.1424 | 0.0011 | 0.3402 | 907 | 54.6 | 872 | 13.9 | 858 | 6.5 | 1D |
| 36 | 107 | 196 | 561 | 0.35 | 0.0555 | 0.0013 | 0.3040 | 0.0070 | 0.0396 | 0.0003 | 0.3549 | 435 | 49.1 | 270 | 5.5 | 250 | 2.0 | 1A |
| 37 | 667 | 201 | 533 | 0.38 | 0.1237 | 0.0020 | 6.1313 | 0.1015 | 0.3580 | 0.0028 | 0.4749 | 2010 | 27.6 | 1995 | 14.5 | 1973 | 13.4 | 1B |
| 38 | 245 | 851 | 869 | 0.98 | 0.0574 | 0.0013 | 0.2625 | 0.0059 | 0.0331 | 0.0003 | 0.3368 | 506 | 50.0 | 237 | 4.8 | 210 | 1.6 | 1D |
| 39 | 117 | 331 | 654 | 0.51 | 0.0554 | 0.0015 | 0.2752 | 0.0070 | 0.0360 | 0.0003 | 0.3195 | 428 | 59.3 | 247 | 5.6 | 228 | 1.8 | 1A |
| 40 | 552 | 147 | 164 | 0.90 | 0.1560 | 0.0022 | 9.6164 | 0.1377 | 0.4462 | 0.0034 | 0.5374 | 2413 | 23.8 | 2399 | 13.3 | 2378 | 15.4 | 1D |
| 41 | 100 | 58.5 | 199 | 0.29 | 0.0769 | 0.0017 | 1.5285 | 0.0337 | 0.1441 | 0.0013 | 0.3972 | 1118 | 42.6 | 942 | 13.5 | 868 | 7.1 | 3 |

Table S2 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | Isotopic ratios | | | | | | rho | Apparent ages (Ma) | | | | | | Morphologic classification |
| Spots | Pb | Th | U | Th/U | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ |
| 42 | 459 | 96.7 | 661 | 0.15 | 0.1245 | 0.0015 | 6.3057 | 0.0901 | 0.3665 | 0.0035 | 0.6669 | 2022 | -11.882 | 2019 | 12.6 | 2013 | 16.5 | 3 |
| 43 | 1079 | 303 | 415 | 0.73 | 0.1660 | 0.0020 | 9.0963 | 0.1154 | 0.3953 | 0.0024 | 0.4755 | 2518 | 20.4 | 2348 | 11.7 | 2148 | 11.1 | 3 |
| 44 | 50.0 | 37.1 | 71.9 | 0.52 | 0.0687 | 0.0022 | 1.2852 | 0.0411 | 0.1366 | 0.0016 | 0.3618 | 900 | 65.9 | 839 | 18.3 | 826 | 9.0 | 1A |
| 45 | 60.6 | 97.4 | 358 | 0.27 | 0.0555 | 0.0014 | 0.4531 | 0.0116 | 0.0591 | 0.0005 | 0.3429 | 432 | 57.4 | 379 | 8.1 | 370 | 3.2 | 1D |
| 46 | 472 | 137 | 672 | 0.20 | 0.1162 | 0.0014 | 5.1350 | 0.0815 | 0.3188 | 0.0036 | 0.7151 | 1899 | 22.2 | 1842 | 13.5 | 1784 | 17.7 | 3 |
| 47 | 140 | 213 | 269 | 0.79 | 0.0579 | 0.0019 | 0.5147 | 0.0152 | 0.0649 | 0.0006 | 0.2982 | 524 | 70.4 | 422 | 10.2 | 405 | 3.5 | 1A |
| 48 | 530 | 156 | 241 | 0.65 | 0.1303 | 0.0022 | 5.6955 | 0.1013 | 0.3153 | 0.0028 | 0.5024 | 2102 | 29.5 | 1931 | 15.4 | 1767 | 13.8 | 3 |
| 49 | 67 | 191 | 401 | 0.48 | 0.0515 | 0.0015 | 0.2555 | 0.0076 | 0.0359 | 0.0004 | 0.3512 | 261 | 66.7 | 231 | 6.1 | 227 | 2.3 | 1D |
| 50 | 31.9 | 101 | 111 | 0.91 | 0.0512 | 0.0030 | 0.2401 | 0.0137 | 0.0342 | 0.0005 | 0.2353 | 250 | 140 | 218 | 11.2 | 217 | 2.9 | 1A |
| 51 | 149 | 125 | 119 | 1.05 | 0.0670 | 0.0018 | 1.2473 | 0.0343 | 0.1347 | 0.0013 | 0.3452 | 839 | 52.8 | 822 | 15.5 | 815 | 7.3 | 1D |
| 52 | 168 | 621 | 730 | 0.85 | 0.0573 | 0.0016 | 0.2487 | 0.0069 | 0.0316 | 0.0004 | 0.4092 | 502 | 61.1 | 226 | 5.6 | 200 | 2.2 | 1A |
| 53 | 107 | 216 | 265 | 0.82 | 0.0537 | 0.0016 | 0.3748 | 0.0114 | 0.0505 | 0.0005 | 0.3251 | 367 | 66.7 | 323 | 8.4 | 317 | 3.1 | 1A |
| 54 | 66 | 148 | 172 | 0.86 | 0.0530 | 0.0027 | 0.3342 | 0.0165 | 0.0462 | 0.0005 | 0.2211 | 328 | 115 | 293 | 12.5 | 291 | 3.1 | 3 |
| 55 | 469 | 695 | 817 | 0.85 | 0.0616 | 0.0011 | 0.6680 | 0.0128 | 0.0784 | 0.0007 | 0.4517 | 661 | 40.7 | 519 | 7.8 | 487 | 4.1 | 2 |
| 56 | 2447 | 624 | 494 | 1.26 | 0.1654 | 0.0024 | 10.7479 | 0.1677 | 0.4697 | 0.0037 | 0.5016 | 2522 | 24.4 | 2502 | 14.6 | 2482 | 16.2 | 3 |
| 57 | 143 | 63.9 | 686 | 0.09 | 0.0700 | 0.0011 | 1.4659 | 0.0243 | 0.1513 | 0.0012 | 0.4702 | 929 | 31.5 | 916 | 10.0 | 908 | 6.6 | 1A |
| 58 | 416 | 236 | 303 | 0.78 | 0.0782 | 0.0012 | 2.0750 | 0.0367 | 0.1917 | 0.0017 | 0.5076 | 1152 | 31.5 | 1141 | 12.1 | 1131 | 9.3 | 1C |
| 59 | 293 | 1005 | 671 | 1.50 | 0.0503 | 0.0013 | 0.2215 | 0.0063 | 0.0318 | 0.0003 | 0.3231 | 209 | 93.5 | 203 | 5.2 | 202 | 1.8 | 1D |
| 60 | 915 | 268 | 1292 | 0.21 | 0.1695 | 0.0024 | 6.5998 | 0.1022 | 0.2816 | 0.0024 | 0.5597 | 2554 | 23.8 | 2059 | 13.7 | 1600 | 12.3 | 3 |
| 61 | 555 | 163 | 258 | 0.63 | 0.1421 | 0.0019 | 8.1401 | 0.1158 | 0.4126 | 0.0037 | 0.6351 | 2254 | 22.2 | 2247 | 13.0 | 2227 | 17.1 | 3 |
| 62 | 175 | 150 | 321 | 0.47 | 0.0876 | 0.0022 | 1.1364 | 0.0525 | 0.0905 | 0.0030 | 0.7297 | 1373 | 47.7 | 771 | 25.0 | 558 | 18.0 | 1A |
| 63 | 77 | 270 | 518 | 0.52 | 0.0515 | 0.0014 | 0.2321 | 0.0064 | 0.0325 | 0.0003 | 0.3367 | 261 | 63.0 | 212 | 5.3 | 206 | 1.9 | 1A |

Table S2 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | Isotopic ratios | | | | | | rho | Apparent ages (Ma) | | | | | | Morphologic classification |
| Spots | Pb | Th | U | Th/U | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ |
| 64 | 670 | 635 | 408 | 1.56 | 0.0689 | 0.0012 | 1.3050 | 0.0214 | 0.1365 | 0.0010 | 0.4630 | 898 | 35.2 | 848 | 9.4 | 825 | 5.9 | 1C |
| 65 | 611 | 120 | 1096 | 0.11 | 0.1460 | 0.0021 | 8.2390 | 0.1265 | 0.4057 | 0.0030 | 0.4791 | 2299 | 25.3 | 2258 | 14.0 | 2195 | 13.7 | 2 |
| 66 | 695 | 190 | 197 | 0.97 | 0.1696 | 0.0028 | 11.3398 | 0.1920 | 0.4819 | 0.0047 | 0.5803 | 2553 | 28.1 | 2551 | 15.9 | 2536 | 20.6 | 1A |
| 67 | 249 | 66.5 | 148 | 0.45 | 0.1507 | 0.0024 | 9.0666 | 0.1501 | 0.4336 | 0.0043 | 0.5922 | 2354 | 26.7 | 2345 | 15.2 | 2322 | 19.2 | 3 |
| 68 | 538 | 111 | 1196 | 0.09 | 0.1154 | 0.0015 | 5.3711 | 0.0745 | 0.3355 | 0.0029 | 0.6213 | 1887 | 23.8 | 1880 | 11.9 | 1865 | 14.0 | 2 |
| 69 | 112 | 195 | 325 | 0.60 | 0.0612 | 0.0018 | 0.5448 | 0.0168 | 0.0642 | 0.0006 | 0.2860 | 656 | 63.0 | 442 | 11.1 | 401 | 3.4 | 1A |
| 70 | 118 | 305 | 468 | 0.65 | 0.0785 | 0.0028 | 0.3578 | 0.0126 | 0.0330 | 0.0003 | 0.2343 | 1161 | 72.2 | 311 | 9.4 | 209 | 1.7 | 1A |
| 71 | 136 | 119 | 116 | 1.02 | 0.0816 | 0.0022 | 1.5503 | 0.0454 | 0.1369 | 0.0013 | 0.3299 | 1235 | 52.9 | 951 | 18.1 | 827 | 7.5 | 1D |
| 72 | 219 | 483 | 987 | 0.49 | 0.0875 | 0.0022 | 0.4189 | 0.0120 | 0.0343 | 0.0003 | 0.3438 | 1372 | 48.1 | 355 | 8.6 | 217 | 2.1 | 1A |
| 73 | 263 | 63.6 | 447 | 0.14 | 0.1156 | 0.0017 | 5.5311 | 0.0924 | 0.3456 | 0.0034 | 0.5835 | 1900 | 25.9 | 1905 | 14.4 | 1913 | 16.2 | 2 |
| 74 | 265 | 152 | 572 | 0.26 | 0.1273 | 0.0044 | 1.0011 | 0.0326 | 0.0577 | 0.0007 | 0.3588 | 2061 | 60.8 | 704 | 16.6 | 361 | 4.1 | 1A |
| 75 | 107 | 359 | 676 | 0.53 | 0.0524 | 0.0012 | 0.2463 | 0.0059 | 0.0339 | 0.0002 | 0.2930 | 302 | 49.1 | 224 | 4.8 | 215 | 1.5 | 1A |
| 76 | 678 | 1336 | 2155 | 0.62 | 0.0586 | 0.0008 | 0.4919 | 0.0077 | 0.0605 | 0.0005 | 0.5732 | 554 | 29.6 | 406 | 5.3 | 379 | 3.3 | 2 |
| 77 | 255 | 73.6 | 97.7 | 0.75 | 0.1469 | 0.0024 | 8.6352 | 0.1460 | 0.4246 | 0.0044 | 0.6097 | 2311 | 27.9 | 2300 | 15.5 | 2281 | 19.8 | 1C |
| 78 | 388 | 355 | 548 | 0.65 | 0.0651 | 0.0012 | 1.1464 | 0.0217 | 0.1270 | 0.0011 | 0.4377 | 777 | 38.9 | 776 | 10.3 | 771 | 6.0 | 1B |
| 79 | 107 | 351 | 831 | 0.42 | 0.0497 | 0.0012 | 0.2308 | 0.0056 | 0.0336 | 0.0003 | 0.4038 | 183 | 57.4 | 211 | 4.6 | 213 | 2.1 | 1A |
| 80 | 83 | 290 | 631 | 0.46 | 0.0506 | 0.0014 | 0.2274 | 0.0058 | 0.0327 | 0.0003 | 0.3836 | 220 | 58.3 | 208 | 4.8 | 207 | 2.0 | 1A |
| 81 | 224 | 70.1 | 280 | 0.25 | 0.1149 | 0.0017 | 4.9323 | 0.0783 | 0.3096 | 0.0028 | 0.5605 | 1880 | 25.9 | 1808 | 13.5 | 1739 | 13.6 | 2 |
| **PT-02** | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 304 | 99.7 | 111 | 0.90 | 0.1298 | 0.0023 | 6.2298 | 0.1184 | 0.3458 | 0.0030 | 0.4632 | 2095 | 30.1 | 2009 | 16.7 | 1915 | 14.6 | 3 |
| 2 | 246 | 103 | 1642 | 0.06 | 0.0946 | 0.0012 | 1.4676 | 0.0195 | 0.1119 | 0.0007 | 0.5037 | 1520 | 24.4 | 917 | 8.0 | 684 | 4.3 | 2 |
| 3 | 58.1 | 194 | 304 | 0.64 | 0.0552 | 0.0018 | 0.2618 | 0.0078 | 0.0345 | 0.0003 | 0.3278 | 420 | 75.0 | 236 | 6.3 | 219 | 2.1 | 1C |

Table S2 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | Isotopic ratios | | | | | | rho | Apparent ages (Ma) | | | | | | Morphologic classification |
| Spots | Pb | Th | U | Th/U | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ |
| 4 | 325 | 86.5 | 108 | 0.80 | 0.1627 | 0.0025 | 10.8849 | 0.1719 | 0.4823 | 0.0044 | 0.5738 | 2484 | 25.6 | 2513 | 14.8 | 2537 | 19.1 | 3 |
| 5 | 188 | 54.4 | 234 | 0.23 | 0.1161 | 0.0019 | 5.4649 | 0.0898 | 0.3390 | 0.0026 | 0.4666 | 1898 | -2.775 | 1895 | 14.2 | 1882 | 12.6 | 1D |
| 6 | 1053 | 410 | 564 | 0.73 | 0.1143 | 0.0020 | 5.2749 | 0.0956 | 0.3322 | 0.0033 | 0.5480 | 1869 | 30.1 | 1865 | 15.5 | 1849 | 16.0 | 1D |
| 7 | 87 | 290 | 573 | 0.51 | 0.0509 | 0.0013 | 0.2306 | 0.0061 | 0.0327 | 0.0003 | 0.3712 | 239 | 61.1 | 211 | 5.1 | 207 | 2.0 | 1A |
| 8 | 56.6 | 220 | 353 | 0.62 | 0.0523 | 0.0017 | 0.2368 | 0.0078 | 0.0327 | 0.0003 | 0.3128 | 298 | 69.4 | 216 | 6.4 | 208 | 2.1 | 1A |
| 9 | 55.0 | 78.5 | 243 | 0.32 | 0.0569 | 0.0013 | 0.6309 | 0.0143 | 0.0801 | 0.0008 | 0.4265 | 487 | 82.4 | 497 | 8.9 | 497 | 4.6 | 1A |
| 10 | 322 | 329 | 384 | 0.86 | 0.0649 | 0.0012 | 1.1325 | 0.0208 | 0.1259 | 0.0011 | 0.4978 | 769 | 37.0 | 769 | 9.9 | 765 | 6.6 | 3 |
| 11 | 92 | 226 | 736 | 0.31 | 0.0525 | 0.0011 | 0.3035 | 0.0063 | 0.0418 | 0.0003 | 0.3396 | 309 | 54.6 | 269 | 4.9 | 264 | 1.8 | 3 |
| 12 | 136 | 40.7 | 126 | 0.32 | 0.1210 | 0.0021 | 5.9310 | 0.1057 | 0.3533 | 0.0033 | 0.5265 | 1972 | 30.6 | 1966 | 15.5 | 1950 | 15.8 | 1A |
| 13 | 83 | 326 | 258 | 1.26 | 0.0505 | 0.0017 | 0.2345 | 0.0079 | 0.0335 | 0.0004 | 0.3320 | 220 | 75.9 | 214 | 6.5 | 213 | 2.4 | 1G |
| 14 | 163 | 234 | 529 | 0.44 | 0.0577 | 0.0012 | 0.6283 | 0.0125 | 0.0786 | 0.0006 | 0.3718 | 520 | 46.3 | 495 | 7.8 | 488 | 3.5 | 1C |
| 15 | 849 | 249 | 234 | 1.06 | 0.1678 | 0.0022 | 11.0208 | 0.1395 | 0.4738 | 0.0033 | 0.5520 | 2536 | 21.6 | 2525 | 11.9 | 2500 | 14.5 | 1A |
| 16 | 39.7 | 40.6 | 78.2 | 0.52 | 0.0602 | 0.0023 | 0.8080 | 0.0278 | 0.0983 | 0.0011 | 0.3211 | 613 | 86.1 | 601 | 15.6 | 604 | 6.4 | 3 |
| 17 | 115 | 440 | 740 | 0.60 | 0.0502 | 0.0013 | 0.2162 | 0.0058 | 0.0311 | 0.0003 | 0.3219 | 211 | 63.0 | 199 | 4.9 | 198 | 1.7 | 1A |
| 18 | 900 | 770 | 687 | 1.12 | 0.0716 | 0.0012 | 1.5916 | 0.0263 | 0.1604 | 0.0013 | 0.4975 | 976 | 33.3 | 967 | 10.3 | 959 | 7.3 | 3 |
| 19 | 211 | 21.1 | 362 | 0.06 | 0.1469 | 0.0024 | 9.4815 | 0.2191 | 0.4617 | 0.0063 | 0.5911 | 2310 | 27.8 | 2386 | 21.3 | 2447 | 27.8 | 1B |
| 20 | 155 | 212 | 301 | 0.71 | 0.0588 | 0.0013 | 0.7519 | 0.0172 | 0.0922 | 0.0008 | 0.3796 | 567 | 48.1 | 569 | 10.0 | 569 | 4.7 | 1G |
| 21 | 331 | 115 | 301 | 0.38 | 0.1140 | 0.0016 | 5.0980 | 0.0736 | 0.3227 | 0.0020 | 0.4390 | 1865 | 24.8 | 1836 | 12.3 | 1803 | 10.0 | 2 |
| 22 | 154 | 159 | 118 | 1.34 | 0.0675 | 0.0016 | 1.1941 | 0.0301 | 0.1278 | 0.0011 | 0.3401 | 854 | -149.075 | 798 | 13.9 | 775 | 6.3 | 1D |
| 23 | 98 | 357 | 590 | 0.61 | 0.0506 | 0.0013 | 0.2339 | 0.0057 | 0.0335 | 0.0003 | 0.3609 | 233 | 57.4 | 213 | 4.7 | 212 | 1.9 | 1A |
| 24 | 30.7 | 102 | 174 | 0.59 | 0.0489 | 0.0024 | 0.2228 | 0.0107 | 0.0333 | 0.0004 | 0.2789 | 143 | 110 | 204 | 8.9 | 211 | 2.8 | 1D |
| 25 | 44.1 | 135 | 325 | 0.41 | 0.0507 | 0.0017 | 0.2353 | 0.0076 | 0.0338 | 0.0004 | 0.3260 | 233 | 77.8 | 215 | 6.3 | 214 | 2.2 | 1D |

Table S2 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | Isotopic ratios | | | | | | rho | Apparent ages (Ma) | | | | | | Morphologic classification |
| Spots | Pb | Th | U | Th/U | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ |
| 26 | 334 | 94.0 | 62.3 | 1.51 | 0.1600 | 0.0025 | 10.3573 | 0.1760 | 0.4685 | 0.0044 | 0.5565 | 2457 | 27.3 | 2467 | 15.8 | 2477 | 19.5 | 1G |
| 27 | 175 | 134 | 156 | 0.86 | 0.0692 | 0.0014 | 1.5852 | 0.0325 | 0.1661 | 0.0015 | 0.4320 | 906 | 43.4 | 964 | 12.8 | 990 | 8.1 | 3 |
| 28 | 270 | 44.9 | 87.0 | 0.52 | 0.1996 | 0.0039 | 14.3374 | 0.3924 | 0.5124 | 0.0066 | 0.4721 | 2833 | 31.8 | 2772 | 26.0 | 2667 | 28.3 | 1C |
| 29 | 565 | 231 | 281 | 0.82 | 0.1126 | 0.0017 | 4.6312 | 0.0700 | 0.2970 | 0.0020 | 0.4407 | 1843 | 27.5 | 1755 | 12.7 | 1677 | 9.9 | 1A |
| 30 | 44.4 | 120 | 676 | 0.18 | 0.0521 | 0.0013 | 0.2504 | 0.0064 | 0.0348 | 0.0003 | 0.3334 | 287 | 59.3 | 227 | 5.2 | 220 | 1.8 | 1A |
| 31 | 82 | 251 | 651 | 0.39 | 0.0520 | 0.0013 | 0.2500 | 0.0063 | 0.0347 | 0.0003 | 0.3585 | 287 | 57.4 | 227 | 5.1 | 220 | 2.0 | 3 |
| 32 | 85 | 174 | 497 | 0.35 | 0.0566 | 0.0014 | 0.3437 | 0.0082 | 0.0440 | 0.0004 | 0.3350 | 476 | 53.7 | 300 | 6.2 | 277 | 2.2 | 3 |
| 33 | 212 | 598 | 322 | 1.85 | 0.0635 | 0.0018 | 0.3873 | 0.0110 | 0.0440 | 0.0004 | 0.2981 | 726 | 59.3 | 332 | 8.1 | 278 | 2.3 | 1A |
| 34 | 39.6 | 127 | 162 | 0.78 | 0.0540 | 0.0027 | 0.2564 | 0.0125 | 0.0348 | 0.0005 | 0.2703 | 372 | 113 | 232 | 10.1 | 221 | 2.8 | 1D |
| 35 | 243 | 216 | 385 | 0.56 | 0.0638 | 0.0012 | 1.1624 | 0.0219 | 0.1315 | 0.0011 | 0.4363 | 744 | 37.8 | 783 | 10.3 | 797 | 6.2 | 1C |
| 36 | 105 | 98.5 | 160 | 0.62 | 0.1098 | 0.0040 | 1.0524 | 0.0321 | 0.0719 | 0.0014 | 0.6391 | 1798 | 66.4 | 730 | 15.9 | 447 | 8.4 | 1A |
| 37 | 132 | 104 | 166 | 0.63 | 0.0688 | 0.0016 | 1.3864 | 0.0320 | 0.1461 | 0.0016 | 0.4837 | 894 | 41.7 | 883 | 13.6 | 879 | 9.2 | 1A |
| 38 | 127 | 126 | 83.0 | 1.52 | 0.0636 | 0.0020 | 1.0794 | 0.0343 | 0.1230 | 0.0014 | 0.3558 | 728 | 66.7 | 743 | 16.8 | 748 | 8.0 | 1A |
| 39 | 886 | 310 | 537 | 0.58 | 0.1509 | 0.0019 | 6.0882 | 0.1115 | 0.2904 | 0.0036 | 0.6690 | 2367 | 22.2 | 1989 | 16.0 | 1644 | 17.8 | 3 |
| 40 | 82 | 264 | 426 | 0.62 | 0.0529 | 0.0016 | 0.2481 | 0.0071 | 0.0340 | 0.0003 | 0.3283 | 328 | 68.5 | 225 | 5.8 | 216 | 2.0 | 1C |
| 41 | 79 | 260 | 501 | 0.52 | 0.0496 | 0.0013 | 0.2238 | 0.0063 | 0.0325 | 0.0003 | 0.3427 | 189 | 58.3 | 205 | 5.2 | 206 | 2.0 | 1A |
| 42 | 66 | 212 | 243 | 0.87 | 0.0508 | 0.0019 | 0.2371 | 0.0084 | 0.0341 | 0.0004 | 0.3355 | 232 | 88.0 | 216 | 6.9 | 216 | 2.5 | 2 |
| 43 | 97 | 323 | 611 | 0.53 | 0.0505 | 0.0012 | 0.2292 | 0.0055 | 0.0328 | 0.0003 | 0.3724 | 220 | 55.5 | 210 | 4.6 | 208 | 1.8 | 1A |
| 44 | 20.28 | 5.36 | 420 | 0.01 | 0.0546 | 0.0012 | 0.5154 | 0.0110 | 0.0683 | 0.0006 | 0.4075 | 398 | 46.3 | 422 | 7.3 | 426 | 3.6 | 1A |
| 45 | 139 | 54.5 | 270 | 0.20 | 0.0881 | 0.0014 | 2.8076 | 0.0447 | 0.2302 | 0.0018 | 0.5001 | 1387 | 25.0 | 1358 | 12.0 | 1335 | 9.6 | 1A |
| 46 | 106 | 166 | 240 | 0.69 | 0.0553 | 0.0015 | 0.5589 | 0.0149 | 0.0732 | 0.0007 | 0.3752 | 433 | 59.3 | 451 | 9.7 | 455 | 4.4 | 3 |

Table S2 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | |  | |  |  | Isotopic ratios | | | | | | rho | Apparent ages (Ma) | | | | | | Morphologic classification |
| Spots | Pb | | Th | | U | Th/U | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ |
| **TTL01** | | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | | 127 | | 420 | 602 | 0.70 | 0.0499 | 0.0012 | 0.2093 | 0.0050 | 0.0304 | 0.0003 | 0.3961 | 191 | 62.0 | 193 | 4.2 | 193 | 1.8 | 1C |
| 2 | | 161 | | 41.1 | 202 | 0.20 | 0.1114 | 0.0016 | 5.0977 | 0.0766 | 0.3308 | 0.0030 | 0.6029 | 1822 | 25.6 | 1836 | 12.8 | 1842 | 14.6 | 3 |
| 3 | | 208 | | 53.2 | 317 | 0.17 | 0.1102 | 0.0014 | 4.8153 | 0.0756 | 0.3150 | 0.0030 | 0.6122 | 1802 | 18.4 | 1788 | 13.3 | 1765 | 14.9 | 3 |
| 4 | | 590 | | 143 | 714 | 0.20 | 0.1168 | 0.0015 | 5.0027 | 0.0762 | 0.3087 | 0.0027 | 0.5698 | 1907 | 23.6 | 1820 | 12.9 | 1734 | 13.2 | 1A |
| 5 | | 76 | | 85.1 | 298 | 0.29 | 0.0612 | 0.0015 | 0.7160 | 0.0169 | 0.0849 | 0.0009 | 0.4523 | 656 | 51.8 | 548 | 10.0 | 525 | 5.4 | 1D |
| 6 | | 86 | | 256 | 516 | 0.50 | 0.0488 | 0.0013 | 0.2205 | 0.0056 | 0.0328 | 0.0003 | 0.3858 | 200 | 59.3 | 202 | 4.7 | 208 | 2.0 | 1A |
| 7 | | 985 | | 233 | 335 | 0.70 | 0.1662 | 0.0024 | 10.1139 | 0.1513 | 0.4396 | 0.0036 | 0.5534 | 2520 | 23.8 | 2445 | 13.9 | 2349 | 16.3 | 1A |
| 8 | | 93.4 | | 21.2 | 477 | 0.04 | 0.1127 | 0.0017 | 2.2534 | 0.0360 | 0.1444 | 0.0010 | 0.4523 | 1844 | 27.8 | 1198 | 11.3 | 870 | 5.9 | 1A |
| 9 | | 246 | | 27.0 | 788 | 0.03 | 0.1153 | 0.0014 | 5.0878 | 0.0612 | 0.3187 | 0.0018 | 0.4767 | 1887 | 20.8 | 1834 | 10.3 | 1783 | 9.0 | 3 |
| 10 | | 396 | | 216 | 311 | 0.69 | 0.1680 | 0.0021 | 9.1692 | 0.1174 | 0.3945 | 0.0023 | 0.4626 | 2539 | 20.7 | 2355 | 11.8 | 2144 | 10.9 | 3 |
| 11 | | 269 | | 60.8 | 454 | 0.13 | 0.1150 | 0.0015 | 5.1589 | 0.0755 | 0.3241 | 0.0023 | 0.4788 | 1881 | 24.1 | 1846 | 12.5 | 1810 | 11.1 | 1A |
| 12 | | 61 | | 210 | 298 | 0.70 | 0.0633 | 0.0028 | 0.2333 | 0.0111 | 0.0265 | 0.0003 | 0.2626 | 720 | 96.3 | 213 | 9.2 | 168 | 2.1 | 1A |
| 13 | | 185 | | 46.0 | 209 | 0.22 | 0.1163 | 0.0019 | 5.4590 | 0.0997 | 0.3402 | 0.0037 | 0.5973 | 1902 | 30.715 | 1894 | 15.7 | 1888 | 17.9 | 1C |
| 14 | | 776 | | 362 | 533 | 0.68 | 0.0990 | 0.0024 | 3.0674 | 0.0781 | 0.2245 | 0.0022 | 0.3814 | 1606 | 45.2 | 1425 | 19.5 | 1305 | 11.5 | 1C |
| 15 | | 70 | | 106 | 161 | 0.66 | 0.0572 | 0.0017 | 0.5327 | 0.0159 | 0.0677 | 0.0007 | 0.3615 | 502 | 66.7 | 434 | 10.5 | 422 | 4.4 | 1A |
| 16 | | 73 | | 187 | 627 | 0.30 | 0.0514 | 0.0013 | 0.2354 | 0.0062 | 0.0332 | 0.0003 | 0.3343 | 257 | 61.1 | 215 | 5.1 | 211 | 1.8 | 1A |
| 17 | | 1185 | | 421 | 1398 | 0.30 | 0.1655 | 0.0018 | 6.8546 | 0.0951 | 0.2995 | 0.0029 | 0.7042 | 2512 | 18.1 | 2093 | 12.4 | 1689 | 14.5 | 1A |
| 18 | | 965 | | 398 | 542 | 0.73 | 0.1559 | 0.0018 | 8.9261 | 0.1244 | 0.4139 | 0.0038 | 0.6601 | 2413 | 19.8 | 2330 | 12.8 | 2233 | 17.4 | 1A |
| 19 | | 12.6 | | 25.4 | 35.8 | 0.71 | 0.0596 | 0.0044 | 0.7237 | 0.0545 | 0.0889 | 0.0025 | 0.3670 | 591 | 161 | 553 | 32.1 | 549 | 14.5 | 1D |
| 20 | | 612 | | 192 | 447 | 0.43 | 0.1701 | 0.0023 | 10.7468 | 0.1510 | 0.4570 | 0.0034 | 0.5255 | 2558 | 22.5 | 2501 | 13.2 | 2426 | 15.0 | 3 |
| 21 | | 130 | | 72.3 | 159 | 0.45 | 0.1119 | 0.0021 | 4.2041 | 0.0814 | 0.2717 | 0.0022 | 0.4243 | 1831 | 33.3 | 1675 | 15.9 | 1549 | 11.3 | 1C |

Table S2 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | Isotopic ratios | | | | | | rho | Apparent ages (Ma) | | | | | | Morphologic classification |
| Spots | Pb | Th | U | Th/U | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ |
| 22 | 264 | 104 | 119 | 0.88 | 0.1623 | 0.0026 | 9.8966 | 0.1635 | 0.4415 | 0.0038 | 0.5234 | 2479 | 26.4 | 2425 | 15.3 | 2357 | 17.1 | 3 |
| 23 | 714 | 212 | 561 | 0.38 | 0.1701 | 0.0022 | 10.7724 | 0.1406 | 0.4575 | 0.0027 | 0.4448 | 2559 | 20.5 | 2504 | 12.2 | 2428 | 11.8 | 1A |
| 24 | 42.9 | 194 | 204 | 0.95 | 0.0531 | 0.0019 | 0.2673 | 0.0093 | 0.0368 | 0.0004 | 0.3430 | 332 | 78.7 | 241 | 7.5 | 233 | 2.7 | 1A |
| 25 | 76 | 485 | 529 | 0.92 | 0.0542 | 0.0018 | 0.1846 | 0.0062 | 0.0247 | 0.0003 | 0.3023 | 376 | 75.9 | 172 | 5.3 | 158 | 1.6 | 1A |
| 26 | 350 | 116 | 340 | 0.34 | 0.1511 | 0.0025 | 8.0301 | 0.1525 | 0.3827 | 0.0034 | 0.4644 | 2358 | 27.6 | 2234 | 17.2 | 2089 | 15.8 | 1A |
| 27 | 338 | 204 | 512 | 0.40 | 0.0904 | 0.0015 | 3.1130 | 0.0507 | 0.2489 | 0.0017 | 0.4265 | 1435 | 31.3 | 1436 | 12.6 | 1433 | 9.0 | 1G |
| 28 | 400 | 596 | 370 | 1.61 | 0.0638 | 0.0012 | 1.0761 | 0.0194 | 0.1223 | 0.0010 | 0.4381 | 744 | 38.9 | 742 | 9.5 | 744 | 5.6 | 1C |
| 29 | 731 | 302 | 864 | 0.35 | 0.1627 | 0.0020 | 8.6227 | 0.1293 | 0.3824 | 0.0032 | 0.5666 | 2484 | 21.3 | 2299 | 13.7 | 2087 | 15.2 | 3 |
| 30 | 388 | 176 | 251 | 0.70 | 0.1361 | 0.0025 | 5.3825 | 0.1053 | 0.2855 | 0.0020 | 0.3517 | 2177 | 31.3 | 1882 | 16.8 | 1619 | 9.9 | 2 |
| 31 | 75 | 252 | 623 | 0.40 | 0.0647 | 0.0015 | 0.3305 | 0.0081 | 0.0369 | 0.0003 | 0.3394 | 765 | 48.1 | 290 | 6.1 | 233 | 1.9 | 1A |
| 32 | 44.5 | 224 | 496 | 0.45 | 0.0526 | 0.0017 | 0.1980 | 0.0063 | 0.0273 | 0.0003 | 0.3238 | 322 | 72.2 | 183 | 5.4 | 174 | 1.8 | 1A |
| 33 | 14.0 | 60.0 | 83.9 | 0.72 | 0.0503 | 0.0032 | 0.2627 | 0.0164 | 0.0390 | 0.0007 | 0.2945 | 209 | 148 | 237 | 13.2 | 246 | 4.5 | 3 |
| 34 | 206 | 71.1 | 105 | 0.67 | 0.1650 | 0.0025 | 10.7211 | 0.1754 | 0.4697 | 0.0041 | 0.5282 | 2507 | 25.6 | 2499 | 15.3 | 2482 | 17.9 | 3 |
| 35 | 204 | 65.3 | 402 | 0.16 | 0.1117 | 0.0015 | 5.1019 | 0.0721 | 0.3299 | 0.0025 | 0.5372 | 1828 | 24.1 | 1836 | 12.1 | 1838 | 12.2 | 2 |
| 36 | 285 | 117 | 233 | 0.50 | 0.1496 | 0.0020 | 7.8392 | 0.1088 | 0.3784 | 0.0027 | 0.5093 | 2343 | 23.6 | 2213 | 12.6 | 2069 | 12.6 | 2 |
| 37 | 187 | 103 | 171 | 0.60 | 0.1096 | 0.0017 | 4.5001 | 0.0773 | 0.2963 | 0.0028 | 0.5493 | 1794 | 28.2 | 1731 | 14.3 | 1673 | 13.9 | 1D |
| 38 | 238 | 83.7 | 546 | 0.15 | 0.1109 | 0.0018 | 4.4473 | 0.0685 | 0.2894 | 0.0020 | 0.4461 | 1817 | 28.2 | 1721 | 12.8 | 1638 | 10.0 | 1D |
| 39 | 185 | 87.8 | 166 | 0.53 | 0.1117 | 0.0019 | 5.2329 | 0.0907 | 0.3384 | 0.0032 | 0.5477 | 1827 | 31.2 | 1858 | 14.8 | 1879 | 15.5 | 3 |
| 40 | 84 | 482 | 994 | 0.49 | 0.0519 | 0.0013 | 0.1816 | 0.0043 | 0.0253 | 0.0002 | 0.3419 | 280 | 55.6 | 169 | 3.7 | 161 | 1.3 | 1A |
| 41 | 82 | 431 | 1067 | 0.40 | 0.0546 | 0.0012 | 0.1954 | 0.0042 | 0.0259 | 0.0002 | 0.4022 | 398 | 54.6 | 181 | 3.6 | 165 | 1.4 | 1C |
| 42 | 200 | 283 | 345 | 0.82 | 0.0649 | 0.0012 | 1.1092 | 0.0202 | 0.1234 | 0.0009 | 0.4043 | 772 | 32.4 | 758 | 9.7 | 750 | 5.2 | 1C |
| 43 | 147 | 70.9 | 128 | 0.55 | 0.1129 | 0.0018 | 5.1231 | 0.0874 | 0.3277 | 0.0029 | 0.5270 | 1847 | 29.0 | 1840 | 14.6 | 1827 | 14.3 | 3 |

Table S2 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | Isotopic ratios | | | | | | rho | Apparent ages (Ma) | | | | | | Morphologic classification |
| Spots | Pb | Th | U | Th/U | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ |
| 44 | 268 | 84.5 | 702 | 0.12 | 0.1136 | 0.0017 | 5.0501 | 0.0774 | 0.3208 | 0.0023 | 0.4773 | 1858 | 26.4 | 1828 | 13.1 | 1794 | 11.5 | 3 |
| 45 | 416 | 62.2 | 874 | 0.07 | 0.1568 | 0.0022 | 9.4399 | 0.1407 | 0.4347 | 0.0035 | 0.5393 | 2422 | 23.9 | 2382 | 13.8 | 2327 | 15.8 | 3 |
| 46 | 369 | 80.8 | 1449 | 0.06 | 0.1115 | 0.0014 | 4.4089 | 0.0577 | 0.2852 | 0.0016 | 0.4415 | 1824 | 18.4 | 1714 | 10.9 | 1617 | 8.3 | 2 |
| 47 | 30.6 | 191 | 169 | 1.13 | 0.0483 | 0.0032 | 0.1713 | 0.0104 | 0.0264 | 0.0004 | 0.2540 | 122 | 139 | 161 | 9.0 | 168 | 2.6 | 1A |
| 48 | 54.2 | 62.3 | 107 | 0.58 | 0.0687 | 0.0018 | 1.2332 | 0.0306 | 0.1302 | 0.0013 | 0.4143 | 900 | 52.9 | 816 | 13.9 | 789 | 7.7 | 1A |
| 49 | 117 | 159 | 134 | 1.19 | 0.0660 | 0.0017 | 1.1538 | 0.0287 | 0.1267 | 0.0013 | 0.4012 | 806 | 52.9 | 779 | 13.6 | 769 | 7.3 | 1A |
| 50 | 171 | 57.6 | 107 | 0.54 | 0.1682 | 0.0026 | 10.7633 | 0.1666 | 0.4616 | 0.0037 | 0.5220 | 2540 | 25.9 | 2503 | 14.5 | 2447 | 16.5 | 3 |
| 51 | 265 | 73.7 | 247 | 0.30 | 0.1621 | 0.0024 | 10.2618 | 0.1588 | 0.4567 | 0.0042 | 0.5909 | 2477 | 24.2 | 2459 | 14.4 | 2425 | 18.5 | 3 |
| 52 | 227 | 169 | 724 | 0.23 | 0.1150 | 0.0015 | 4.6851 | 0.0643 | 0.2941 | 0.0024 | 0.5993 | 1880 | 22.7 | 1765 | 11.5 | 1662 | 12.1 | 3 |
| 53 | 114 | 130 | 373 | 0.35 | 0.0653 | 0.0011 | 1.1209 | 0.0203 | 0.1237 | 0.0009 | 0.4246 | 783 | 35.2 | 763 | 9.7 | 752 | 5.5 | 1A |
| 54 | 564 | 794 | 435 | 1.82 | 0.0641 | 0.0011 | 1.1215 | 0.0205 | 0.1265 | 0.0012 | 0.5159 | 746 | 37.0 | 764 | 9.8 | 768 | 6.8 | 1A |
| 55 | 204 | 74.4 | 455 | 0.16 | 0.1115 | 0.0016 | 4.2739 | 0.0678 | 0.2771 | 0.0027 | 0.6079 | 1824 | 25.8 | 1688 | 13.1 | 1577 | 13.5 | 3 |
| 56 | 502 | 163 | 462 | 0.35 | 0.1603 | 0.0023 | 9.7585 | 0.1568 | 0.4402 | 0.0040 | 0.5696 | 2459 | 24.2 | 2412 | 14.9 | 2351 | 18.1 | 3 |
| 57 | 44.0 | 169 | 254 | 0.67 | 0.0508 | 0.0017 | 0.2838 | 0.0098 | 0.0406 | 0.0005 | 0.3237 | 232 | 77.8 | 254 | 7.7 | 256 | 2.8 | 1C |
| 58 | 85 | 109 | 153 | 0.72 | 0.0694 | 0.0018 | 1.0915 | 0.0286 | 0.1142 | 0.0011 | 0.3587 | 909 | 52.6 | 749 | 13.9 | 697 | 6.2 | 1A |
| 59 | 25.0 | 161 | 183 | 0.88 | 0.0575 | 0.0030 | 0.1990 | 0.0106 | 0.0252 | 0.0003 | 0.2578 | 522 | 119 | 184 | 9.0 | 161 | 2.2 | 1D |
| 60 | 780 | 475 | 301 | 1.58 | 0.1129 | 0.0014 | 4.6269 | 0.0650 | 0.2965 | 0.0025 | 0.5922 | 1847 | 18.1 | 1754 | 11.8 | 1674 | 12.3 | 2 |
| 61 | 331 | 153 | 519 | 0.30 | 0.1138 | 0.0015 | 4.4575 | 0.0620 | 0.2832 | 0.0020 | 0.5192 | 1861 | 23.0 | 1723 | 11.6 | 1607 | 10.3 | 3 |
| 62 | 393 | 239 | 396 | 0.60 | 0.1365 | 0.0020 | 4.8733 | 0.0880 | 0.2579 | 0.0028 | 0.6092 | 2183 | 26.1 | 1798 | 15.3 | 1479 | 14.6 | 1A |
| 63 | 22.9 | 79.9 | 85.5 | 0.93 | 0.0534 | 0.0028 | 0.3191 | 0.0168 | 0.0443 | 0.0008 | 0.3524 | 346 | 112 | 281 | 12.9 | 279 | 5.1 | 1D |
| 64 | 87 | 122 | 286 | 0.43 | 0.0692 | 0.0017 | 0.8196 | 0.0221 | 0.0854 | 0.0008 | 0.3498 | 906 | 56.5 | 608 | 12.4 | 528 | 4.8 | 1G |
| 65 | 186 | 65.4 | 553 | 0.12 | 0.0957 | 0.0012 | 3.4414 | 0.0495 | 0.2600 | 0.0022 | 0.5899 | 1543 | 23.8 | 1514 | 11.4 | 1490 | 11.3 | 3 |

Table S2 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  |  |  |  |  | Isotopic ratios | | | | | | rho | Apparent ages (Ma) | | | | | | Morphologic classification |
| Spots | | Pb |  | Th | U | Th/U | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ |
| 66 | | 68 |  | 364 | 733 | 0.50 | 0.0513 | 0.0014 | 0.1892 | 0.0048 | 0.0270 | 0.0003 | 0.3801 | 257 | 64.8 | 176 | 4.1 | 171 | 1.6 | 1C |
| 67 | | 147 |  | 48.6 | 67.7 | 0.72 | 0.1697 | 0.0029 | 10.9005 | 0.1958 | 0.4655 | 0.0047 | 0.5578 | 2554 | 28.9 | 2515 | 16.8 | 2464 | 20.6 | 3 |
| 68 | | 340 |  | 328 | 982 | 0.33 | 0.1304 | 0.0020 | 2.4257 | 0.0476 | 0.1343 | 0.0016 | 0.6043 | 2103 | 26.9 | 1250 | 14.1 | 812 | 9.1 | 3 |
| 69 | | 436 |  | 215 | 189 | 1.14 | 0.1217 | 0.0019 | 5.8566 | 0.0981 | 0.3481 | 0.0028 | 0.4738 | 1981 | 27.6 | 1955 | 14.6 | 1926 | 13.3 | 3 |
| 70 | | 124 |  | 67.5 | 109 | 0.62 | 0.1037 | 0.0020 | 4.2861 | 0.0841 | 0.2999 | 0.0030 | 0.5114 | 1691 | 36.3 | 1691 | 16.2 | 1691 | 14.9 | 3 |
| 71 | | 69 |  | 189 | 218 | 0.87 | 0.0547 | 0.0017 | 0.4438 | 0.0143 | 0.0588 | 0.0006 | 0.3395 | 467 | 75.0 | 373 | 10.0 | 368 | 3.9 | 1A |
| 72 | | 128 |  | 76.6 | 63.9 | 1.20 | 0.1022 | 0.0020 | 4.0441 | 0.0811 | 0.2868 | 0.0029 | 0.5116 | 1665 | 35.5 | 1643 | 16.4 | 1625 | 14.8 | 1D |
| 73 | | 530 |  | 177 | 673 | 0.26 | 0.1656 | 0.0021 | 9.2427 | 0.1267 | 0.4031 | 0.0026 | 0.4777 | 2513 | 53.9 | 2362 | 12.7 | 2183 | 12.2 | 3 |
| 74 | | 101 |  | 647 | 461 | 1.40 | 0.0531 | 0.0016 | 0.1832 | 0.0052 | 0.0252 | 0.0003 | 0.4128 | 345 | 101 | 171 | 4.4 | 161 | 1.8 | 3 |
| 75 | | 198 |  | 102 | 852 | 0.12 | 0.1047 | 0.0019 | 0.7402 | 0.0120 | 0.0512 | 0.0004 | 0.4959 | 1709 | 33.3 | 563 | 7.0 | 322 | 2.5 | 3 |
| 76 | | 59 |  | 315 | 468 | 0.67 | 0.0516 | 0.0016 | 0.1755 | 0.0055 | 0.0246 | 0.0002 | 0.3017 | 333 | 74.1 | 164 | 4.8 | 157 | 1.5 | 1A |
| 77 | | 85 |  | 245 | 267 | 0.92 | 0.0873 | 0.0055 | 0.4030 | 0.0273 | 0.0329 | 0.0004 | 0.1827 | 1369 | 120 | 344 | 19.7 | 209 | 2.5 | 1A |
| 78 | | 363 |  | 369 | 493 | 0.75 | 0.2339 | 0.0061 | 1.4502 | 0.0519 | 0.0436 | 0.0007 | 0.4195 | 3079 | 41.4 | 910 | 21.5 | 275 | 4.0 | 1A |
| 79 | | 379 |  | 112 | 170 | 0.66 | 0.1658 | 0.0024 | 10.5272 | 0.1514 | 0.4579 | 0.0036 | 0.5525 | 2517 | 24.1 | 2482 | 13.4 | 2430 | 16.1 | 1A |
| 80 | | 184 |  | 49.0 | 364 | 0.13 | 0.1156 | 0.0019 | 4.8904 | 0.0788 | 0.3049 | 0.0024 | 0.4980 | 1900 | 29.6 | 1801 | 13.6 | 1716 | 12.1 | 3 |
| 81 | | 722 |  | 221 | 288 | 0.77 | 0.1587 | 0.0026 | 10.0263 | 0.1700 | 0.4548 | 0.0039 | 0.5020 | 2442 | 28.1 | 2437 | 15.7 | 2417 | 17.2 | 3 |
|  | **W** | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | | 55.4 |  | 200 | 393 | 0.51 | 0.0519 | 0.0016 | 0.2435 | 0.0072 | 0.0339 | 0.0003 | 0.3392 | 283 | 68.5 | 221 | 5.9 | 215 | 2.1 | 1A |
| 2 | | 41.3 |  | 40.5 | 63.5 | 0.64 | 0.0686 | 0.0025 | 1.1225 | 0.0397 | 0.1188 | 0.0016 | 0.3710 | 888 | 74.1 | 764 | 19.0 | 724 | 9.0 | 3 |
| 3 | | 67 |  | 70.6 | 68.6 | 1.03 | 0.0732 | 0.0028 | 1.2924 | 0.0479 | 0.1289 | 0.0016 | 0.3344 | 1020 | 78.6 | 842 | 21.2 | 782 | 9.1 | 1C |
| 4 | | 90 |  | 313 | 686 | 0.46 | 0.0515 | 0.0013 | 0.2497 | 0.0064 | 0.0351 | 0.0003 | 0.3284 | 265 | 56.5 | 226 | 5.2 | 222 | 1.8 | 1C |
| 5 | | 208.2 |  | 11.6 | 660 | 0.02 | 0.1216 | 0.0017 | 5.9574 | 0.0837 | 0.3533 | 0.0020 | 0.4021 | 1981 | 25.0 | 1970 | 12.3 | 1950 | 9.6 | 1A |

Table S2 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | Isotopic ratios | | | | | | rho | Apparent ages (Ma) | | | | | | Morphologic classification |
| Spots | Pb | Th | U | Th/U | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ |
| 6 | 76 | 128 | 122 | 1.05 | 0.0622 | 0.0025 | 0.6837 | 0.0271 | 0.0798 | 0.0009 | 0.2929 | 680 | 84.1 | 529 | 16.4 | 495 | 5.5 | 1C |
| 7 | 545 | 214 | 406 | 0.53 | 0.1207 | 0.0019 | 5.6936 | 0.0943 | 0.3405 | 0.0026 | 0.4627 | 1966 | 27.9 | 1930 | 14.4 | 1889 | 12.6 | 3 |
| 8 | 126 | 32.9 | 190 | 0.17 | 0.1208 | 0.0026 | 5.7668 | 0.1339 | 0.3444 | 0.0027 | 0.3363 | 1968 | 38.6 | 1941 | 20.1 | 1908 | 12.9 | 1A |
| 9 | 234 | 53.3 | 508 | 0.10 | 0.1162 | 0.0015 | 5.2583 | 0.0737 | 0.3267 | 0.0023 | 0.5084 | 1898 | 22.7 | 1862 | 12.0 | 1822 | 11.4 | 1A |
| 10 | 53.3 | 56.0 | 96.1 | 0.58 | 0.0652 | 0.0020 | 1.1521 | 0.0355 | 0.1283 | 0.0013 | 0.3172 | 789 | 61.0 | 778 | 16.8 | 778 | 7.2 | 1D |
| 11 | 69 | 74.7 | 104 | 0.72 | 0.0682 | 0.0019 | 1.2009 | 0.0322 | 0.1278 | 0.0013 | 0.3930 | 876 | 57.4 | 801 | 14.9 | 775 | 7.7 | 1D |
| 12 | 250 | 80.7 | 209 | 0.39 | 0.1319 | 0.0021 | 7.0116 | 0.1170 | 0.3838 | 0.0033 | 0.5170 | 2124 | 28.1 | 2113 | 14.9 | 2094 | 15.5 | 1D |
| 13 | 55.4 | 1058 | 2417 | 0.44 | 0.0487 | 0.0040 | 0.0419 | 0.0032 | 0.0063 | 0.0001 | 0.1776 | 200 | 117 | 41.6 | 3.1 | 40.4 | 0.5 | 1A |
| 14 | 169 | 52.6 | 40.4 | 1.30 | 0.1720 | 0.0030 | 11.4936 | 0.1972 | 0.4840 | 0.0046 | 0.5487 | 2577 | 29.0 | 2564 | 16.1 | 2545 | 19.8 | 1D |
| 15 | 358 | 92.3 | 236 | 0.39 | 0.1674 | 0.0022 | 10.9908 | 0.1470 | 0.4743 | 0.0032 | 0.4975 | 2532 | 22.2 | 2522 | 12.6 | 2502 | 13.9 | 1A |
| 16 | 218 | 70.9 | 34.2 | 2.07 | 0.1649 | 0.0031 | 10.5879 | 0.1868 | 0.4670 | 0.0052 | 0.6289 | 2506 | 31.5 | 2488 | 16.5 | 2470 | 22.8 | 3 |
| 17 | 283 | 101 | 278 | 0.36 | 0.1147 | 0.0020 | 5.2992 | 0.0971 | 0.3341 | 0.0031 | 0.5028 | 1876 | 30.9 | 1869 | 15.7 | 1858 | 14.9 | 1A |
| 18 | 181 | 52.3 | 395 | 0.13 | 0.1128 | 0.0018 | 4.6059 | 0.0742 | 0.2949 | 0.0020 | 0.4210 | 1856 | 28.4 | 1750 | 13.5 | 1666 | 10.0 | 1A |
| 19 | 63.2 | 197 | 1505 | 0.13 | 0.0519 | 0.0011 | 0.2303 | 0.0054 | 0.0322 | 0.0004 | 0.5638 | 280 | 48.1 | 210 | 4.4 | 204 | 2.6 | 1D |
| 20 | 54.8 | 181 | 740 | 0.24 | 0.0514 | 0.0012 | 0.2327 | 0.0056 | 0.0327 | 0.0003 | 0.3667 | 257 | 49.1 | 212 | 4.6 | 208 | 1.8 | 1C |
| 21 | 67.1 | 103 | 591 | 0.17 | 0.0574 | 0.0011 | 0.4913 | 0.0090 | 0.0619 | 0.0005 | 0.4154 | 506 | 40.7 | 406 | 6.2 | 387 | 2.9 | 1A |
| 22 | 373 | 123 | 435 | 0.28 | 0.1143 | 0.0014 | 5.4591 | 0.0800 | 0.3448 | 0.0033 | 0.6510 | 1869 | 22.2 | 1894 | 12.6 | 1910 | 15.8 | 2 |
| 23 | 135.7 | 20.7 | 252 | 0.08 | 0.1469 | 0.0020 | 8.0869 | 0.1175 | 0.3972 | 0.0028 | 0.4849 | 2310 | 28.7 | 2241 | 13.2 | 2156 | 13.0 | 3 |
| 24 | 689 | 204 | 176 | 1.16 | 0.1509 | 0.0019 | 1.3050 | 0.0214 | 0.5124 | 0.0066 | 0.5339 | 2367 | 22.2 | 848 | 9.4 | 2667 | 28.3 | 3 |
| 25 | 141 | 59.4 | 142 | 0.42 | 0.1206 | 0.0023 | 4.1686 | 0.0797 | 0.2496 | 0.0021 | 0.4378 | 1966 | 33.3 | 1668 | 15.7 | 1436 | 10.8 | 3 |
| 26 | 399 | 116 | 182 | 0.64 | 0.1697 | 0.0022 | 11.7257 | 0.1838 | 0.4988 | 0.0052 | 0.6609 | 2555 | 21.9 | 2583 | 14.8 | 2609 | 22.3 | 1A |
| 27 | 159 | 57.8 | 172 | 0.34 | 0.1183 | 0.0018 | 5.5006 | 0.0872 | 0.3360 | 0.0026 | 0.4917 | 1931 | 31.9 | 1901 | 13.7 | 1868 | 12.7 | 1D |

Table S2 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | Isotopic ratios | | | | | | rho | Apparent ages (Ma) | | | | | | Morphologic classification |
| Spots | Pb | Th | U | Th/U | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ |
| 28 | 138 | 288 | 406 | 0.71 | 0.0577 | 0.0015 | 0.5316 | 0.0127 | 0.0669 | 0.0005 | 0.3082 | 517 | 55.6 | 433 | 8.4 | 417 | 3.0 | 1A |
| 29 | 71 | 77.5 | 106 | 0.73 | 0.0665 | 0.0019 | 1.1737 | 0.0341 | 0.1283 | 0.0014 | 0.3780 | 820 | 59.3 | 788 | 15.9 | 778 | 8.1 | 1A |
| 30 | 399 | 109 | 179 | 0.61 | 0.1693 | 0.0024 | 11.8882 | 0.1970 | 0.5075 | 0.0049 | 0.5792 | 2551 | 24.1 | 2596 | 15.6 | 2646 | 20.9 | 1A |
| 31 | 485 | 162 | 861 | 0.19 | 0.1086 | 0.0014 | 4.6719 | 0.0690 | 0.3106 | 0.0028 | 0.6016 | 1776 | 29.8 | 1762 | 12.4 | 1744 | 13.6 | 1C |
| 32 | 131 | 60.7 | 81.3 | 0.75 | 0.1572 | 0.0034 | 5.0752 | 0.0983 | 0.2350 | 0.0024 | 0.5238 | 2426 | 37.3 | 1832 | 16.5 | 1360 | 12.5 | 3 |
| 33 | 127 | 357 | 748 | 0.48 | 0.0589 | 0.0013 | 0.3599 | 0.0089 | 0.0440 | 0.0005 | 0.4462 | 561 | 43.5 | 312 | 6.7 | 277 | 3.0 | 1A |
| 34 | 54.3 | 46.8 | 91.4 | 0.51 | 0.0712 | 0.0022 | 1.4268 | 0.0436 | 0.1457 | 0.0018 | 0.3966 | 963 | 63.4 | 900 | 18.3 | 877 | 10.0 | 3 |
| 35 | 163 | 784 | 684 | 1.15 | 0.0519 | 0.0017 | 0.2362 | 0.0080 | 0.0328 | 0.0004 | 0.3310 | 280 | 74.1 | 215 | 6.6 | 208 | 2.3 | 1D |
| 36 | 8.4 | 30.6 | 56.6 | 0.54 | 0.0549 | 0.0048 | 0.2692 | 0.0214 | 0.0365 | 0.0008 | 0.2628 | 406 | 200 | 242 | 17.1 | 231 | 4.7 | 1D |
| 37 | 149 | 175 | 134 | 1.30 | 0.0653 | 0.0019 | 1.1715 | 0.0358 | 0.1299 | 0.0016 | 0.4009 | 785 | 66.8 | 787 | 16.7 | 787 | 9.1 | 3 |
| 38 | 546 | 194 | 244 | 0.80 | 0.1421 | 0.0021 | 8.3820 | 0.1293 | 0.4265 | 0.0040 | 0.6130 | 2254 | 24.7 | 2273 | 14.1 | 2290 | 18.3 | 3 |
| 39 | 74 | 92.3 | 91.3 | 1.01 | 0.0618 | 0.0022 | 1.0503 | 0.0367 | 0.1237 | 0.0014 | 0.3267 | 733 | 77.8 | 729 | 18.2 | 752 | 8.1 | 1A |
| 40 | 59.7 | 243 | 459 | 0.53 | 0.0499 | 0.0016 | 0.2413 | 0.0075 | 0.0352 | 0.0004 | 0.3657 | 187 | 69.4 | 219 | 6.2 | 223 | 2.5 | 3 |
| 41 | 225 | 92.0 | 244 | 0.38 | 0.1087 | 0.0021 | 5.0112 | 0.1015 | 0.3344 | 0.0037 | 0.5420 | 1789 | 35.2 | 1821 | 17.2 | 1859 | 17.8 | 3 |
| 42 | 209 | 236 | 451 | 0.52 | 0.0625 | 0.0013 | 1.0699 | 0.0291 | 0.1242 | 0.0024 | 0.6989 | 700 | 44.4 | 739 | 14.3 | 755 | 13.5 | 1C |
| 43 | 836 | 256 | 375 | 0.68 | 0.1522 | 0.0024 | 9.8932 | 0.1590 | 0.4709 | 0.0037 | 0.4827 | 2372 | 27.6 | 2425 | 14.9 | 2488 | 16.1 | 1A |
| 44 | 605 | 1091 | 3209 | 0.34 | 0.0555 | 0.0009 | 0.5312 | 0.0081 | 0.0693 | 0.0005 | 0.4592 | 432 | 33.3 | 433 | 5.4 | 432 | 2.9 | 3 |
| 45 | 176 | 56.1 | 66.6 | 0.84 | 0.1620 | 0.0029 | 10.4349 | 0.1821 | 0.4667 | 0.0041 | 0.5058 | 2476 | 29.9 | 2474 | 16.3 | 2469 | 18.2 | 1C |
| 46 | 144 | 501 | 773 | 0.65 | 0.0530 | 0.0014 | 0.3069 | 0.0080 | 0.0418 | 0.0004 | 0.3333 | 328 | 26.9 | 272 | 6.2 | 264 | 2.3 | 1B |
| 47 | 1501 | 494 | 779 | 0.63 | 0.1621 | 0.0026 | 9.3032 | 0.1535 | 0.4139 | 0.0036 | 0.5323 | 2477 | 27.6 | 2368 | 15.2 | 2233 | 16.6 | 3 |
| 48 | 190 | 144 | 181 | 0.79 | 0.0793 | 0.0018 | 2.1221 | 0.0453 | 0.1936 | 0.0018 | 0.4411 | 1189 | 44.4 | 1156 | 14.8 | 1141 | 9.9 | 1A |
| 49 | 27.0 | 132 | 314 | 0.42 | 0.0493 | 0.0022 | 0.1827 | 0.0082 | 0.0270 | 0.0004 | 0.3044 | 165 | 106 | 170 | 7.1 | 172 | 2.3 | 1A |

Table S2 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | Isotopic ratios | | | | | | rho | Apparent ages (Ma) | | | | | | Morphologic classification |
| Spots | Pb | Th | U | Th/U | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ | 207Pb/206Pb | 2σ | 207Pb/235U | 2σ | 206Pb/238U | 2σ |
| 50 | 99 | 197 | 280 | 0.70 | 0.0560 | 0.0016 | 0.5656 | 0.0164 | 0.0728 | 0.0008 | 0.3747 | 454 | 65.7 | 455 | 10.7 | 453 | 4.8 | 1A |
| 51 | 476 | 90.4 | 539 | 0.17 | 0.1727 | 0.0023 | 10.4563 | 0.1434 | 0.4363 | 0.0030 | 0.5014 | 2584 | 22.8 | 2476 | 12.8 | 2334 | 13.5 | 3 |
| 52 | 97 | 399 | 746 | 0.53 | 0.0511 | 0.0013 | 0.2284 | 0.0060 | 0.0323 | 0.0003 | 0.3744 | 243 | 56.5 | 209 | 5.0 | 205 | 2.0 | 1C |
| 53 | 111 | 62.4 | 669 | 0.09 | 0.0691 | 0.0011 | 1.4629 | 0.0244 | 0.1526 | 0.0011 | 0.4362 | 902 | 61.1 | 915 | 10.1 | 915 | 6.2 | 1A |
| 54 | 41 | 31.4 | 49 | 0.64 | 0.0668 | 0.0028 | 1.2064 | 0.0498 | 0.1316 | 0.0018 | 0.3318 | 833 | 87.0 | 804 | 22.9 | 797 | 10.3 | 3 |
| 55 | 65 | 82 | 109 | 0.75 | 0.0569 | 0.0023 | 0.5533 | 0.0218 | 0.0712 | 0.0009 | 0.3195 | 500 | 90.7 | 447 | 14.3 | 443 | 5.4 | 1C |
| 56 | 202 | 497 | 463 | 1.07 | 0.0534 | 0.0015 | 0.2985 | 0.0084 | 0.0406 | 0.0005 | 0.3955 | 346 | 64.8 | 265 | 6.6 | 256 | 2.8 | 1A |
| 57 | 208 | 53 | 87 | 0.61 | 0.1572 | 0.0026 | 8.2139 | 0.1406 | 0.3768 | 0.0031 | 0.4863 | 2428 | 27.8 | 2255 | 15.6 | 2061 | 14.7 | 3 |
| 58 | 1150 | 280 | 132 | 2.12 | 0.1604 | 0.0026 | 10.0959 | 0.1747 | 0.4538 | 0.0043 | 0.5425 | 2461 | 27.2 | 2444 | 16.1 | 2412 | 18.9 | 1C |
| 59 | 170 | 37 | 45 | 0.82 | 0.1644 | 0.0036 | 10.7061 | 0.2489 | 0.4693 | 0.0045 | 0.4143 | 2501 | 37.0 | 2498 | 21.7 | 2480 | 19.9 | 3 |
| 60 | 67 | 199 | 317 | 0.63 | 0.0536 | 0.0021 | 0.2417 | 0.0090 | 0.0328 | 0.0004 | 0.3081 | 354 | 87.0 | 220 | 7.4 | 208 | 2.4 | 1A |
| 61 | 288 | 224 | 366 | 0.61 | 0.0640 | 0.0013 | 1.1184 | 0.0219 | 0.1263 | 0.0011 | 0.4433 | 743 | 42.6 | 762 | 10.5 | 766 | 6.3 | 1C |
| 62 | 123 | 40 | 67 | 0.60 | 0.1044 | 0.0023 | 4.4266 | 0.0933 | 0.3073 | 0.0029 | 0.4510 | 1703 | 41.1 | 1717 | 17.5 | 1727 | 14.4 | 1G |
| 63 | 118 | 150 | 374 | 0.40 | 0.0583 | 0.0015 | 0.5736 | 0.0145 | 0.0713 | 0.0008 | 0.4435 | 543 | 55.5 | 460 | 9.4 | 444 | 4.8 | 3 |
| 64 | 53 | 122 | 264 | 0.46 | 0.0549 | 0.0019 | 0.2926 | 0.0101 | 0.0387 | 0.0005 | 0.3529 | 409 | 79.6 | 261 | 7.9 | 245 | 2.9 | 1C |
| 65 | 194 | 128 | 204 | 0.63 | 0.0785 | 0.0026 | 1.3712 | 0.0549 | 0.1242 | 0.0015 | 0.2963 | 1158 | 66.7 | 877 | 23.5 | 754 | 8.4 | 2 |

Table S3. Zircon LA-ICP-MS trace element concentrations for samples analyzed (ppm).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Spot | Ti | Y | Nb | La | Ce | Pr | Nd | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu | Hf | Ta | Th | U |
| **PT-01** | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 3.21 | 480 | 1.91 | 5.92 | 48.1 | 15.8 | 9.25 | 3.42 | 0.83 | 10.6 | 3.07 | 39.3 | 14.9 | 70.6 | 17.9 | 198 | 38.4 | 11008 | 0.98 | 307 | 606 |
| 2 | 10.0 | 1262 | 1.47 | 2.16 | 16.3 | 3.85 | 2.85 | 3.96 | 0.88 | 19.9 | 7.42 | 102 | 41.4 | 203 | 47.9 | 472 | 88.4 | 10104 | 0.59 | 86.8 | 105 |
| 3 | 4.19 | 432 | 1.70 | 0.083 | 25.2 | 0.58 | 1.37 | 1.69 | 0.43 | 7.88 | 2.66 | 33.0 | 12.8 | 65.6 | 16.5 | 183 | 36.3 | 10868 | 0.96 | 226 | 493 |
| 6 | 12.5 | 733 | 1.69 | 0.015 | 18.7 | 2.07 | 4.32 | 4.96 | 1.04 | 18.1 | 5.37 | 64.6 | 23.0 | 106 | 24.5 | 245 | 44.1 | 9465 | 0.89 | 185 | 323 |
| 7 | 6.38 | 676 | 2.09 | 0.25 | 29.5 | 1.99 | 3.02 | 4.88 | 1.66 | 18.7 | 5.90 | 58.7 | 21.8 | 101 | 24.5 | 250 | 47.8 | 10107 | 1.19 | 241 | 431 |
| 9 | 12.1 | 923 | 2.66 | 0.10 | 26.7 | 1.42 | 2.81 | 4.48 | 0.43 | 19.0 | 6.65 | 82.2 | 30.9 | 142 | 33.1 | 317 | 54.9 | 10495 | 1.26 | 193 | 351 |
| 10 | 8.80 | 1860 | 3.25 | 0.17 | 39.5 | 9.24 | 17.0 | 20.7 | 6.56 | 63.5 | 17.9 | 189 | 61.4 | 258 | 57.8 | 541 | 96.1 | 8155 | 1.06 | 341 | 197 |
| 11 | 4.61 | 527 | 1.66 | 33.6 | 119 | 99.1 | 62.8 | 9.14 | 1.61 | 13.5 | 3.52 | 40.7 | 15.4 | 78.8 | 20.4 | 222 | 44.2 | 10463 | 1.01 | 303 | 612 |
| 12 | 13.5 | 554 | 3.23 | 0.021 | 5.25 | 1.10 | 2.56 | 4.80 | 0.19 | 16.5 | 4.97 | 53.7 | 18.4 | 77.1 | 17.6 | 169 | 30.6 | 11502 | 1.87 | 189 | 673 |
| 13 | 2.56 | 440 | 1.82 | 0.039 | 28.0 | 0.46 | 0.94 | 1.39 | 0.61 | 7.14 | 2.37 | 30.4 | 12.5 | 67.2 | 17.6 | 200 | 42.5 | 10377 | 0.60 | 284 | 564 |
| 14 | 1.62 | 732 | 1.80 | 0.023 | 10.6 | 0.25 | 1.07 | 1.62 | 0.46 | 9.79 | 4.29 | 60.3 | 23.0 | 109 | 25.3 | 241 | 45.6 | 12554 | 1.40 | 67.4 | 230 |
| 15 | 15.7 | 903 | 4.46 | 0.31 | 9.08 | 1.64 | 3.01 | 2.78 | 0.40 | 17.2 | 6.15 | 80.3 | 30.0 | 137 | 31.0 | 284 | 49.3 | 9853 | 1.92 | 129 | 263 |
| 16 | 5.24 | 4038 | 42.7 | 0.33 | 38.9 | 2.55 | 4.70 | 10.9 | 0.93 | 73.9 | 28.6 | 379 | 144 | 646 | 138 | 1230 | 210 | 11703 | 9.32 | 491 | 823 |
| 17 | 18.3 | 1445 | 3.95 | 0.040 | 26.1 | 2.03 | 5.06 | 8.35 | 0.22 | 35.2 | 11.7 | 147 | 50.6 | 216 | 45.2 | 396 | 62.5 | 12758 | 1.57 | 559 | 345 |
| 18 | 4.06 | 754 | 2.92 | 9.21 | 65.5 | 27.2 | 15.7 | 5.44 | 0.91 | 14.4 | 4.82 | 59.2 | 23.2 | 114 | 28.7 | 300 | 57.6 | 10564 | 1.55 | 329 | 603 |
| 19 | 3.48 | 954 | 5.38 | 0.42 | 56.3 | 3.49 | 4.54 | 4.94 | 1.62 | 18.9 | 6.20 | 76.8 | 28.8 | 140 | 34.6 | 371 | 73.0 | 10948 | 1.61 | 524 | 842 |
| 20 | 6.76 | 1267 | 2.94 | 0.012 | 32.0 | 1.26 | 3.31 | 6.01 | 2.29 | 28.9 | 9.34 | 113 | 40.7 | 183 | 42.0 | 410 | 77.4 | 10278 | 0.72 | 113 | 94.8 |
| 21 | 37.2 | 1871 | 3.41 | 3.89 | 43.4 | 63.4 | 64.9 | 49.7 | 19.8 | 123 | 33.4 | 273 | 62.3 | 214 | 43.5 | 383 | 63.6 | 13635 | 5.18 | 176 | 1346 |
| 22 | 4.04 | 479 | 1.76 | 5.08 | 41.4 | 13.6 | 10.3 | 3.03 | 0.73 | 9.08 | 2.84 | 37.6 | 15.0 | 76.5 | 19.8 | 216 | 45.4 | 10028 | 0.72 | 219 | 282 |
| 23 | 3.98 | 1664 | 108 | 0.35 | 19.6 | 9.81 | 11.8 | 10.0 | 2.46 | 28.4 | 10.8 | 141 | 52.9 | 254 | 59.4 | 564 | 92.8 | 15161 | 42.7 | 183 | 851 |
| 24 | 14.1 | 1468 | 1.49 | 0.061 | 81.2 | 4.18 | 9.34 | 11.0 | 2.28 | 39.4 | 12.1 | 141 | 50.5 | 227 | 49.9 | 460 | 85.0 | 7371 | 0.49 | 141 | 66.4 |
| 25 | 14.0 | 471 | 2.14 | 0.052 | 6.06 | 0.53 | 1.92 | 4.19 | 0.24 | 15.7 | 4.74 | 48.1 | 15.6 | 67.7 | 15.7 | 152 | 28.4 | 12366 | 0.91 | 129 | 387 |

Table S3 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Spot | Ti | Y | Nb | La | Ce | Pr | Nd | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu | Hf | Ta | Th | U |
| 26 | 7.72 | 1018 | 4.43 | 0.51 | 22.5 | 7.56 | 8.50 | 8.35 | 2.66 | 26.6 | 8.33 | 89.9 | 31.6 | 154 | 37.4 | 386 | 73.7 | 10511 | 1.79 | 206 | 479 |
| 27 | 11.9 | 1023 | 2.19 | 0.25 | 46.7 | 9.18 | 18.1 | 16.2 | 3.65 | 47.7 | 12.1 | 118 | 34.8 | 132 | 27.0 | 235 | 38.8 | 9192 | 1.17 | 275 | 169 |
| 28 | 8.37 | 1624 | 4.30 | 3.07 | 109 | 47.7 | 50.4 | 37.9 | 12.5 | 89.5 | 22.5 | 190 | 51.3 | 211 | 46.7 | 477 | 90.3 | 10337 | 0.95 | 1043 | 971 |
| 29 | 4.68 | 573 | 2.59 | 1.57 | 38.6 | 5.60 | 4.96 | 2.10 | 0.77 | 9.35 | 3.17 | 39.9 | 16.3 | 86.8 | 23.5 | 259 | 55.8 | 10744 | 0.81 | 361 | 660 |
| 30 | 7.80 | 457 | 0.92 | 0.019 | 12.7 | 0.68 | 1.46 | 2.74 | 0.56 | 9.74 | 3.45 | 38.9 | 14.8 | 70.2 | 16.2 | 157 | 29.4 | 9516 | 0.48 | 84.7 | 119 |
| 31 | 5.72 | 559 | 2.31 | 7.29 | 38.3 | 16.0 | 8.95 | 2.87 | 0.67 | 9.62 | 3.13 | 41.3 | 16.9 | 87.9 | 23.0 | 252 | 53.2 | 10708 | 1.28 | 331 | 416 |
| 32 | 4.13 | 1198 | 9.68 | 0.0000 | 20.5 | 0.33 | 1.67 | 4.10 | 0.32 | 16.7 | 6.57 | 90.8 | 37.5 | 200 | 53.1 | 568 | 108 | 13356 | 5.43 | 527 | 757 |
| 33 | 7.53 | 946 | 3.54 | 0.0000 | 32.8 | 0.62 | 1.50 | 2.68 | 1.13 | 14.4 | 5.30 | 70.8 | 29.2 | 153 | 39.2 | 427 | 89.8 | 9459 | 0.93 | 228 | 180 |
| 34 | 8.02 | 824 | 3.18 | 0.069 | 27.8 | 3.64 | 8.18 | 8.54 | 1.20 | 27.5 | 7.83 | 82.4 | 27.2 | 116 | 24.8 | 231 | 41.0 | 9983 | 1.10 | 313 | 320 |
| 35 | 26.6 | 1879 | 1.61 | 0.058 | 15.1 | 5.64 | 12.8 | 12.8 | 2.23 | 54.5 | 16.2 | 185 | 63.8 | 267 | 55.6 | 489 | 86.3 | 7775 | 0.83 | 221 | 149 |
| 36 | 4.68 | 1013 | 2.61 | 0.70 | 35.4 | 18.1 | 26.8 | 15.3 | 3.91 | 32.3 | 8.71 | 92.2 | 31.9 | 148 | 35.2 | 358 | 69.4 | 9952 | 1.23 | 196 | 561 |
| 37 | 3.41 | 1684 | 2.02 | 12.9 | 42.0 | 42.6 | 30.5 | 10.8 | 0.92 | 36.0 | 12.3 | 153 | 56.4 | 262 | 60.5 | 563 | 101 | 10783 | 1.05 | 201 | 533 |
| 39 | 1.89 | 455 | 2.04 | 26.1 | 96.5 | 76.3 | 46.1 | 6.78 | 1.45 | 10.2 | 2.68 | 33.3 | 12.8 | 67.8 | 17.6 | 196 | 42.3 | 9934 | 0.75 | 331 | 654 |
| 40 | 14.6 | 646 | 1.63 | 0.45 | 26.2 | 5.07 | 5.78 | 4.87 | 1.61 | 17.1 | 4.93 | 57.1 | 20.4 | 93.6 | 22.2 | 222 | 43.1 | 9234 | 0.65 | 147 | 164 |
| 41 | 107 | 357 | 2.91 | 0.81 | 5.17 | 4.65 | 3.85 | 3.93 | 0.37 | 15.9 | 4.92 | 44.2 | 10.7 | 33.9 | 5.89 | 46.8 | 7.13 | 8995 | 0.75 | 58.5 | 199 |
| 42 | 4.21 | 460 | 1.92 | 0.038 | 10.2 | 0.85 | 0.68 | 1.16 | 0.38 | 6.32 | 2.59 | 36.7 | 15.1 | 75.0 | 17.9 | 178 | 32.7 | 13059 | 1.60 | 96.7 | 661 |
| 43 | 36.9 | 2598 | 3.39 | 12.7 | 37.0 | 4.13 | 31.3 | 67.5 | 24.7 | 322 | 70.2 | 450 | 93.3 | 293 | 53.4 | 449 | 71.9 | 10774 | 1.22 | 303 | 415 |
| 44 | 12.4 | 877 | 0.94 | 0.065 | 8.83 | 0.098 | 1.51 | 3.05 | 0.55 | 17.2 | 5.99 | 75.7 | 29.0 | 140 | 31.8 | 313 | 58.5 | 9147 | 0.43 | 37.1 | 71.9 |
| 45 | 9.23 | 2881 | 1.74 | 0.37 | 1.70 | 0.20 | 3.49 | 7.04 | 0.43 | 49.2 | 19.4 | 259 | 98.4 | 441 | 93.1 | 849 | 143 | 12064 | 1.09 | 97.4 | 358 |
| 46 | 16.8 | 3237 | 1.33 | 25.2 | 28.0 | 8.66 | 49.9 | 36.7 | 11.2 | 100 | 29.5 | 318 | 105 | 449 | 93.8 | 830 | 133 | 12900 | 0.84 | 137 | 672 |
| 47 | 2.17 | 484 | 1.71 | 0.63 | 23.4 | 0.013 | 0.63 | 0.85 | 0.53 | 5.85 | 2.07 | 28.4 | 13.1 | 75.4 | 21.5 | 264 | 63.6 | 9567 | 0.29 | 213 | 269 |
| 48 | 5.40 | 889 | 1.01 | 1.51 | 10.8 | 0.33 | 3.13 | 6.12 | 1.40 | 32.8 | 8.85 | 91.8 | 30.2 | 123 | 25.2 | 235 | 40.5 | 9387 | 0.30 | 156 | 241 |
| 49 | 5.48 | 814 | 0.79 | 0.0000 | 15.8 | 0.30 | 3.49 | 5.61 | 1.00 | 21.0 | 6.46 | 74.4 | 26.1 | 118 | 26.5 | 253 | 45.0 | 10486 | 0.63 | 191 | 401 |

Table S3 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Spot | Ti | Y | Nb | La | Ce | Pr | Nd | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu | Hf | Ta | Th | U |
| 50 | 7.86 | 701 | 0.68 | 0.50 | 17.0 | 0.36 | 4.10 | 4.39 | 1.70 | 18.3 | 4.79 | 56.7 | 21.4 | 103 | 25.4 | 273 | 55.7 | 8930 | 0.36 | 101 | 111 |
| 51 | 14.4 | 2644 | 1.74 | 0.62 | 15.9 | 0.51 | 6.44 | 10.7 | 2.05 | 60.9 | 20.4 | 249 | 88.8 | 393 | 83.2 | 754 | 133 | 8999 | 0.63 | 125 | 119 |
| 53 | 7.97 | 1205 | 3.05 | 0.72 | 24.5 | 0.17 | 2.52 | 4.99 | 0.29 | 25.9 | 9.00 | 110 | 40.6 | 187 | 40.2 | 368 | 63.3 | 10071 | 1.36 | 216 | 265 |
| 54 | 6.98 | 852 | 0.76 | 0.0087 | 8.56 | 0.29 | 3.20 | 4.28 | 1.81 | 20.0 | 6.06 | 70.1 | 26.6 | 123 | 29.1 | 301 | 58.8 | 7834 | 0.31 | 148 | 172 |
| 55 | 12.1 | 1390 | 2.14 | 30.4 | 110 | 10.0 | 56.5 | 46.9 | 16.5 | 121 | 24.3 | 177 | 42.6 | 158 | 33.6 | 315 | 55.5 | 10529 | 0.27 | 695 | 817 |
| 56 | 7.81 | 951 | 3.31 | 335 | 173 | 16.5 | 59.4 | 17.5 | 3.65 | 41.0 | 10.4 | 100 | 31.6 | 134 | 29.4 | 269 | 48.7 | 8781 | 1.17 | 624 | 494 |
| 57 | 5.70 | 2133 | 1.49 | 0.0000 | 0.67 | 0.087 | 0.60 | 2.82 | 0.0025 | 26.0 | 13.0 | 182 | 70.0 | 327 | 73.8 | 695 | 121 | 12518 | 0.88 | 63.9 | 686 |
| 58 | 14.7 | 745 | 2.92 | 0.0000 | 16.2 | 0.13 | 1.34 | 2.70 | 0.20 | 16.2 | 5.46 | 67.5 | 24.6 | 111 | 24.1 | 223 | 38.1 | 11672 | 1.27 | 236 | 303 |
| 59 | 3.67 | 2777 | 3.67 | 1.92 | 142 | 1.97 | 25.1 | 29.7 | 10.6 | 104 | 27.4 | 281 | 90.8 | 385 | 81.3 | 770 | 137 | 8676 | 0.84 | 1005 | 671 |
| 61 | 12.8 | 2075 | 2.88 | 0.14 | 18.0 | 10.6 | 11.8 | 13.3 | 1.86 | 60.2 | 19.2 | 211 | 72.8 | 302 | 63.8 | 563 | 92.3 | 9776 | 1.43 | 163 | 258 |
| 63 | 4.11 | 415 | 1.54 | 45.1 | 76.5 | 116 | 33.7 | 3.64 | 0.88 | 8.76 | 2.75 | 31.1 | 12.6 | 61.2 | 15.6 | 173 | 33.9 | 11009 | 0.92 | 270 | 518 |
| 64 | 12.8 | 2527 | 9.21 | 4.89 | 45.9 | 15.0 | 10.6 | 9.59 | 3.31 | 50.4 | 18.2 | 221 | 82.9 | 370 | 83.9 | 796 | 143 | 8586 | 2.12 | 635 | 408 |
| 65 | 20.8 | 2219 | 12.4 | 9.32 | 41.8 | 146 | 73.5 | 36.8 | 11.9 | 111 | 30.4 | 265 | 74.7 | 289 | 59.2 | 521 | 85.9 | 12181 | 5.45 | 120 | 1096 |
| 66 | 4.62 | 520 | 1.55 | 0.0070 | 39.2 | 2.41 | 1.80 | 2.67 | 1.18 | 13.1 | 3.82 | 44.4 | 16.5 | 75.9 | 18.2 | 182 | 35.4 | 9794 | 0.50 | 190 | 197 |
| 67 | 7.89 | 657 | 2.02 | 0.099 | 6.82 | 2.74 | 3.02 | 2.85 | 0.32 | 15.2 | 5.09 | 60.1 | 22.2 | 96.3 | 20.2 | 189 | 32.8 | 9627 | 0.85 | 66.5 | 148 |
| 68 | 7.76 | 1621 | 0.85 | 0.20 | 2.81 | 11.8 | 11.6 | 10.3 | 0.72 | 47.6 | 16.2 | 177 | 55.5 | 218 | 43.9 | 390 | 64.1 | 12777 | 1.48 | 111 | 1196 |
| 69 | 13.6 | 1017 | 3.16 | 0.094 | 4.37 | 2.59 | 3.84 | 4.86 | 0.14 | 22.2 | 8.08 | 95.1 | 34.8 | 156 | 34.0 | 321 | 56.0 | 11523 | 1.33 | 195 | 325 |
| 73 | 6.32 | 1562 | 0.67 | 0.074 | 0.77 | 1.56 | 2.23 | 4.79 | 0.13 | 31.2 | 12.3 | 146 | 51.7 | 222 | 48.0 | 434 | 73.4 | 12782 | 0.62 | 63.6 | 447 |
| 75 | 2.98 | 563 | 2.36 | 0.74 | 34.1 | 3.98 | 2.67 | 2.04 | 0.89 | 9.51 | 3.08 | 39.4 | 16.1 | 83.8 | 22.1 | 244 | 51.4 | 10802 | 0.90 | 359 | 676 |
| 76 | 24.1 | 5907 | 30.1 | 20.3 | 90.2 | 322 | 176 | 103 | 30.0 | 275 | 72.2 | 687 | 214 | 868 | 177 | 1554 | 246 | 12367 | 12.7 | 1336 | 2155 |
| 77 | 0.90 | 1217 | 2.11 | 0.068 | 12.0 | 5.24 | 8.12 | 7.29 | 0.57 | 31.6 | 10.3 | 119 | 41.8 | 182 | 38.6 | 352 | 61.1 | 9265 | 0.57 | 73.6 | 97.7 |
| 78 | 6.41 | 2118 | 9.04 | 14.2 | 34.7 | 65.8 | 29.5 | 10.5 | 0.60 | 38.3 | 14.1 | 177 | 68.6 | 328 | 78.1 | 782 | 140 | 11704 | 3.38 | 355 | 548 |
| 79 | 2.52 | 600 | 2.28 | 2.67 | 28.4 | 10.2 | 3.88 | 1.78 | 0.73 | 10.1 | 3.45 | 43.5 | 17.4 | 89.1 | 22.9 | 255 | 50.4 | 11047 | 1.16 | 351 | 831 |

Table S3 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Spot | Ti | Y | Nb | La | Ce | Pr | Nd | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu | Hf | Ta | Th | U |
| 80 | 3.81 | 547 | 2.13 | 0.0000 | 29.7 | 1.04 | 1.25 | 1.70 | 0.63 | 8.27 | 2.88 | 37.8 | 15.5 | 82.2 | 22.0 | 252 | 52.6 | 11465 | 0.87 | 290 | 631 |
| 81 | 29.0 | 748 | 1.64 | 0.0000 | 5.44 | 1.43 | 1.34 | 2.76 | 0.39 | 16.9 | 6.16 | 68.9 | 24.7 | 107 | 23.5 | 228 | 40.7 | 11291 | 0.98 | 70.1 | 280 |
| **PT-02** | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 27.0 | 729 | 0.91 | 0.017 | 3.71 | 0.41 | 1.42 | 3.38 | 0.14 | 18.2 | 5.97 | 71.1 | 24.8 | 106 | 22.5 | 204 | 33.8 | 10174 | 0.48 | 99.7 | 111 |
| 3 | 11.2 | 632 | 1.86 | 0.91 | 29.0 | 2.41 | 4.14 | 2.86 | 0.71 | 11.7 | 3.97 | 50.9 | 19.6 | 95.2 | 23.5 | 240 | 43.8 | 9859 | 1.07 | 194 | 304 |
| 4 | 20.0 | 296 | 1.33 | 0.0000 | 20.2 | 0.21 | 1.05 | 2.37 | 0.43 | 9.32 | 2.67 | 27.9 | 9.57 | 42.4 | 9.83 | 95.6 | 16.8 | 9203 | 0.54 | 86.5 | 108 |
| 5 | 8.35 | 1244 | 0.59 | 0.016 | 1.06 | 0.21 | 1.34 | 2.80 | 0.065 | 19.5 | 8.08 | 109 | 42.0 | 196 | 44.2 | 399 | 66.5 | 10817 | 0.42 | 54.4 | 234 |
| 6 | 10.3 | 3255 | 1.96 | 0.0069 | 5.26 | 1.53 | 7.50 | 16.1 | 0.36 | 75.0 | 25.3 | 314 | 115 | 500 | 109 | 947 | 149 | 10656 | 1.53 | 410 | 564 |
| 7 | 3.84 | 835 | 3.13 | 0.39 | 37.7 | 0.90 | 2.44 | 3.04 | 0.77 | 13.7 | 4.94 | 64.5 | 25.6 | 125 | 32.5 | 341 | 63.1 | 10107 | 1.61 | 290 | 573 |
| 8 | 5.32 | 787 | 1.77 | 3.94 | 47.5 | 7.42 | 11.5 | 5.27 | 1.32 | 18.3 | 5.57 | 68.1 | 24.8 | 117 | 28.6 | 294 | 54.0 | 9856 | 0.98 | 220 | 353 |
| 9 | 3.26 | 713 | 0.54 | 0.0000 | 2.54 | 0.25 | 0.62 | 1.58 | 0.66 | 9.86 | 3.47 | 51.4 | 21.4 | 121 | 33.4 | 396 | 87.7 | 9457 | 0.36 | 78.5 | 243 |
| 10 | 8.22 | 890 | 2.43 | 0.0059 | 30.1 | 0.10 | 2.03 | 3.07 | 0.26 | 16.5 | 5.98 | 76.1 | 28.2 | 135 | 31.6 | 306 | 54.4 | 12056 | 1.49 | 329 | 384 |
| 11 | 1.01 | 813 | 3.26 | 0.017 | 6.26 | 0.23 | 0.40 | 1.65 | 0.29 | 11.8 | 4.68 | 64.0 | 25.8 | 127 | 31.8 | 320 | 58.4 | 11072 | 2.78 | 226 | 736 |
| 12 | 5.98 | 153 | 0.48 | 0.0022 | 4.75 | 0.12 | 0.39 | 0.99 | 0.11 | 3.27 | 1.02 | 13.0 | 4.68 | 23.7 | 5.61 | 59.2 | 11.4 | 9952 | 0.39 | 40.7 | 126 |
| 13 | 37.1 | 1422 | 1.34 | 0.068 | 16.5 | 2.24 | 8.80 | 9.54 | 1.80 | 39.8 | 12.5 | 138 | 46.5 | 201 | 43.0 | 394 | 66.5 | 8318 | 0.80 | 326 | 258 |
| 14 | 1.43 | 798 | 2.24 | 0.39 | 10.5 | 1.03 | 2.27 | 2.71 | 0.30 | 12.3 | 4.65 | 63.6 | 25.5 | 127 | 31.1 | 308 | 56.3 | 9540 | 1.19 | 234 | 529 |
| 15 | 9.60 | 533 | 1.41 | 0.043 | 44.0 | 0.51 | 2.21 | 3.19 | 0.96 | 13.7 | 3.98 | 44.4 | 16.2 | 76.9 | 18.7 | 193 | 37.3 | 9476 | 0.50 | 249 | 234 |
| 16 | 13.2 | 553 | 0.77 | 0.0000 | 9.22 | 0.39 | 2.51 | 3.98 | 0.36 | 16.2 | 5.08 | 56.5 | 19.3 | 83.9 | 18.1 | 172 | 30.5 | 7040 | 0.30 | 40.6 | 78.2 |
| 17 | 3.09 | 890 | 3.56 | 0.11 | 44.8 | 0.44 | 1.83 | 3.39 | 1.57 | 16.5 | 5.21 | 66.8 | 26.3 | 132 | 34.7 | 374 | 72.6 | 10548 | 0.97 | 440 | 740 |
| 18 | 18.5 | 2824 | 6.47 | 0.057 | 15.0 | 1.62 | 6.47 | 12.9 | 0.97 | 62.3 | 22.4 | 271 | 96.5 | 418 | 89.7 | 803 | 130 | 9328 | 2.35 | 770 | 687 |
| 19 | 2.50 | 331 | 1.35 | 0.0050 | 2.12 | 0.060 | 0.0000 | 0.19 | 0.11 | 2.59 | 1.15 | 20.4 | 9.73 | 57.2 | 16.4 | 193 | 40.2 | 11119 | 0.93 | 21.1 | 362 |
| 20 | 8.96 | 1775 | 1.00 | 0.0000 | 8.70 | 0.84 | 4.87 | 8.91 | 1.79 | 38.5 | 13.2 | 164 | 59.3 | 265 | 58.3 | 525 | 85.5 | 10728 | 0.81 | 212 | 301 |
| 21 | 18.5 | 488 | 1.45 | 0.011 | 4.41 | 0.21 | 0.97 | 2.24 | 0.088 | 9.69 | 3.58 | 44.4 | 16.7 | 76.5 | 16.6 | 154 | 26.6 | 10492 | 0.99 | 115 | 301 |

Table S3 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Spot | Ti | Y | Nb | La | Ce | Pr | Nd | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu | Hf | Ta | Th | U |
| 22 | 21.5 | 810 | 0.85 | 0.019 | 15.8 | 0.52 | 2.81 | 4.91 | 0.65 | 21.7 | 6.99 | 80.5 | 27.8 | 117 | 24.9 | 225 | 36.6 | 10340 | 0.45 | 159 | 118 |
| 23 | 4.67 | 682 | 2.20 | 0.47 | 39.9 | 1.02 | 1.97 | 3.14 | 0.83 | 12.9 | 4.32 | 53.9 | 20.7 | 102 | 25.8 | 271 | 51.8 | 10077 | 1.09 | 357 | 590 |
| 24 | 7.03 | 326 | 0.91 | 0.018 | 16.6 | 0.14 | 1.00 | 1.10 | 0.62 | 5.67 | 1.93 | 24.0 | 9.96 | 51.8 | 13.8 | 153 | 30.5 | 8505 | 0.39 | 102 | 174 |
| 25 | 2.83 | 352 | 1.03 | 0.014 | 17.7 | 0.099 | 0.88 | 0.80 | 0.47 | 5.34 | 2.05 | 26.2 | 10.5 | 54.7 | 14.7 | 164 | 33.6 | 9781 | 0.68 | 135 | 325 |
| 26 | 5.99 | 324 | 0.90 | 0.018 | 21.4 | 0.12 | 1.80 | 1.33 | 0.29 | 6.28 | 2.13 | 24.7 | 9.79 | 49.3 | 12.4 | 136 | 26.4 | 10929 | 0.64 | 94.0 | 62.3 |
| 27 | 8.03 | 868 | 3.07 | 0.016 | 20.2 | 0.47 | 6.60 | 5.88 | 0.97 | 24.6 | 7.79 | 88.3 | 30.2 | 132 | 28.1 | 260 | 42.8 | 9772 | 1.44 | 134 | 156 |
| 28 | 14.6 | 496 | 1.98 | 2.36 | 25.2 | 6.16 | 32.5 | 5.71 | 0.38 | 14.1 | 4.03 | 47.8 | 17.0 | 75.8 | 16.6 | 154 | 26.3 | 9280 | 0.88 | 44.9 | 87.0 |
| 29 | 21.1 | 1205 | 2.02 | 0.030 | 7.52 | 0.39 | 8.91 | 7.66 | 0.088 | 35.8 | 10.9 | 122 | 42.2 | 175 | 35.6 | 311 | 49.6 | 11255 | 1.16 | 231 | 281 |
| 30 | 5.38 | 630 | 3.46 | 0.086 | 4.34 | 0.24 | 2.87 | 2.93 | 0.75 | 16.0 | 5.12 | 58.0 | 19.6 | 84.0 | 18.4 | 178 | 31.9 | 10208 | 0.97 | 120 | 676 |
| 31 | 4.83 | 565 | 2.44 | 0.17 | 18.4 | 0.42 | 3.30 | 2.25 | 0.76 | 10.4 | 3.53 | 43.4 | 16.8 | 88.2 | 23.2 | 267 | 52.4 | 11090 | 1.33 | 251 | 651 |
| 32 | 6.39 | 1298 | 12.0 | 1.11 | 25.1 | 2.25 | 16.5 | 8.88 | 0.89 | 36.5 | 11.5 | 132 | 44.9 | 193 | 41.9 | 383 | 63.4 | 9623 | 3.38 | 174 | 497 |
| 34 | 20.9 | 517 | 1.51 | 0.041 | 14.9 | 0.18 | 3.37 | 3.33 | 0.69 | 13.1 | 4.25 | 46.3 | 16.4 | 75.4 | 17.6 | 172 | 30.8 | 9344 | 0.77 | 127 | 162 |
| 35 | 5.16 | 1732 | 8.87 | 28.0 | 121 | 32.3 | 160 | 22.9 | 0.62 | 44.9 | 13.0 | 156 | 59.3 | 278 | 64.7 | 624 | 109 | 11936 | 3.33 | 216 | 385 |
| 37 | 13.9 | 477 | 1.71 | 0.47 | 18.4 | 0.32 | 3.47 | 1.93 | 0.60 | 9.51 | 3.29 | 41.0 | 15.2 | 72.5 | 17.5 | 179 | 32.7 | 10168 | 0.99 | 104 | 166 |
| 38 | 19.6 | 1183 | 0.72 | 0.0000 | 20.3 | 0.22 | 4.42 | 5.67 | 0.95 | 26.5 | 8.88 | 107 | 38.8 | 172 | 37.9 | 356 | 60.3 | 10197 | 0.25 | 126 | 83.0 |
| 40 | 2.05 | 654 | 1.05 | 0.10 | 22.8 | 0.33 | 3.86 | 4.01 | 1.01 | 15.6 | 4.60 | 55.0 | 20.5 | 96.2 | 23.5 | 245 | 47.0 | 9533 | 0.59 | 264 | 426 |
| 41 | 1.94 | 385 | 1.69 | 0.0000 | 23.1 | 0.0000 | 0.77 | 1.19 | 0.54 | 6.41 | 2.25 | 26.7 | 10.9 | 57.8 | 15.5 | 179 | 36.7 | 10432 | 0.59 | 260 | 501 |
| 42 | 5.56 | 662 | 1.62 | 0.0000 | 37.0 | 0.095 | 3.52 | 3.51 | 1.85 | 15.2 | 4.77 | 54.2 | 20.0 | 95.4 | 23.0 | 246 | 47.1 | 7787 | 0.47 | 212 | 243 |
| 43 | 2.60 | 721 | 2.19 | 0.72 | 33.1 | 0.79 | 4.48 | 2.96 | 0.86 | 14.4 | 4.44 | 56.5 | 21.9 | 111 | 28.3 | 301 | 59.4 | 9455 | 1.20 | 323 | 611 |
| 44 | 1.73 | 1133 | 16.8 | 0.0000 | 1.63 | 0.061 | 0.51 | 0.70 | 0.54 | 9.59 | 5.85 | 94.4 | 37.6 | 174 | 38.9 | 352 | 55.0 | 13273 | 17.0 | 5.36 | 420 |
| 45 | 9.54 | 1979 | 0.74 | 0.0030 | 1.54 | 0.19 | 3.39 | 4.00 | 0.56 | 31.4 | 13.1 | 178 | 65.3 | 298 | 68.0 | 639 | 107 | 12403 | 0.70 | 54.5 | 270 |
| 46 | 17.5 | 416 | 2.53 | 0.0021 | 19.1 | 0.085 | 1.20 | 1.35 | 0.39 | 8.12 | 2.82 | 34.6 | 12.9 | 62.9 | 15.4 | 165 | 29.9 | 10237 | 0.96 | 166 | 240 |

Table S3 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Spot | | Ti | Y | | Nb | La | Ce | Pr | Nd | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu | Hf | Ta | Th | U |
| **TTL01** | | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 3.81 | | | 512 | 5.63 | 0.21 | 44.4 | 0.42 | 2.13 | 2.47 | 0.80 | 10.7 | 3.33 | 42.1 | 15.7 | 75.6 | 18.5 | 191 | 36.1 | 10497 | 1.81 | 420 | 602 |
| 2 | 10.9 | | | 834 | 0.59 | 0.011 | 0.87 | 0.16 | 2.25 | 4.51 | 0.058 | 25.4 | 8.55 | 89.5 | 27.9 | 109 | 21.3 | 186 | 30.9 | 11341 | 0.36 | 41.1 | 202 |
| 3 | 7.21 | | | 1986 | 0.63 | 0.018 | 0.83 | 0.091 | 2.24 | 3.86 | 0.11 | 30.7 | 12.5 | 169 | 66.5 | 306 | 67.7 | 628 | 109 | 11117 | 0.47 | 53.2 | 317 |
| 4 | 15.7 | | | 2675 | 1.71 | 4.84 | 78.8 | 24.2 | 81.7 | 28.4 | 4.04 | 69.7 | 22.5 | 257 | 83.7 | 351 | 73.3 | 640 | 106 | 11892 | 1.00 | 143 | 714 |
| 5 | 8.77 | | | 1944 | 3.38 | 0.20 | 11.4 | 0.88 | 7.97 | 9.09 | 2.54 | 38.8 | 13.4 | 167 | 63.2 | 299 | 70.9 | 702 | 128 | 13105 | 1.30 | 85.1 | 298 |
| 6 | 2.95 | | | 1486 | 3.53 | 0.50 | 7.31 | 1.42 | 5.66 | 3.76 | 0.18 | 24.7 | 9.36 | 125 | 50.6 | 240 | 54.3 | 516 | 93.1 | 11048 | 1.39 | 256 | 516 |
| 7 | 25.9 | | | 1285 | 5.78 | 0.92 | 68.7 | 7.45 | 26.4 | 13.3 | 3.80 | 32.4 | 9.82 | 115 | 40.6 | 191 | 44.2 | 434 | 76.9 | 10418 | 2.38 | 233 | 335 |
| 9 | 24.5 | | | 219 | 0.78 | 0.15 | 2.52 | 0.77 | 4.55 | 5.51 | 0.48 | 32.0 | 8.18 | 47.4 | 6.96 | 14.2 | 1.73 | 11.9 | 1.46 | 13570 | 0.56 | 27.0 | 788 |
| 10 | 68.0 | | | 1413 | 1.74 | 14.4 | 146 | 68.2 | 216 | 64.3 | 18.3 | 90.1 | 22.0 | 194 | 49.7 | 185 | 39.1 | 357 | 57.3 | 11471 | 1.10 | 216 | 311 |
| 11 | 7.67 | | | 2079 | 0.89 | 0.0047 | 1.02 | 0.22 | 2.08 | 3.39 | 0.086 | 29.9 | 13.3 | 180 | 69.0 | 315 | 69.3 | 624 | 106 | 12041 | 0.56 | 60.8 | 454 |
| 13 | 12.8 | | | 1427 | 0.49 | 0.0076 | 1.47 | 0.54 | 4.47 | 7.74 | 0.29 | 41.8 | 13.2 | 147 | 48.9 | 202 | 41.2 | 368 | 62.5 | 11211 | 0.31 | 46.0 | 209 |
| 14 | 11.0 | | | 1187 | 2.51 | 3.73 | 48.1 | 10.6 | 33.4 | 15.7 | 4.54 | 51.3 | 14.0 | 138 | 41.6 | 161 | 33.1 | 293 | 50.3 | 8891 | 1.03 | 362 | 533 |
| 15 | 7.53 | | | 422 | 0.45 | 0.0000 | 10.9 | 0.13 | 1.26 | 1.47 | 0.69 | 8.30 | 2.76 | 34.4 | 13.2 | 63.7 | 15.6 | 166 | 32.1 | 10689 | 0.33 | 106 | 161 |
| 16 | 13.8 | | | 1098 | 2.66 | 0.11 | 6.00 | 0.31 | 2.90 | 3.35 | 0.35 | 20.2 | 7.34 | 92.9 | 35.3 | 166 | 38.9 | 380 | 69.5 | 11611 | 1.61 | 187 | 627 |
| 18 | 5.48 | | | 394 | 1.19 | 1.14 | 34.0 | 3.35 | 9.23 | 3.02 | 0.79 | 7.51 | 2.41 | 30.2 | 11.8 | 59.3 | 16.0 | 171 | 34.4 | 11294 | 0.69 | 398 | 542 |
| 19 | 13.4 | | | 474 | 1.84 | 0.0000 | 6.16 | 0.14 | 0.98 | 2.30 | 0.44 | 9.22 | 3.32 | 41.8 | 16.3 | 75.1 | 17.5 | 169 | 30.8 | 8823 | 0.42 | 25.4 | 35.8 |
| 20 | 11.1 | | | 1857 | 3.52 | 0.030 | 5.24 | 0.79 | 5.78 | 16.0 | 0.44 | 77.7 | 24.2 | 223 | 59.6 | 199 | 35.6 | 284 | 42.4 | 12126 | 1.69 | 192 | 447 |
| 21 | 13.3 | | | 682 | 2.25 | 0.0078 | 5.62 | 0.38 | 3.03 | 4.01 | 0.15 | 18.3 | 5.60 | 67.3 | 23.6 | 101 | 22.1 | 197 | 32.1 | 10646 | 1.15 | 72.3 | 159 |
| 22 | 6.21 | | | 549 | 3.05 | 0.0000 | 45.9 | 0.13 | 2.21 | 3.28 | 0.28 | 13.2 | 4.28 | 49.7 | 18.3 | 82.5 | 19.5 | 189 | 32.8 | 10514 | 1.18 | 104 | 119 |
| 23 | 14.1 | | | 1710 | 5.68 | 4.44 | 73.8 | 23.0 | 66.8 | 28.5 | 9.61 | 50.6 | 14.5 | 152 | 54.2 | 249 | 61.3 | 630 | 114 | 11860 | 1.89 | 212 | 561 |
| 24 | 16.3 | | | 380 | 1.82 | 0.0000 | 16.4 | 0.37 | 1.86 | 3.84 | 0.48 | 11.1 | 3.29 | 35.3 | 12.1 | 52.6 | 12.2 | 122 | 21.3 | 10866 | 0.91 | 194 | 204 |
| 25 | 8.08 | | | 628 | 2.12 | 0.13 | 45.1 | 0.74 | 4.05 | 5.49 | 2.01 | 22.3 | 6.28 | 63.3 | 20.8 | 82.9 | 18.1 | 173 | 30.4 | 11118 | 0.64 | 485 | 529 |

Table S3 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Spot | Ti | Y | Nb | La | Ce | Pr | Nd | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu | Hf | Ta | Th | U |
| 26 | 6.19 | 542 | 1.33 | 0.0000 | 6.79 | 0.0000 | 0.78 | 1.04 | 0.16 | 7.08 | 2.82 | 40.5 | 17.8 | 88.9 | 21.9 | 222 | 41.9 | 10250 | 0.97 | 116 | 340 |
| 27 | 2.49 | 746 | 2.84 | 0.018 | 15.7 | 0.28 | 1.69 | 1.98 | 0.20 | 9.02 | 3.85 | 53.3 | 23.1 | 120 | 32.4 | 349 | 64.8 | 14078 | 1.59 | 204 | 512 |
| 28 | 5.39 | 3806 | 3.60 | 0.12 | 59.3 | 3.21 | 25.8 | 26.2 | 4.37 | 96.0 | 29.6 | 347 | 127 | 557 | 125 | 1162 | 196 | 8181 | 0.76 | 596 | 370 |
| 29 | 43.0 | 1140 | 12.2 | 11.0 | 126 | 50.8 | 138 | 39.1 | 11.2 | 49.2 | 12.0 | 120 | 39.0 | 170 | 38.7 | 369 | 65.2 | 11407 | 8.40 | 302 | 864 |
| 32 | 3.64 | 1372 | 5.96 | 2.65 | 36.0 | 4.92 | 12.9 | 6.60 | 1.33 | 22.7 | 8.06 | 103 | 42.6 | 210 | 54.2 | 571 | 108 | 10145 | 1.51 | 224 | 496 |
| 33 | 12.8 | 482 | 0.77 | 0.020 | 10.7 | 0.13 | 1.85 | 2.36 | 0.43 | 11.3 | 3.50 | 43.3 | 16.4 | 72.2 | 16.3 | 151 | 26.1 | 9537 | 0.35 | 60.0 | 83.9 |
| 34 | 12.8 | 364 | 0.56 | 0.020 | 15.9 | 0.17 | 1.41 | 1.84 | 0.39 | 7.54 | 2.57 | 31.4 | 11.9 | 53.9 | 13.0 | 129 | 23.2 | 9196 | 0.31 | 71.1 | 105 |
| 35 | 9.82 | 2141 | 0.78 | 0.0033 | 0.84 | 0.16 | 1.72 | 4.56 | 0.042 | 26.3 | 12.5 | 176 | 71.8 | 336 | 78.5 | 732 | 121 | 12106 | 0.69 | 65.3 | 402 |
| 36 | 9.47 | 583 | 4.96 | 0.035 | 40.0 | 0.46 | 4.32 | 4.54 | 0.79 | 15.3 | 4.61 | 53.3 | 19.0 | 84.4 | 20.1 | 199 | 33.8 | 9987 | 3.16 | 117 | 233 |
| 37 | 15.7 | 125 | 0.83 | 0.0000 | 3.97 | 0.56 | 5.31 | 6.91 | 0.11 | 14.4 | 2.81 | 18.8 | 4.01 | 11.8 | 2.01 | 14.3 | 1.99 | 11920 | 0.47 | 103 | 171 |
| 38 | 5.09 | 189 | 1.02 | 0.020 | 2.54 | 0.18 | 1.70 | 3.75 | 0.33 | 16.1 | 3.77 | 28.5 | 6.14 | 16.9 | 2.79 | 19.9 | 2.80 | 11140 | 0.59 | 83.7 | 546 |
| 39 | 15.3 | 830 | 0.60 | 0.026 | 2.24 | 0.37 | 4.30 | 6.41 | 0.039 | 26.0 | 7.81 | 82.7 | 27.8 | 114 | 24.7 | 222 | 35.8 | 11531 | 0.40 | 87.8 | 166 |
| 40 | 1.69 | 2374 | 14.1 | 0.38 | 19.8 | 1.38 | 6.50 | 7.53 | 0.74 | 39.5 | 15.6 | 205 | 79.0 | 358 | 81.5 | 775 | 130 | 12389 | 4.91 | 482 | 994 |
| 41 | 12.7 | 1210 | 5.87 | 1.93 | 33.4 | 9.42 | 25.9 | 11.1 | 2.20 | 25.4 | 8.82 | 102 | 39.0 | 181 | 44.3 | 444 | 82.4 | 10262 | 2.04 | 431 | 1067 |
| 42 | 3.60 | 1487 | 3.65 | 0.17 | 24.2 | 0.37 | 2.84 | 4.60 | 0.46 | 23.2 | 8.77 | 121 | 50.2 | 241 | 59.7 | 603 | 110 | 10193 | 1.48 | 283 | 345 |
| 43 | 8.38 | 214 | 1.25 | 0.080 | 13.6 | 0.46 | 3.12 | 1.67 | 0.47 | 6.65 | 1.77 | 19.5 | 6.98 | 30.7 | 6.82 | 68.5 | 12.2 | 9878 | 0.61 | 70.9 | 128 |
| 44 | 9.03 | 1799 | 0.99 | 0.43 | 8.74 | 2.40 | 9.91 | 8.02 | 1.11 | 33.2 | 13.2 | 161 | 59.2 | 260 | 57.8 | 538 | 90.2 | 12635 | 0.72 | 84.5 | 702 |
| 45 | 18.8 | 353 | 1.03 | 7.66 | 83.2 | 28.7 | 74.8 | 23.7 | 6.22 | 29.7 | 7.13 | 59.4 | 13.2 | 44.5 | 9.31 | 84.9 | 12.0 | 11184 | 0.79 | 62.2 | 874 |
| 46 | 30.7 | 294 | 1.09 | 4.67 | 33.6 | 19.3 | 53.4 | 19.0 | 2.86 | 28.3 | 5.87 | 42.9 | 9.95 | 31.2 | 5.71 | 45.8 | 7.20 | 13789 | 0.55 | 80.8 | 1449 |
| 47 | 2.38 | 452 | 1.80 | 0.012 | 31.0 | 0.23 | 2.38 | 3.32 | 1.14 | 13.4 | 3.71 | 41.2 | 14.0 | 62.0 | 14.2 | 150 | 30.2 | 10807 | 0.44 | 191 | 169 |
| 48 | 12.5 | 733 | 2.00 | 0.0067 | 7.79 | 0.30 | 2.90 | 5.21 | 1.18 | 18.5 | 5.70 | 69.4 | 26.0 | 116 | 26.0 | 250 | 44.1 | 9558 | 0.77 | 62.3 | 107 |
| 49 | 7.48 | 1295 | 3.79 | 0.0000 | 48.3 | 0.65 | 3.33 | 6.21 | 1.64 | 22.6 | 7.95 | 104 | 42.1 | 206 | 51.3 | 520 | 98.6 | 9227 | 0.91 | 159 | 134 |
| 50 | 5.33 | 661 | 1.67 | 0.036 | 13.7 | 0.21 | 3.14 | 3.02 | 1.36 | 15.4 | 5.12 | 60.9 | 22.0 | 93.0 | 20.9 | 191 | 33.4 | 10419 | 0.62 | 57.6 | 107 |

Table S3 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Spot | Ti | Y | Nb | La | Ce | Pr | Nd | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu | Hf | Ta | Th | U |
| 51 | 13.5 | 213 | 0.81 | 0.059 | 7.63 | 0.26 | 1.21 | 1.39 | 0.43 | 4.23 | 1.53 | 19.2 | 6.81 | 33.5 | 8.29 | 86.3 | 16.8 | 9696 | 0.40 | 73.7 | 247 |
| 52 | 82.8 | 829 | 2.27 | 19.7 | 163 | 90.7 | 242 | 72.7 | 13.4 | 81.9 | 16.8 | 125 | 27.6 | 91.7 | 18.2 | 157 | 22.1 | 12896 | 0.71 | 169 | 724 |
| 53 | 5.65 | 808 | 3.11 | 0.010 | 4.68 | 0.37 | 2.86 | 3.31 | 0.43 | 14.5 | 5.22 | 66.7 | 26.8 | 126 | 30.4 | 307 | 56.3 | 9561 | 1.41 | 130 | 373 |
| 54 | 12.8 | 1572 | 8.29 | 0.030 | 190 | 2.33 | 16.2 | 15.9 | 5.34 | 54.4 | 15.2 | 159 | 53.1 | 214 | 47.1 | 434 | 72.3 | 7708 | 1.96 | 794 | 435 |
| 55 | 8.82 | 2136 | 1.44 | 0.080 | 1.37 | 0.40 | 3.14 | 4.16 | 0.16 | 28.2 | 12.8 | 177 | 72.5 | 332 | 76.1 | 701 | 118 | 11228 | 0.68 | 74.4 | 455 |
| 56 | 14.9 | 554 | 5.65 | 1.22 | 57.0 | 5.91 | 20.0 | 7.17 | 1.85 | 13.2 | 4.01 | 47.0 | 17.0 | 80.7 | 20.6 | 216 | 39.4 | 11293 | 2.42 | 163 | 462 |
| 57 | 6.54 | 568 | 2.04 | 6.50 | 46.4 | 12.0 | 27.1 | 4.81 | 0.39 | 12.1 | 3.86 | 47.5 | 18.6 | 89.0 | 21.6 | 222 | 39.6 | 11172 | 0.77 | 169 | 254 |
| 58 | 11.2 | 2324 | 3.59 | 1.95 | 25.9 | 6.51 | 22.0 | 14.8 | 2.73 | 51.3 | 17.1 | 212 | 80.5 | 365 | 82.4 | 786 | 138 | 8961 | 1.04 | 109 | 153 |
| 60 | 158 | 49.7 | 2.92 | 0.023 | 3.67 | 0.82 | 6.65 | 10.5 | 0.42 | 21.9 | 2.88 | 11.8 | 1.73 | 3.33 | 0.47 | 3.15 | 0.46 | 12927 | 0.81 | 475 | 301 |
| 61 | 11.7 | 2343 | 1.68 | 0.12 | 2.63 | 0.65 | 3.39 | 5.75 | 0.074 | 35.6 | 14.7 | 202 | 80.2 | 361 | 82.0 | 738 | 120 | 11611 | 0.92 | 153 | 519 |
| 63 | 5.60 | 665 | 2.00 | 0.0071 | 22.0 | 0.20 | 1.81 | 2.68 | 0.56 | 12.1 | 4.32 | 53.9 | 21.0 | 103 | 25.5 | 266 | 49.5 | 11085 | 0.67 | 79.9 | 85.5 |
| 65 | 8.81 | 1872 | 1.07 | 0.062 | 1.32 | 0.36 | 3.49 | 4.49 | 0.057 | 28.3 | 12.4 | 169 | 62.5 | 271 | 60.9 | 557 | 91.8 | 11771 | 0.82 | 65.4 | 553 |
| 66 | 2.22 | 1498 | 15.5 | 0.23 | 17.4 | 0.83 | 3.77 | 3.93 | 0.49 | 23.0 | 9.13 | 126 | 49.3 | 233 | 55.5 | 537 | 93.8 | 11008 | 5.64 | 364 | 733 |
| 67 | 6.44 | 272 | 0.49 | 0.12 | 23.6 | 0.76 | 3.03 | 2.53 | 0.86 | 8.59 | 2.41 | 25.2 | 8.45 | 37.4 | 8.58 | 88.6 | 16.0 | 9041 | 0.21 | 48.6 | 67.7 |
| 69 | 14.7 | 953 | 3.21 | 0.0000 | 7.15 | 0.41 | 4.37 | 6.04 | 0.078 | 23.9 | 7.67 | 88.4 | 32.2 | 143 | 32.4 | 305 | 51.6 | 10833 | 1.04 | 215 | 189 |
| 70 | 11.7 | 1704 | 4.69 | 0.034 | 19.1 | 2.37 | 18.2 | 16.9 | 0.30 | 53.3 | 15.3 | 173 | 60.6 | 255 | 56.3 | 503 | 81.4 | 10013 | 1.81 | 67.5 | 109 |
| 71 | 4.80 | 629 | 2.77 | 0.028 | 33.4 | 0.18 | 1.60 | 2.38 | 1.02 | 11.8 | 3.79 | 47.8 | 19.8 | 96.9 | 25.6 | 281 | 54.4 | 9186 | 0.74 | 189 | 218 |
| 72 | 11.5 | 1785 | 4.89 | 0.012 | 16.6 | 1.66 | 14.8 | 15.9 | 0.37 | 53.4 | 16.7 | 185 | 64.5 | 263 | 55.2 | 479 | 76.4 | 10067 | 1.59 | 76.6 | 63.9 |
| 73 | 233 | 693 | 1.98 | 11.9 | 80.0 | 46.1 | 130 | 43.5 | 10.7 | 45.8 | 10.8 | 89.5 | 23.0 | 86.3 | 19.1 | 188 | 31.8 | 10067 | 0.40 | 177 | 673 |
| 74 | 4.72 | 2520 | 19.7 | 0.16 | 175 | 1.18 | 4.41 | 8.70 | 1.22 | 45.5 | 16.4 | 215 | 82.1 | 364 | 82.3 | 764 | 126 | 9872 | 3.53 | 647 | 461 |
| 76 | 4.16 | 549 | 1.86 | 0.019 | 26.4 | 0.30 | 1.39 | 2.26 | 0.91 | 11.7 | 3.37 | 42.0 | 15.4 | 72.6 | 17.8 | 194 | 39.6 | 11197 | 0.48 | 315 | 468 |
| 79 | 4.08 | 318 | 1.27 | 0.016 | 17.8 | 0.70 | 1.82 | 1.77 | 0.68 | 7.79 | 2.21 | 26.2 | 10.1 | 46.7 | 11.6 | 123 | 24.3 | 10233 | 0.83 | 112 | 170 |
| 80 | 9.67 | 1273 | 1.30 | 0.063 | 3.26 | 0.35 | 1.00 | 2.26 | 0.058 | 16.4 | 7.65 | 105 | 40.8 | 181 | 40.9 | 377 | 64.0 | 10229 | 0.73 | 49.0 | 364 |

Table S3 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Spot | Ti | Y | Nb | La | Ce | Pr | Nd | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu | Hf | Ta | Th | U |
| 81 | 4.50 | 497 | 1.67 | 0.032 | 30.3 | 0.59 | 1.94 | 3.99 | 0.75 | 14.9 | 3.79 | 43.9 | 15.4 | 68.6 | 16.5 | 169 | 31.1 | 9094 | 0.71 | 221 | 288 |
| **W** | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 13.5 | 1039 | 1.81 | 0.028 | 4.29 | 1.02 | 3.25 | 4.86 | 0.27 | 23.8 | 7.80 | 96.9 | 35.4 | 154 | 33.9 | 316 | 55.1 | 9936 | 1.02 | 200 | 393 |
| 2 | 4.07 | 414 | 0.86 | 0.0000 | 10.7 | 0.039 | 0.82 | 1.16 | 0.37 | 8.27 | 2.62 | 35.4 | 13.4 | 62.4 | 14.5 | 148 | 27.4 | 9892 | 0.32 | 40.5 | 63.5 |
| 3 | 11.2 | 824 | 1.66 | 0.019 | 17.7 | 0.44 | 2.17 | 3.17 | 0.34 | 14.7 | 5.45 | 67.6 | 26.2 | 120 | 27.4 | 263 | 48.5 | 10160 | 0.63 | 70.6 | 68.6 |
| 4 | 2.22 | 1117 | 4.82 | 3.11 | 14.0 | 8.22 | 7.49 | 3.67 | 0.12 | 17.3 | 6.56 | 86.7 | 35.7 | 171 | 39.6 | 393 | 72.9 | 11629 | 2.51 | 313 | 686 |
| 5 | 4.60 | 942 | 1.09 | 0.057 | 0.27 | 0.28 | 0.37 | 1.16 | 0.062 | 9.16 | 5.02 | 72.5 | 28.4 | 133 | 32.2 | 307 | 55.6 | 13108 | 1.26 | 11.6 | 660 |
| 6 | 19.8 | 1191 | 1.21 | 0.054 | 12.8 | 3.76 | 8.20 | 8.49 | 1.33 | 30.9 | 9.73 | 109 | 38.5 | 168 | 36.4 | 334 | 59.5 | 8062 | 0.64 | 128 | 122 |
| 7 | 3.60 | 1064 | 8.85 | 0.098 | 12.5 | 0.53 | 1.58 | 3.60 | 0.12 | 18.3 | 6.79 | 88.9 | 34.1 | 162 | 37.6 | 367 | 66.0 | 11078 | 2.92 | 214 | 406 |
| 8 | 10.0 | 1065 | 0.51 | 0.093 | 0.85 | 0.71 | 1.68 | 3.18 | 0.077 | 19.9 | 7.38 | 95.0 | 34.4 | 153 | 33.4 | 305 | 53.4 | 11439 | 0.27 | 32.9 | 190 |
| 9 | 12.7 | 793 | 1.03 | 0.100 | 1.50 | 1.27 | 3.20 | 5.57 | 0.089 | 29.6 | 9.38 | 88.7 | 24.5 | 87.0 | 17.2 | 150 | 24.4 | 12546 | 0.60 | 53.3 | 508 |
| 10 | 7.89 | 378 | 0.86 | 0.031 | 14.4 | 0.025 | 0.31 | 1.17 | 0.29 | 7.22 | 2.21 | 30.3 | 11.8 | 55.0 | 13.4 | 135 | 26.0 | 11647 | 0.41 | 56.0 | 96.1 |
| 11 | 7.59 | 500 | 1.05 | 0.0000 | 16.4 | 0.24 | 0.77 | 1.62 | 0.30 | 9.42 | 3.24 | 40.9 | 15.8 | 74.7 | 17.7 | 173 | 32.4 | 10990 | 0.47 | 74.7 | 104 |
| 12 | 4.77 | 240 | 0.36 | 0.0000 | 7.00 | 0.27 | 0.36 | 0.95 | 0.30 | 4.34 | 1.40 | 17.8 | 6.91 | 35.5 | 9.79 | 108 | 22.6 | 9573 | 0.26 | 80.7 | 209 |
| 13 | 2.15 | 672 | 2.71 | 0.0008 | 41.0 | 0.87 | 2.34 | 3.14 | 1.41 | 14.7 | 3.93 | 47.6 | 18.4 | 91.0 | 23.8 | 266 | 56.6 | 10345 | 0.64 | 1058 | 2417 |
| 14 | 11.1 | 801 | 4.04 | 0.0000 | 47.1 | 4.29 | 9.29 | 9.10 | 1.50 | 26.2 | 7.37 | 78.2 | 25.8 | 111 | 23.9 | 234 | 41.4 | 9317 | 1.15 | 52.6 | 40.4 |
| 15 | 16.3 | 538 | 1.63 | 0.0000 | 11.0 | 0.47 | 1.44 | 2.26 | 0.21 | 10.5 | 3.59 | 45.1 | 17.6 | 80.8 | 19.3 | 188 | 35.3 | 9257 | 0.72 | 92.3 | 236 |
| 16 | 12.0 | 367 | 1.29 | 0.0000 | 17.2 | 0.58 | 1.63 | 2.10 | 0.36 | 8.25 | 2.73 | 30.8 | 11.7 | 52.6 | 12.1 | 117 | 21.0 | 10013 | 0.48 | 70.9 | 34.2 |
| 17 | 10.2 | 1900 | 1.37 | 0.021 | 1.90 | 0.63 | 3.00 | 5.78 | 0.021 | 34.9 | 12.8 | 164 | 62.5 | 273 | 59.8 | 528 | 90.3 | 10857 | 0.65 | 101 | 278 |
| 18 | 4.75 | 809 | 1.00 | 0.042 | 1.03 | 0.45 | 1.10 | 4.57 | 0.16 | 29.3 | 10.0 | 100.0 | 25.5 | 75.1 | 11.8 | 80.1 | 10.7 | 11714 | 0.70 | 52.3 | 395 |
| 19 | 4.27 | 380 | 3.04 | 0.0065 | 15.0 | 0.52 | 0.076 | 1.37 | 0.37 | 6.11 | 2.19 | 28.4 | 11.0 | 55.7 | 14.9 | 163 | 34.2 | 13032 | 1.89 | 197 | 1505 |
| 20 | 1.55 | 880 | 5.03 | 8.89 | 29.9 | 30.0 | 30.5 | 8.01 | 0.70 | 20.2 | 6.29 | 75.8 | 27.4 | 123 | 28.4 | 270 | 48.2 | 10948 | 1.99 | 181 | 740 |
| 21 | 4.31 | 2193 | 3.17 | 0.067 | 2.27 | 0.23 | 0.61 | 3.32 | 0.11 | 23.1 | 11.5 | 172 | 68.7 | 331 | 79.7 | 756 | 131 | 12168 | 2.06 | 103 | 591 |

Table S3 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Spot | Ti | Y | Nb | La | Ce | Pr | Nd | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu | Hf | Ta | Th | U |
| 22 | 8.09 | 800 | 1.50 | 0.036 | 3.83 | 0.60 | 1.43 | 3.40 | 0.11 | 15.9 | 5.75 | 71.9 | 26.3 | 118 | 26.0 | 235 | 40.0 | 12198 | 1.02 | 123 | 435 |
| 23 | 1.27 | 166 | 0.57 | 0.0000 | 2.32 | 0.0000 | 0.50 | 0.21 | 0.15 | 1.97 | 0.74 | 11.8 | 4.80 | 24.5 | 6.87 | 79.8 | 16.6 | 11283 | 0.40 | 20.7 | 252 |
| 24 | 17.8 | 1751 | 1.30 | 0.22 | 15.5 | 10.1 | 25.7 | 20.0 | 1.07 | 61.5 | 16.3 | 178 | 59.1 | 231 | 46.3 | 391 | 64.0 | 9328 | 0.77 | 204 | 176 |
| 26 | 11.2 | 649 | 1.49 | 0.0064 | 14.1 | 0.54 | 3.84 | 3.74 | 0.61 | 17.7 | 5.31 | 59.9 | 21.5 | 93.1 | 20.4 | 187 | 32.7 | 8717 | 0.63 | 116 | 182 |
| 27 | 9.45 | 193 | 0.45 | 0.0000 | 4.10 | 0.0000 | 0.0000 | 0.81 | 0.23 | 2.88 | 1.05 | 13.9 | 5.71 | 30.1 | 8.25 | 93.1 | 19.1 | 9064 | 0.26 | 57.8 | 172 |
| 28 | 17.4 | 623 | 2.62 | 0.023 | 29.9 | 1.39 | 3.95 | 5.21 | 0.78 | 17.6 | 5.62 | 61.8 | 20.4 | 84.6 | 18.8 | 171 | 29.7 | 11082 | 1.20 | 288 | 406 |
| 29 | 8.03 | 562 | 1.02 | 0.0000 | 19.8 | 0.25 | 1.01 | 2.17 | 0.46 | 11.6 | 3.98 | 47.2 | 18.2 | 82.5 | 19.5 | 194 | 34.9 | 10931 | 0.54 | 77.5 | 106 |
| 30 | 9.26 | 578 | 1.61 | 0.048 | 22.0 | 0.38 | 1.82 | 3.03 | 0.36 | 11.7 | 3.91 | 47.8 | 18.6 | 88.3 | 21.5 | 217 | 40.8 | 9277 | 0.84 | 109 | 179 |
| 31 | 7.71 | 557 | 1.22 | 0.30 | 7.34 | 1.71 | 3.75 | 5.86 | 0.17 | 21.0 | 6.60 | 61.7 | 18.2 | 69.8 | 14.1 | 127 | 21.6 | 12934 | 0.71 | 162 | 861 |
| 35 | 6.46 | 336 | 0.52 | 0.068 | 11.0 | 0.0000 | 0.84 | 1.71 | 0.42 | 6.95 | 2.54 | 29.0 | 11.0 | 51.0 | 12.3 | 123 | 23.7 | 10861 | 0.21 | 46.8 | 91.4 |
| 36 | 8.96 | 1372 | 5.30 | 0.15 | 30.8 | 4.11 | 11.6 | 14.4 | 1.83 | 47.9 | 13.6 | 141 | 46.4 | 193 | 41.0 | 379 | 65.1 | 11083 | 1.68 | 784 | 684 |
| 37 | 7.86 | 440 | 0.86 | 0.0000 | 5.90 | 0.71 | 0.94 | 1.40 | 0.53 | 7.15 | 2.46 | 32.6 | 13.5 | 68.9 | 18.4 | 197 | 41.7 | 9230 | 0.26 | 30.6 | 56.6 |
| 38 | 9.40 | 1734 | 2.05 | 0.0094 | 32.9 | 2.44 | 7.16 | 8.04 | 1.91 | 41.4 | 12.8 | 158 | 59.2 | 270 | 60.7 | 583 | 106 | 9126 | 0.68 | 175 | 134 |
| 39 | 2.53 | 877 | 2.41 | 0.022 | 13.9 | 1.49 | 4.03 | 6.11 | 0.38 | 24.6 | 7.32 | 83.7 | 29.7 | 131 | 27.8 | 262 | 43.9 | 10790 | 0.99 | 194 | 244 |
| 40 | 15.8 | 600 | 1.04 | 0.021 | 17.4 | 0.45 | 1.55 | 2.07 | 0.39 | 12.1 | 4.08 | 51.0 | 19.5 | 91.5 | 20.8 | 202 | 37.4 | 11562 | 0.42 | 92.3 | 91.3 |
| 41 | 1.59 | 661 | 1.68 | 0.14 | 15.5 | 0.67 | 1.87 | 2.69 | 0.45 | 10.7 | 3.84 | 50.3 | 20.7 | 106 | 27.4 | 293 | 60.9 | 12044 | 1.16 | 243 | 459 |
| 42 | 20.7 | 244 | 1.12 | 0.045 | 2.78 | 0.72 | 2.57 | 3.07 | 0.052 | 11.3 | 2.79 | 27.3 | 8.08 | 31.5 | 6.61 | 63.6 | 10.8 | 13504 | 0.67 | 92.0 | 244 |
| 43 | 0.0000 | 980 | 7.51 | 0.25 | 19.3 | 0.64 | 1.27 | 2.11 | 0.30 | 12.5 | 4.98 | 70.2 | 31.4 | 163 | 42.9 | 454 | 88.7 | 14022 | 3.91 | 236 | 451 |
| 44 | 9.33 | 1339 | 5.84 | 0.011 | 65.4 | 1.43 | 6.83 | 8.51 | 1.91 | 34.8 | 10.9 | 122 | 44.2 | 194 | 44.5 | 421 | 78.0 | 9835 | 1.95 | 256 | 375 |
| 45 | 1.49 | 4680 | 38.3 | 0.51 | 13.8 | 1.30 | 2.59 | 7.40 | 0.34 | 66.9 | 29.3 | 418 | 168 | 765 | 169 | 1525 | 260 | 17200 | 17.1 | 1091 | 3209 |
| 46 | 32.4 | 538 | 3.76 | 0.049 | 11.7 | 1.80 | 3.83 | 4.41 | 0.51 | 16.1 | 4.98 | 56.3 | 19.0 | 77.4 | 16.3 | 147 | 25.3 | 10868 | 1.41 | 56.1 | 66.6 |
| 47 | 5.49 | 999 | 3.28 | 19.0 | 70.2 | 42.1 | 34.0 | 7.08 | 0.82 | 17.4 | 6.02 | 77.4 | 31.2 | 157 | 40.4 | 426 | 82.9 | 12093 | 2.10 | 501 | 773 |
| 48 | 24.2 | 1329 | 3.44 | 13.1 | 82.6 | 97.8 | 120 | 53.6 | 8.50 | 78.2 | 17.6 | 150 | 43.1 | 184 | 40.3 | 398 | 70.9 | 10265 | 1.46 | 494 | 779 |

Table S3 (continued)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Spot | Ti | Y | Nb | La | Ce | Pr | Nd | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu | Hf | Ta | Th | U |
| 49 | 8.15 | 967 | 13.3 | 0.0000 | 18.0 | 0.68 | 2.00 | 4.15 | 0.41 | 20.6 | 7.58 | 93.4 | 34.5 | 153 | 33.1 | 303 | 52.1 | 11075 | 3.52 | 144 | 181 |
| 50 | 2.38 | 890 | 2.41 | 7.07 | 34.4 | 17.9 | 17.1 | 5.32 | 0.72 | 17.3 | 5.46 | 72.6 | 29.6 | 142 | 34.6 | 356 | 68.9 | 9993 | 0.90 | 132 | 314 |
| 51 | 4.85 | 724 | 2.35 | 24.8 | 82.8 | 57.1 | 47.0 | 8.66 | 1.14 | 17.6 | 5.28 | 61.1 | 23.7 | 113 | 27.2 | 276 | 55.6 | 11626 | 1.32 | 197 | 280 |
| 52 | 4.59 | 720 | 3.52 | 1.64 | 19.0 | 13.6 | 31.9 | 14.8 | 8.47 | 21.4 | 5.69 | 64.2 | 23.2 | 102 | 21.5 | 198 | 33.9 | 14701 | 2.11 | 90.4 | 539 |
| 53 | 8.31 | 573 | 4.90 | 0.0000 | 24.8 | 0.58 | 1.70 | 2.47 | 0.36 | 11.7 | 4.14 | 49.1 | 18.1 | 85.2 | 20.4 | 205 | 38.6 | 13011 | 2.35 | 399 | 746 |
| 54 | 7.06 | 2134 | 1.16 | 0.0000 | 0.79 | 0.11 | 0.89 | 4.93 | 0.076 | 37.9 | 16.6 | 204 | 69.2 | 287 | 61.6 | 544 | 91.0 | 14830 | 0.78 | 62.4 | 669 |
| 55 | 11.7 | 418 | 0.58 | 0.0000 | 10.6 | 0.015 | 0.64 | 2.28 | 0.53 | 11.3 | 3.38 | 38 | 13.7 | 64 | 14.0 | 126 | 23.3 | 9906 | 0.20 | 31.4 | 49 |
| 56 | 10.2 | 937 | 10.4 | 0.007 | 16.7 | 0.28 | 4.3 | 8.3 | 0.06 | 29.9 | 9.2 | 102 | 35 | 143 | 28.0 | 243 | 40 | 7603 | 3.7 | 82 | 109 |
| 57 | 15.0 | 1191 | 5.0 | 0.0000 | 20.1 | 0.16 | 2.63 | 5.4 | 0.47 | 23.4 | 8.1 | 101 | 39 | 183 | 40 | 378 | 68 | 10052 | 2.60 | 497 | 463 |
| 58 | 9.2 | 362 | 1.05 | 0.015 | 17.0 | 0.12 | 0.99 | 2.79 | 1.30 | 9.4 | 2.89 | 31.5 | 10.8 | 47 | 11.0 | 105 | 18.4 | 8861 | 0.61 | 53 | 87 |
| 59 | 20.1 | 775 | 1.71 | 0.005 | 9.2 | 0.18 | 2.28 | 5.1 | 0.027 | 23.5 | 7.5 | 78 | 26.6 | 106 | 20.7 | 189 | 37 | 12337 | 0.41 | 280 | 132 |
| 60 | 17.8 | 541 | 1.87 | 0.009 | 19.9 | 0.07 | 1.51 | 3.32 | 0.15 | 10.4 | 3.6 | 44 | 16.9 | 82 | 19.2 | 179 | 33.8 | 13241 | 0.98 | 37 | 45 |
| 61 | 14.1 | 359 | 3.6 | 0.0000 | 24.1 | 0.12 | 0.75 | 2.18 | 0.34 | 8.6 | 2.57 | 30.9 | 11.1 | 53 | 12.7 | 127 | 23.4 | 11261 | 1.74 | 199 | 317 |
| 62 | 2.19 | 369 | 0.75 | 0.0000 | 17.1 | 0.0000 | 0.64 | 1.15 | 0.31 | 6.4 | 2.05 | 26.5 | 10.9 | 58 | 15.4 | 175 | 38 | 12496 | 0.69 | 224 | 366 |
| 63 | 6.3 | 993 | 10.5 | 0.010 | 18.2 | 0.21 | 3.02 | 6.6 | 0.26 | 29.5 | 9.5 | 106 | 36 | 150 | 29.3 | 254 | 41 | 7513 | 3.22 | 40 | 67 |
| 64 | 2.58 | 311 | 1.26 | 0.04 | 11.6 | 0.09 | 0.73 | 0.97 | 0.31 | 3.5 | 1.49 | 20.6 | 8.8 | 51 | 14.9 | 176 | 42 | 11581 | 1.00 | 150 | 374 |
| 65 | 2.29 | 950 | 0.44 | 0.018 | 4.7 | 0.28 | 2.79 | 5.5 | 1.44 | 19.8 | 6.5 | 77 | 28.5 | 136 | 32.7 | 333 | 65 | 10089 | 0.38 | 122 | 264 |