Supplementary table 1 In situ zircon U-Pb isotope compositions from the granitoids from Qiyugou gold deposit

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Analysis name | Element (ppm) | Th/U | Isotope ratio |  | Apparent age (Ma) |
| Th | U |  | 207Pb/206Pb | 1σ | 207Pb/235U | 1σ | 206Pb/238U | 1σ |  | 207Pb/235U | 1σ | 206Pb/238U | 1σ |
| **SIMS** |
| **Porphyritic monzogranite at Qi189 pluton** |
| QYG-B02\_01 | 1379 | 1457 | 0.95 | 0.05084 | 0.01563 | 0.13720 | 0.00319 | 0.02032 | 0.00021 |  | 131 | 3 | 130 | 1 |
| QYG-B02\_02 | 2346 | 2358 | 0.99 | 0.04893 | 0.01757 | 0.14036 | 0.00277 | 0.02080 | 0.00019 |  | 133 | 2 | 133 | 1 |
| QYG-B02\_03 | 802 | 1394 | 0.58 | 0.05036 | 0.01615 | 0.13156 | 0.00341 | 0.02027 | 0.00021 |  | 126 | 3 | 129 | 1 |
| QYG-B02\_04 | 3169 | 4377 | 0.72 | 0.04970 | 0.01006 | 0.14166 | 0.00201 | 0.02089 | 0.00019 |  | 135 | 2 | 133 | 1 |
| QYG-B02\_05 | 1689 | 2518 | 0.67 | 0.04908 | 0.01224 | 0.13664 | 0.00248 | 0.02074 | 0.00023 |  | 130 | 2 | 132 | 1 |
| QYG-B02\_06 | 1100 | 1622 | 0.68 | 0.04882 | 0.01483 | 0.13309 | 0.00305 | 0.02074 | 0.00020 |  | 127 | 3 | 132 | 1 |
| QYG-B02\_07 | 935 | 945 | 0.99 | 0.04913 | 0.02234 | 0.13862 | 0.00340 | 0.02046 | 0.00021 |  | 132 | 3 | 131 | 1 |
| QYG-B02\_08 | 719 | 1006 | 0.72 | 0.04840 | 0.01931 | 0.13602 | 0.00305 | 0.02038 | 0.00023 |  | 129 | 3 | 130 | 1 |
| QYG-B02\_09 | 2092 | 2772 | 0.75 | 0.05027 | 0.01128 | 0.13799 | 0.00239 | 0.02074 | 0.00019 |  | 131 | 2 | 132 | 1 |
| QYG-B02\_10 | 1592 | 1489 | 1.07 | 0.04910 | 0.01593 | 0.13194 | 0.00288 | 0.02008 | 0.00021 |  | 126 | 3 | 128 | 1 |
| QYG-B02\_11 | 613 | 1765 | 0.35 | 0.04883 | 0.01499 | 0.13365 | 0.00288 | 0.02057 | 0.00022 |  | 127 | 3 | 131 | 1 |
| QYG-B02\_12 | 3633 | 3827 | 0.95 | 0.05394 | 0.00952 | 0.13760 | 0.00317 | 0.02082 | 0.00020 |  | 131 | 3 | 133 | 1 |
| QYG-B02\_13 | 1680 | 1440 | 1.17 | 0.04949 | 0.02061 | 0.14190 | 0.00326 | 0.02079 | 0.00021 |  | 135 | 3 | 133 | 1 |
| QYG-B02\_14 | 474 | 1061 | 0.45 | 0.05016 | 0.01927 | 0.13479 | 0.00361 | 0.02031 | 0.00022 |  | 128 | 3 | 130 | 1 |
| QYG-B02\_15 | 1286 | 1646 | 0.78 | 0.04939 | 0.01536 | 0.13237 | 0.00314 | 0.02052 | 0.00022 |  | 126 | 3 | 131 | 1 |
| **Granite porphyry** |
| QYG-BQ01\_ 1 | 1429 | 2088 | 0.68 | 0.05326 | 0.01711 | 0.13125 | 0.00459 | 0.02070 | 0.00020 |  | 125 | 4 | 132 | 1 |
| QYG-BQ01\_ 2 | 587 | 796 | 0.74 | 0.05212 | 0.03504 | 0.14904 | 0.00560 | 0.02074 | 0.00028 |  | 141 | 5 | 132 | 2 |
| QYG-BQ01\_ 3 | 2215 | 2047 | 1.08 | 0.05115 | 0.01640 | 0.14842 | 0.00281 | 0.02104 | 0.00020 |  | 141 | 2 | 134 | 1 |
| QYG-BQ01\_ 4 | 3254 | 3378 | 0.96 | 0.05333 | 0.01245 | 0.14966 | 0.00278 | 0.02098 | 0.00021 |  | 142 | 2 | 134 | 1 |
| QYG-BQ01\_ 5 | 2027 | 2568 | 0.79 | 0.04964 | 0.01458 | 0.13589 | 0.00298 | 0.02091 | 0.00019 |  | 129 | 3 | 133 | 1 |
| QYG-BQ01\_ 6 | 2561 | 2879 | 0.89 | 0.04877 | 0.01536 | 0.13736 | 0.00282 | 0.02092 | 0.00024 |  | 131 | 3 | 133 | 1 |
| QYG-BQ01\_ 7 | 1797 | 2582 | 0.70 | 0.05140 | 0.01549 | 0.14276 | 0.00311 | 0.02072 | 0.00023 |  | 136 | 3 | 132 | 1 |
| QYG-BQ01\_ 8 | 1757 | 2085 | 0.84 | 0.04923 | 0.02295 | 0.13922 | 0.00389 | 0.02121 | 0.00021 |  | 132 | 3 | 135 | 1 |
| QYG-BQ01\_ 9 | 2196 | 2555 | 0.86 | 0.04803 | 0.01443 | 0.13526 | 0.00262 | 0.02093 | 0.00020 |  | 129 | 2 | 134 | 1 |
| QYG-BQ01\_ 10 | 1303 | 1696 | 0.77 | 0.04891 | 0.02778 | 0.13425 | 0.00507 | 0.02075 | 0.00023 |  | 128 | 5 | 132 | 1 |
| QYG-BQ01\_ 11 | 3322 | 3088 | 1.08 | 0.04880 | 0.01322 | 0.14027 | 0.00252 | 0.02130 | 0.00021 |  | 133 | 2 | 136 | 1 |
| QYG-BQ01\_ 12 | 411 | 953 | 0.43 | 0.05121 | 0.02738 | 0.13271 | 0.00615 | 0.02046 | 0.00024 |  | 127 | 6 | 131 | 2 |
| **Monzogranite porphyry** |
| QYG-BR01\_ 1 | 1757 | 1951 | 0.90 | 0.04947 | 0.01430 | 0.12964 | 0.00273 | 0.01975 | 0.00021 |  | 124 | 2 | 126 | 1 |
| QYG-BR01\_ 2 | 1641 | 2008 | 0.82 | 0.05012 | 0.01408 | 0.13931 | 0.00237 | 0.02016 | 0.00019 |  | 132 | 2 | 129 | 1 |
| QYG-BR01\_ 3 | 1209 | 1643 | 0.74 | 0.04843 | 0.01962 | 0.13090 | 0.00347 | 0.02012 | 0.00023 |  | 125 | 3 | 128 | 1 |
| QYG-BR01\_ 4 | 1152 | 1456 | 0.79 | 0.05865 | 0.01576 | 0.13333 | 0.00476 | 0.01981 | 0.00019 |  | 127 | 4 | 126 | 1 |
| QYG-BR01\_ 5 | 1056 | 1365 | 0.77 | 0.05188 | 0.01688 | 0.13575 | 0.00356 | 0.02001 | 0.00025 |  | 129 | 3 | 128 | 2 |
| QYG-BR01\_ 6 | 940 | 1171 | 0.80 | 0.05169 | 0.02746 | 0.13752 | 0.00440 | 0.01989 | 0.00023 |  | 131 | 4 | 127 | 1 |
| QYG-BR01\_ 7 | 584 | 1017 | 0.57 | 0.04808 | 0.02048 | 0.13310 | 0.00320 | 0.02008 | 0.00025 |  | 127 | 3 | 128 | 2 |
| QYG-BR01\_ 8 | 1219 | 1725 | 0.71 | 0.04969 | 0.01549 | 0.13694 | 0.00290 | 0.02049 | 0.00022 |  | 130 | 3 | 131 | 1 |
| QYG-BR01\_ 9 | 3672 | 2113 | 1.74 | 0.05039 | 0.01470 | 0.13583 | 0.00277 | 0.02023 | 0.00019 |  | 129 | 2 | 129 | 1 |
| QYG-BR01\_ 10 | 1006 | 1339 | 0.75 | 0.04829 | 0.01844 | 0.13281 | 0.00278 | 0.01995 | 0.00020 |  | 127 | 2 | 127 | 1 |
| QYG-BR01\_ 11 | 963 | 1402 | 0.69 | 0.04818 | 0.01898 | 0.12704 | 0.00365 | 0.01985 | 0.00025 |  | 121 | 3 | 127 | 2 |
| QYG-BR01\_ 12 | 1707 | 1942 | 0.88 | 0.05097 | 0.01542 | 0.14263 | 0.00265 | 0.02030 | 0.00021 |  | 135 | 2 | 130 | 1 |
| QYG-BR01\_ 13 | 1508 | 1565 | 0.96 | 0.04826 | 0.01787 | 0.13482 | 0.00285 | 0.02026 | 0.00023 |  | 128 | 3 | 129 | 1 |
| QYG-BR01\_ 14 | 945 | 1168 | 0.81 | 0.05755 | 0.02992 | 0.13420 | 0.00650 | 0.01975 | 0.00023 |  | 128 | 6 | 126 | 1 |
| QYG-BR01\_ 15 | 660 | 916 | 0.72 | 0.05057 | 0.02278 | 0.13304 | 0.00444 | 0.02014 | 0.00024 |  | 127 | 4 | 129 | 2 |
| QYG-BR01\_ 16 | 666 | 1071 | 0.62 | 0.04940 | 0.02619 | 0.13773 | 0.00402 | 0.02022 | 0.00026 |  | 131 | 4 | 129 | 2 |
| **Reference materials** |
| **Plesovice** |
| Ple-01 | 220 | 2268 | 0.10  | 0.0535  | 0.72 | 0.3933  | 1.10 | 0.0533  | 0.83 |  | 337 | 3 | 335 | 3 |
| Ple-02 | 406 | 2771 | 0.15  | 0.0540  | 0.64 | 0.4009  | 1.07 | 0.0538  | 0.86 |  | 342 | 3 | 338 | 3 |
| Ple-03 | 206 | 2161 | 0.10  | 0.0538  | 0.77 | 0.3992  | 1.23 | 0.0538  | 0.96 |  | 341 | 4 | 338 | 3 |
| Ple-04 | 174 | 1946 | 0.09  | 0.0540  | 0.87 | 0.3965  | 1.37 | 0.0536  | 1.03 |  | 339 | 4 | 337 | 3 |
| Ple-05 | 456 | 4502 | 0.10  | 0.0529  | 0.53 | 0.3947  | 1.11 | 0.0543  | 0.96 |  | 338 | 3 | 341 | 3 |
| Ple-06 | 34 | 442 | 0.08  | 0.0539  | 1.74 | 0.3978  | 2.29 | 0.0535  | 1.49 |  | 340 | 7 | 336 | 5 |
| Ple-07 | 204 | 2076 | 0.10  | 0.0535  | 0.81 | 0.3942  | 1.24 | 0.0534  | 0.94 |  | 337 | 4 | 336 | 3 |
| Ple-08 | 214 | 2151 | 0.10  | 0.0542  | 0.80 | 0.3977  | 1.38 | 0.0537  | 1.07 |  | 340 | 4 | 337 | 4 |
| Ple-09 | 98 | 1203 | 0.08  | 0.0526  | 1.09 | 0.3886  | 1.50 | 0.0535  | 1.03 |  | 333 | 4 | 336 | 3 |
| Ple-10 | 208 | 2158 | 0.10  | 0.0529  | 0.81 | 0.3956  | 1.23 | 0.0543  | 0.93 |  | 338 | 4 | 341 | 3 |
| Ple-11 | 290 | 2635 | 0.11  | 0.0535  | 0.77 | 0.3994  | 1.59 | 0.0541  | 1.39 |  | 341 | 5 | 340 | 5 |
| Ple-12 | 239 | 2159 | 0.11  | 0.0540  | 0.88 | 0.4008  | 1.39 | 0.0538  | 1.08 |  | 342 | 4 | 338 | 4 |
| Ple-13 | 141 | 1593 | 0.09  | 0.0534  | 1.86 | 0.3907  | 2.06 | 0.0530  | 0.90 |  | 335 | 6 | 333 | 3 |
| Ple-14 | 145 | 1639 | 0.09  | 0.0529  | 1.14 | 0.3846  | 1.68 | 0.0535  | 1.13 |  | 330 | 5 | 336 | 4 |
| Ple-15 | 189 | 2066 | 0.09  | 0.0541  | 0.98 | 0.4009  | 1.44 | 0.0537  | 1.06 |  | 342 | 4 | 337 | 3 |
| Ple-16 | 188 | 1964 | 0.10  | 0.0536  | 0.99 | 0.3974  | 1.34 | 0.0538  | 0.90 |  | 340 | 4 | 338 | 3 |
| Ple-17 | 226 | 2018 | 0.11  | 0.0540  | 0.95 | 0.4023  | 1.34 | 0.0541  | 0.94 |  | 343 | 4 | 339 | 3 |
| Ple-18 | 214 | 2017 | 0.11  | 0.0534  | 1.08 | 0.3909  | 1.52 | 0.0537  | 1.00 |  | 335 | 4 | 337 | 3 |
| Ple-19 | 189 | 1944 | 0.10  | 0.0538  | 1.02 | 0.3988  | 1.44 | 0.0537  | 1.01 |  | 341 | 4 | 337 | 3 |
| Ple-20 | 313 | 3328 | 0.09  | 0.0531  | 0.75 | 0.3965  | 1.28 | 0.0542  | 1.03 |  | 339 | 4 | 340 | 3 |
| Ple-21 | 192 | 2221 | 0.09  | 0.0534  | 0.90 | 0.3913  | 1.32 | 0.0537  | 0.88 |  | 335 | 4 | 337 | 3 |
| Ple-22 | 168 | 1909 | 0.09  | 0.0537  | 1.12 | 0.3923  | 1.60 | 0.0535  | 1.04 |  | 336 | 5 | 336 | 3 |
| Ple-23 | 312 | 2693 | 0.12  | 0.0528  | 0.84 | 0.3923  | 1.50 | 0.0539  | 1.25 |  | 336 | 4 | 339 | 4 |
| Ple-24 | 154 | 1605 | 0.10  | 0.0527  | 1.08 | 0.3885  | 1.67 | 0.0535  | 1.27 |  | 333 | 5 | 336 | 4 |
| Ple-25 | 108 | 1237 | 0.09  | 0.0540  | 1.46 | 0.3942  | 1.99 | 0.0538  | 1.21 |  | 337 | 6 | 338 | 4 |
| **Penglai** |
| Qinghu-01 | 636 | 1295 | 0.49  | 0.0501  | 1.43 | 0.1670  | 2.19 | 0.0242  | 1.66 |  | 157 | 3 | 154 | 3 |
| Qinghu-02 | 899 | 2395 | 0.38  | 0.0485  | 1.36 | 0.1665  | 1.66 | 0.0249  | 0.95 |  | 156 | 2 | 159 | 1 |
| Qinghu-03 | 999 | 2408 | 0.42  | 0.0497  | 1.57 | 0.1706  | 1.79 | 0.0249  | 0.85 |  | 160 | 3 | 159 | 1 |
| Qinghu-04 | 1373 | 2342 | 0.59  | 0.0500  | 1.16 | 0.1739  | 1.62 | 0.0252  | 1.12 |  | 163 | 2 | 161 | 2 |
| Qinghu-05 | 919 | 2095 | 0.44  | 0.0495  | 1.24 | 0.1711  | 1.84 | 0.0251  | 1.36 |  | 160 | 3 | 160 | 2 |
| Qinghu-06 | 758 | 1578 | 0.48  | 0.0497  | 1.58 | 0.1714  | 1.92 | 0.0250  | 1.10 |  | 161 | 3 | 159 | 2 |
| Qinghu-07 | 761 | 1568 | 0.49  | 0.0489  | 1.96 | 0.1602  | 2.79 | 0.0247  | 1.13 |  | 151 | 4 | 157 | 2 |
| Qinghu-08 | 967 | 2364 | 0.41  | 0.0479  | 1.44 | 0.1637  | 1.77 | 0.0248  | 1.03 |  | 154 | 3 | 158 | 2 |
| Qinghu-09 | 662 | 1395 | 0.47  | 0.0483  | 1.76 | 0.1675  | 2.04 | 0.0252  | 1.03 |  | 157 | 3 | 160 | 2 |
| Qinghu-10 | 788 | 1873 | 0.42  | 0.0493  | 1.51 | 0.1691  | 1.91 | 0.0249  | 1.16 |  | 159 | 3 | 158 | 2 |
| Qinghu-11 | 668 | 1697 | 0.39  | 0.0499  | 1.58 | 0.1702  | 1.94 | 0.0247  | 1.12 |  | 160 | 3 | 158 | 2 |
| Qinghu-12 | 1246 | 2101 | 0.59  | 0.0497  | 1.44 | 0.1731  | 1.80 | 0.0253  | 1.09 |  | 162 | 3 | 161 | 2 |
| Qinghu-13 | 955 | 2019 | 0.47  | 0.0507  | 1.47 | 0.1756  | 1.75 | 0.0251  | 0.95 |  | 164 | 3 | 160 | 2 |
| **LA-ICP-MS** |
| **Porphyritic monzogranite beneath J4 breccia pipe** |
| QYG-B06\_01 | 820 | 956 | 0.86 | 0.04935 | 0.00156 | 0.13637 | 0.00411 | 0.02012 | 0.00017 |  | 130 | 4 | 128 | 1 |
| QYG-B06\_02 | 375 | 624 | 0.60 | 0.04626 | 0.00151 | 0.13035 | 0.00407 | 0.02053 | 0.00021 |  | 124 | 4 | 131 | 1 |
| QYG-B06\_03 | 1373 | 1008 | 1.36 | 0.05191 | 0.00185 | 0.14908 | 0.00538 | 0.02070 | 0.00017 |  | 141 | 5 | 132 | 1 |
| QYG-B06\_04 | 688 | 757 | 0.91 | 0.04851 | 0.00160 | 0.13437 | 0.00433 | 0.02006 | 0.00017 |  | 128 | 4 | 128 | 1 |
| QYG-B06\_05 | 810 | 772 | 1.05 | 0.04964 | 0.00175 | 0.13947 | 0.00396 | 0.02025 | 0.00019 |  | 133 | 4 | 129 | 1 |
| QYG-B06\_06 | 471 | 604 | 0.78 | 0.05069 | 0.00263 | 0.14511 | 0.00535 | 0.02066 | 0.00020 |  | 138 | 5 | 132 | 1 |
| QYG-B06\_07 | 1008 | 880 | 1.15 | 0.05121 | 0.00138 | 0.14730 | 0.00406 | 0.02075 | 0.00019 |  | 140 | 4 | 132 | 1 |
| QYG-B06\_08 | 765 | 905 | 0.84 | 0.05044 | 0.00162 | 0.14077 | 0.00424 | 0.02017 | 0.00017 |  | 134 | 4 | 129 | 1 |
| QYG-B06\_09 | 521 | 700 | 0.74 | 0.04815 | 0.00194 | 0.13493 | 0.00438 | 0.02028 | 0.00019 |  | 129 | 4 | 129 | 1 |
| QYG-B06\_10 | 553 | 650 | 0.85 | 0.04970 | 0.00208 | 0.14129 | 0.00479 | 0.02058 | 0.00026 |  | 134 | 4 | 131 | 2 |
| QYG-B06\_11 | 435 | 609 | 0.71 | 0.04789 | 0.00230 | 0.13410 | 0.00634 | 0.02037 | 0.00018 |  | 128 | 6 | 130 | 1 |
| QYG-B06\_12 | 377 | 512 | 0.74 | 0.05360 | 0.00272 | 0.14907 | 0.00576 | 0.02013 | 0.00022 |  | 141 | 5 | 128 | 1 |
| QYG-B06\_13 | 373 | 506 | 0.74 | 0.05336 | 0.00288 | 0.15426 | 0.00536 | 0.02067 | 0.00023 |  | 146 | 5 | 132 | 1 |
| QYG-B06\_14 | 413 | 818 | 0.50 | 0.04703 | 0.00152 | 0.13112 | 0.00421 | 0.02013 | 0.00016 |  | 125 | 4 | 128 | 1 |
| **Reference materials** |
| **GJ-1** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| GJ-1\_1 | 8.12 | 272 | 0.03  | 0.0577 | 0.0016 | 0.7812 | 0.0215 | 0.0982 | 0.0010 |  | 586 | 12 | 604 | 6 |
| GJ-1\_2 | 8.83 | 293 | 0.03  | 0.0592 | 0.0013 | 0.7973 | 0.0185 | 0.0976 | 0.0007 |  | 595 | 10 | 600 | 4 |
| GJ-1\_3 | 9.11 | 300 | 0.03  | 0.0610 | 0.0015 | 0.8289 | 0.0200 | 0.0982 | 0.0008 |  | 613 | 11 | 604 | 5 |
| GJ-1\_4 | 8.09 | 274 | 0.03  | 0.0607 | 0.0016 | 0.8192 | 0.0221 | 0.0979 | 0.0009 |  | 608 | 12 | 602 | 5 |
| GJ-1\_5 | 8.29 | 279 | 0.03  | 0.0591 | 0.0016 | 0.7992 | 0.0219 | 0.0980 | 0.0009 |  | 596 | 12 | 603 | 5 |
| GJ-1\_6 | 7.98 | 274 | 0.03  | 0.0582 | 0.0014 | 0.7892 | 0.0194 | 0.0981 | 0.0009 |  | 591 | 11 | 603 | 5 |
| GJ-1\_7 | 8.97 | 297 | 0.03  | 0.0617 | 0.0014 | 0.8266 | 0.0188 | 0.0974 | 0.0008 |  | 612 | 10 | 599 | 5 |
| GJ-1\_8 | 8.94 | 296 | 0.03  | 0.0588 | 0.0014 | 0.7933 | 0.0185 | 0.0977 | 0.0009 |  | 593 | 11 | 601 | 5 |
| GJ-1\_9 | 9.06 | 300 | 0.03  | 0.0608 | 0.0017 | 0.8191 | 0.0222 | 0.0976 | 0.0007 |  | 608 | 12 | 600 | 4 |
| GJ-1\_10 | 9.10 | 299 | 0.03  | 0.0575 | 0.0014 | 0.7803 | 0.0191 | 0.0981 | 0.0009 |  | 586 | 11 | 603 | 5 |
| **Plesovice** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Ple-1 | 145 | 934 | 0.16  | 0.0512 | 0.0011 | 0.3754 | 0.0080 | 0.0532 | 0.0004 |  | 324 | 6 | 334 | 2 |
| Ple-2 | 157 | 1186 | 0.13  | 0.0543 | 0.0011 | 0.4061 | 0.0089 | 0.0540 | 0.0004 |  | 346 | 6 | 339 | 3 |
| Ple-3 | 144 | 927 | 0.16  | 0.0518 | 0.0012 | 0.3840 | 0.0093 | 0.0536 | 0.0004 |  | 330 | 7 | 337 | 3 |
| Ple-4 | 155 | 1101 | 0.14  | 0.0514 | 0.0011 | 0.3821 | 0.0084 | 0.0539 | 0.0005 |  | 329 | 6 | 338 | 3 |
| Ple-5 | 154 | 1103 | 0.14  | 0.0533 | 0.0011 | 0.3938 | 0.0083 | 0.0535 | 0.0004 |  | 337 | 6 | 336 | 2 |
| Ple-6 | 144 | 997 | 0.14  | 0.0533 | 0.0013 | 0.3980 | 0.0096 | 0.0541 | 0.0004 |  | 340 | 7 | 340 | 3 |
| Ple-7 | 136 | 960 | 0.14  | 0.0553 | 0.0013 | 0.4124 | 0.0097 | 0.0536 | 0.0004 |  | 351 | 7 | 336 | 2 |
| Ple-8 | 82.7 | 748 | 0.11  | 0.0530 | 0.0013 | 0.3978 | 0.0098 | 0.0541 | 0.0005 |  | 340 | 7 | 339 | 3 |