## Table 1. He Results Overview
| Table 1. (U-Th)/He results summary | Unnamed: 1 | Unnamed: 2 | Unnamed: 3 | Unnamed: 4 | Unnamed: 5 | Unnamed: 6 | Unnamed: 7 | Unnamed: 8 | Unnamed: 9 | Unnamed: 10 | Unnamed: 11 | Unnamed: 12 | Unnamed: 13 | Unnamed: 14 | Unnamed: 15 | Unnamed: 16 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NaN | sample | NaN | NaN | NaN | NaN | apatite He | NaN | NaN | NaN | NaN | zircon He | NaN | NaN | NaN | NaN | NaN |
| name | elev. | latitude | longitude | rock | NaN | # | avg. age | s.d. | s.d. | NaN | # | avg. age | s.d. | s.d | age range | eU range |
| NaN | (m) | NaN | NaN | NaN | NaN | NaN | (Ma) | (Ma) | % | NaN | NaN | (Ma) | (Ma) | % | (Ma) | (ppm) |
| Range Front | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN |
| 13BC-A | 2255.52 | 39.981762 | -105.374198 | Ppz | NaN | 4 | 58.758169 | 1.89107 | 0.032184 | NaN | 6 | 58.688984 | 7.154718 | 0.12 | 50-67 | 1178-2344 |
| 13BC-B | 2453.64 | 39.961931 | -105.377017 | Ppz | NaN | 4 | 56.803603 | 7.08023 | 0.124644 | NaN | 6 | – | – | 0.66 | 147-607 | 379-821 |
| 13BC-C | 2468.88 | 39.98217 | -105.387084 | Ppz | NaN | 4 | 57.400939 | 3.218545 | 0.056071 | NaN | 6 | – | – | 0.3 | 62-129 | 601-1340 |
| 13BC-D | 2194.56 | 39.988535 | -105.369257 | Ppz | NaN | 4 | 59.284141 | 3.964504 | 0.066873 | NaN | 6 | – | – | 0.21 | 54-96 | 778-1634 |
| 13BC-E | 2057.4 | 39.995788 | -105.354946 | Ppz | NaN | 4 | 58.886068 | 3.87527 | 0.06581 | NaN | 6 | 68.563333 | 5.077171 | 0.07 | 65-79 | 736-1651 |
| 13BC-F | 1905 | 40.001652 | -105.352341 | Ppz | NaN | 4 | 53.586241 | 7.91736 | 0.14775 | NaN | 6 | – | – | 0.27 | 59-110 | 631-1788 |
| 13BC-G | NaN | na/ | NaN | Ppz | NaN | 4 | 56.523704 | 3.677404 | 0.06506 | NaN | 6 | 60.663825 | 7.755083 | 0.13 | 50-74 | 851-1377 |
| Range Middle | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN |
| 16NBC-B02 | 2600 | 40.025556 | -105.423778 | Ppz | NaN | 4 | 50.194972 | 1.575614 | 0.03139 | NaN | 6 | – | – | 0.19 | 47-86 | 531-1072 |
| 16NBC-B01 | 2728 | 40.02675 | -105.418833 | CMB | NaN | 4 | 54.695697 | 8.077527 | 0.147681 | NaN | 0 | NaN | NaN | NaN | NaN | NaN |
| 16FM-B06 | 2612 | 40.048056 | -105.466417 | CMB | NaN | 4 | 50.194972 | 1.575614 | 0.03139 | NaN | 0 | NaN | NaN | NaN | NaN | NaN |
| Range Interior | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN |
| 16MBC-B01 | 3925 | 40.014278 | -105.638583 | Ppz | NaN | 4 | 55.129858 | 2.010469 | 0.036468 | NaN | 6 | – | – | 0.18 | 73-108 | 343-921 |
| 16MBC-B02 | 3712 | 40.01 | -105.645889 | Ppz | NaN | 4 | 55.757962 | 2.046366 | 0.036701 | NaN | 6 | 75.243333 | 7.13165 | 0.09 | 67-83 | 289-762 |
| 16MBC-B03 | 3363 | 40.006167 | -105.650861 | Ppz | NaN | 4 | 39.208771 | 4.120594 | 0.105094 | NaN | 0 | NaN | NaN | NaN | NaN | NaN |
| 16MBC-B04 | 3254 | 40.003194 | -105.6436 | Ppz | NaN | 4 | 46.203463 | 2.449905 | 0.053024 | NaN | 6 | 71.586667 | 5.820906 | 0.08 | 66-81 | 375-865 |

## Table 2. ZHe results
| Table 2. Zircon (U-Th)/He results | Unnamed: 1 | Unnamed: 2 | Unnamed: 3 | Unnamed: 4 | Unnamed: 5 | Unnamed: 6 | Unnamed: 7 | Unnamed: 8 | Unnamed: 9 | Unnamed: 10 | Unnamed: 11 | Unnamed: 12 | Unnamed: 13 | Unnamed: 14 | Unnamed: 15 | Unnamed: 16 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Grain ID | [U] ppm | [U] SD | [Th] | [Th] SD | [eU] | 4He | 4He error | [4He] | Mass | FT | Half-width | Shape\* | Length | Uncorr. Age | Age | Age Error |
| NaN | ppm | ppm | ppm | ppm | ppm | ncc | ncc | ncc/g | mg | NaN | µm | NaN | µm | Ma | Ma | Ma |
| 13BC-A Zra | 2143.941799 | 31.437884 | 849.623064 | 13.307354 | 2343.603219 | 149.4885 | 0.049631 | 15549202.956573 | 0.009614 | 0.81419 | 61.394 | nn | 316.687 | 54.687542 | 67.168066 | 0.736965 |
| 13BC-A Zrb | 1592.76062 | 24.032028 | 497.664784 | 7.442288 | 1709.711844 | 145.578944 | 0.064551 | 11320617.074404 | 0.01286 | 0.82177 | 63.164 | nn | 400.195 | 54.584959 | 66.423667 | 0.772399 |
| 13BC-A Zrc | 1755.138355 | 27.821959 | 397.100956 | 5.95541 | 1848.45708 | 50.623964 | 0.035653 | 10458319.364354 | 0.004841 | 0.769659 | 49.2475 | nn | 247.804 | 46.680947 | 60.651484 | 0.717436 |
| 13BC-A Zrd | 1200.06634 | 17.702716 | 524.697191 | 8.494852 | 1323.37018 | 65.159877 | 0.017359 | 6639662.827104 | 0.009814 | 0.825654 | 66.921 | nn | 272.077 | 41.399953 | 50.142039 | 0.557288 |
| 13BC-A Zre | 1709.276722 | 25.254954 | 471.478931 | 7.896897 | 1820.074271 | 69.04382 | 0.029572 | 9308378.168796 | 0.007417 | 0.793726 | 54.773 | nn | 306.973 | 42.209788 | 53.179264 | 0.591718 |
| 13BC-A Zrf | 1117.472398 | 16.455767 | 258.137605 | 3.900771 | 1178.134735 | 47.082556 | 0.025337 | 6304392.994802 | 0.007468 | 0.809245 | 60.956 | nn | 249.555 | 44.160023 | 54.569381 | 0.618942 |
| 13BC-B Zra | 357.188723 | 5.716325 | 114.950943 | 1.741672 | 384.202194 | 112.940472 | 0.034446 | 12852143.601436 | 0.008788 | 0.818013 | 63.842 | nn | 267.697 | 270.420771 | 330.582662 | 3.928163 |
| 13BC-B Zrb | 656.948296 | 9.752157 | 322.409464 | 5.358947 | 732.71452 | 70.666887 | 0.031595 | 10475323.893062 | 0.006746 | 0.78298 | 51.681 | nn | 313.595 | 117.180758 | 149.659947 | 1.531908 |
| 13BC-B Zrc | 347.464093 | 5.419842 | 135.678621 | 2.404972 | 379.348568 | 78.102736 | 0.032632 | 22332829.500567 | 0.003497 | 0.77007 | 51.6845 | nn | 162.549 | 467.392062 | 606.947397 | 6.447245 |
| 13BC-B Zrd | 775.918139 | 11.870948 | 193.690831 | 2.903986 | 821.435484 | 46.656184 | 0.021881 | 11161493.074235 | 0.00418 | 0.75993 | 47.26 | nn | 232.371 | 111.446367 | 146.653478 | 1.597955 |
| 13BC-B Zre | 742.772229 | 11.250094 | 110.446843 | 1.629194 | 768.727237 | 31.568193 | 0.035856 | 11868489.881084 | 0.00266 | 0.74079 | 44.831 | nn | 164.316 | 126.463014 | 170.713647 | 1.846423 |
| 13BC-B Zrf | 544.902001 | 8.12844 | 82.512194 | 1.253339 | 564.292366 | 33.242033 | 0.049521 | 11022854.324176 | 0.003016 | 0.741344 | 44.1955 | nn | 191.699 | 159.513474 | 215.167939 | 2.317191 |
| 13BC-C Zra | 1003.74586 | 15.162199 | 398.390171 | 5.831638 | 1097.36755 | 28.192734 | 0.042363 | 7391670.025307 | 0.003814 | 0.765662 | 49.473 | nn | 193.482 | 55.513229 | 72.503541 | 0.773971 |
| 13BC-C Zrb | 1099.949214 | 16.231097 | 1020.760442 | 15.192458 | 1339.827918 | 24.905283 | 0.036386 | 8100760.500721 | 0.003074 | 0.744326 | 44.831 | nn | 189.929 | 49.815178 | 66.926545 | 0.625551 |
| 13BC-C Zrc | 858.181852 | 12.72083 | 347.030409 | 5.053506 | 939.733998 | 25.280616 | 0.042425 | 6653293.06209 | 0.0038 | 0.760427 | 47.927 | nn | 205.387 | 58.333893 | 76.712012 | 0.787411 |
| 13BC-C Zrd | 705.720757 | 10.638013 | 428.300455 | 6.300112 | 806.371363 | 24.95088 | 0.036352 | 6558391.277886 | 0.003804 | 0.753973 | 46.156 | nn | 221.725 | 66.942912 | 88.786862 | 0.884067 |
| 13BC-C Zre | 540.618861 | 8.100825 | 254.72277 | 3.782174 | 600.478712 | 26.535856 | 0.040513 | 7184357.172565 | 0.003694 | 0.75982 | 47.927 | nn | 199.649 | 98.224913 | 129.273859 | 1.327384 |
| 13BC-C Zrf | 828.112632 | 12.218308 | 241.501986 | 3.834823 | 884.865599 | 27.754363 | 0.039299 | 5167335.298733 | 0.005371 | 0.781443 | 52.347 | nn | 243.368 | 48.167431 | 61.639059 | 0.665266 |
| 13BC-D Zra | 1024.520784 | 15.735853 | 355.418543 | 5.211984 | 1108.044141 | 39.591505 | 0.01945 | 7278331.116503 | 0.00544 | 0.792499 | 56.3215 | nn | 212.914 | 54.147291 | 68.324781 | 0.7691 |
| 13BC-D Zrb | 1310.990144 | 19.350969 | 529.181266 | 7.910779 | 1435.347741 | 75.817473 | 0.036503 | 9143605.951872 | 0.008292 | 0.797185 | 55.453 | nn | 334.799 | 52.516654 | 65.877608 | 0.70626 |
| 13BC-D Zrc | 907.941843 | 13.427542 | 364.509503 | 5.373083 | 993.601577 | 35.427766 | 0.027886 | 5206424.650899 | 0.006805 | 0.802148 | 58.5435 | nn | 246.507 | 43.232204 | 53.895552 | 0.593881 |
| 13BC-D Zrd | 721.295276 | 13.253495 | 239.877053 | 3.79198 | 777.666384 | 40.641718 | 0.036078 | 7052786.427625 | 0.005763 | 0.780662 | 51.7 | nn | 267.678 | 74.625251 | 95.592302 | 1.281051 |
| 13BC-D Zre | 1005.41998 | 14.812517 | 352.877147 | 5.356503 | 1088.34611 | 45.87131 | 0.036302 | 6744513.81985 | 0.006801 | 0.800514 | 57.8645 | nn | 252.202 | 51.097981 | 63.83143 | 0.690259 |
| 13BC-D Zrf | 1470.990495 | 21.613909 | 692.277042 | 10.211749 | 1633.6756 | 34.396149 | 0.029451 | 8883010.201412 | 0.003872 | 0.755158 | 46.376 | nn | 223.535 | 44.849939 | 59.391444 | 0.598669 |
| 13BC-E Zra | 682.968685 | 10.118907 | 225.028868 | 3.418596 | 735.850469 | 51.492548 | 0.013162 | 4968924.468436 | 0.010363 | 0.81911 | 63.167 | np | 322.466 | 55.658779 | 67.950324 | 0.764679 |
| 13BC-E Zrb | 1003.516509 | 14.855867 | 407.36653 | 5.998534 | 1099.247643 | 34.304736 | 0.035381 | 6722839.457109 | 0.005103 | 0.776443 | 51.022 | nn | 243.371 | 50.426378 | 64.945401 | 0.689257 |
| 13BC-E Zrc | 913.919998 | 13.71616 | 314.625741 | 4.609374 | 987.857048 | 26.121007 | 0.038578 | 5940731.610466 | 0.004397 | 0.763311 | 47.931 | nn | 237.629 | 49.592266 | 64.969966 | 0.691547 |
| 13BC-E Zrd | 1524.634783 | 22.63773 | 538.908566 | 8.060274 | 1651.278296 | 36.33939 | 0.034278 | 9835538.050926 | 0.003695 | 0.734247 | 41.7445 | nn | 263.247 | 49.121018 | 66.899885 | 0.673892 |
| 13BC-E Zre | 1135.382535 | 16.913081 | 425.094519 | 6.193413 | 1235.279747 | 19.09811 | 0.031684 | 8361200.513656 | 0.002284 | 0.710204 | 38.868 | nn | 187.724 | 55.782596 | 78.544484 | 0.769164 |
| 13BC-E Zrf | 827.368621 | 12.152151 | 378.848283 | 5.625764 | 916.397968 | 21.184253 | 0.032004 | 5749492.576309 | 0.003685 | 0.759752 | 47.9225 | nn | 199.199 | 51.718337 | 68.072682 | 0.68912 |
| 13BC-F Zra | 1698.957648 | 25.024637 | 377.80198 | 5.563999 | 1787.741114 | 49.426381 | 0.024651 | 9719728.471358 | 0.005085 | 0.763253 | 47.26 | nn | 282.683 | 44.865291 | 58.781708 | 0.626962 |
| 13BC-F Zrb | 1013.990283 | 15.009691 | 365.484377 | 5.308315 | 1099.879111 | 19.357673 | 0.030403 | 6414673.279411 | 0.003018 | 0.741269 | 44.1735 | np | 192.016 | 48.098495 | 64.886688 | 0.666696 |
| 13BC-F Zrc | 572.016723 | 8.397677 | 252.306204 | 3.633608 | 631.30868 | 59.913109 | 0.029478 | 6890335.846324 | 0.008695 | 0.814639 | 62.2835 | nn | 278.303 | 89.678515 | 110.08374 | 1.212835 |
| 13BC-F Zrd | 1146.878316 | 16.885807 | 436.184549 | 6.305289 | 1249.381685 | 38.866941 | 0.024889 | 8033343.384108 | 0.004838 | 0.764977 | 47.931 | nn | 261.477 | 53.005847 | 69.290758 | 0.706401 |
| 13BC-F Zre | 957.747511 | 14.072696 | 357.539456 | 5.235436 | 1041.769283 | 95.093052 | 0.039491 | 8771139.969885 | 0.010842 | 0.802761 | 56.3145 | nn | 424.458 | 69.310281 | 86.339841 | 0.93479 |
| 13BC-F Zrf | 1173.470363 | 17.60511 | 385.488563 | 5.761022 | 1264.060175 | 30.028134 | 0.031894 | 6895743.864816 | 0.004355 | 0.763102 | 47.9225 | nn | 235.424 | 45.006463 | 58.97827 | 0.623333 |
| 13BC-G Zra | 799.819392 | 11.87159 | 245.107187 | 3.539627 | 857.419581 | 60.735312 | 0.024848 | 6275235.768215 | 0.009679 | 0.818126 | 63.1605 | nn | 301.233 | 60.302519 | 73.708133 | 0.836657 |
| 13BC-G Zrb | 1022.190661 | 15.441952 | 365.070508 | 5.275609 | 1107.982231 | 19.36102 | 0.031603 | 5112127.314737 | 0.003787 | 0.762603 | 48.585 | nn | 199.207 | 38.085428 | 49.941372 | 0.542232 |
| 13BC-G Zrc | 952.264993 | 13.99798 | 321.855712 | 4.70159 | 1027.901085 | 53.064339 | 0.025169 | 5944598.906887 | 0.008926 | 0.818233 | 63.8235 | nn | 272.083 | 47.701802 | 58.298581 | 0.668864 |
| 13BC-G Zrd | 773.982873 | 11.617546 | 327.333686 | 4.721593 | 850.90629 | 31.410289 | 0.040982 | 5210532.949051 | 0.006028 | 0.798286 | 57.8675 | nn | 223.513 | 50.487563 | 63.244961 | 0.69754 |
| 13BC-G Zre | 1281.917595 | 18.887304 | 403.480798 | 6.28778 | 1376.735582 | 80.438622 | 0.030668 | 8126937.237029 | 0.009898 | 0.822911 | 65.375 | nn | 287.539 | 48.688301 | 59.165939 | 0.676623 |
| 13BC-G Zrf | 855.701288 | 13.433948 | 330.547316 | 5.590321 | 933.379907 | 33.160576 | 0.036798 | 5307556.770088 | 0.006248 | 0.786619 | 53.223 | nn | 273.849 | 46.901317 | 59.623965 | 0.683696 |
| 16MBC-B01 Zra | 817.54947 | 13.231003 | 439.658921 | 6.934765 | 920.869316 | 25.198629 | 0.029243 | 6132220.041258 | 0.004109 | 0.752802 | 45.498 | nn | 246.466 | 54.872455 | 72.890992 | 0.793381 |
| 16MBC-B01 Zrb | 284.644651 | 4.639884 | 246.843467 | 3.879574 | 342.652866 | 24.268573 | 0.014525 | 3508883.225992 | 0.006916 | 0.78112 | 51.0145 | nn | 329.967 | 84.140046 | 107.717137 | 1.169972 |
| 16MBC-B01 Zrc | 413.24321 | 6.126975 | 336.412697 | 5.154848 | 492.300193 | 21.652254 | 0.017627 | 4061378.521527 | 0.005331 | 0.774324 | 50.139 | np | 263.306 | 67.879255 | 87.662623 | 0.850684 |
| 16MBC-B01 Zrd | 469.639231 | 7.416983 | 321.789568 | 4.677455 | 545.259779 | 14.971412 | 0.010808 | 3571978.759097 | 0.004191 | 0.736181 | 41.7445 | nn | 298.633 | 53.970689 | 73.311737 | 0.749971 |
| 16MBC-B01 Zre | 307.338523 | 4.793104 | 215.162098 | 3.152047 | 357.901616 | 14.038645 | 0.012118 | 3405469.664819 | 0.004122 | 0.746293 | 43.9475 | np | 265.01 | 78.22805 | 104.822155 | 1.047849 |
| 16MBC-B01 Zrf | 710.216673 | 11.174013 | 404.02031 | 5.939052 | 805.161446 | 19.011736 | 0.028624 | 5712516.095636 | 0.003328 | 0.732423 | 41.739 | np | 237.188 | 58.440569 | 79.790695 | 0.807501 |
| 16MBC-B02 Zra | 250.830165 | 3.978873 | 161.758818 | 2.362776 | 288.843487 | 9.102992 | 0.010529 | 2153671.241817 | 0.004227 | 0.741687 | 42.8525 | nn | 285.782 | 61.387543 | 82.767416 | 0.858048 |
| 16MBC-B02 Zrb | 454.188357 | 7.076618 | 332.262632 | 4.888614 | 532.270076 | 26.655968 | 0.017752 | 3880335.277306 | 0.00687 | 0.786031 | 52.5605 | nn | 308.737 | 60.029881 | 76.370891 | 0.808762 |
| 16MBC-B02 Zrc | 407.512901 | 6.646134 | 238.404535 | 3.489443 | 463.537967 | 25.845003 | 0.027235 | 2995330.534966 | 0.008628 | 0.798272 | 55.656 | nn | 345.852 | 53.250772 | 66.707546 | 0.761938 |
| 16MBC-B02 Zrd | 360.24729 | 5.654149 | 183.117112 | 2.671905 | 403.279812 | 23.639011 | 0.023338 | 2926386.676357 | 0.008078 | 0.794884 | 54.769 | np | 334.357 | 59.771149 | 75.19482 | 0.848111 |
| 16MBC-B02 Zre | 669.104846 | 10.903613 | 396.162841 | 5.803042 | 762.203113 | 28.403694 | 0.028253 | 4919146.416033 | 0.005774 | 0.789651 | 54.769 | np | 239 | 53.184696 | 67.352191 | 0.77284 |
| 16MBC-B02 Zrf | 405.430206 | 6.491427 | 352.799329 | 5.157175 | 488.338048 | 16.245521 | 0.02708 | 3653605.561103 | 0.004446 | 0.741335 | 42.623 | np | 303.883 | 61.58548 | 83.07372 | 0.846645 |
| 16MBC-B04 Zra | 349.834117 | 5.467706 | 232.284443 | 3.482335 | 404.420962 | 8.383277 | 0.020768 | 2915060.628794 | 0.002876 | 0.733605 | 42.6225 | nn | 196.549 | 59.351668 | 80.904153 | 0.811681 |
| 16MBC-B04 Zrb | 383.616939 | 6.051014 | 303.869154 | 4.517286 | 455.02619 | 17.940187 | 0.030735 | 2820630.008038 | 0.00636 | 0.77776 | 50.3595 | nn | 311.387 | 51.075647 | 65.670164 | 0.695912 |
| 16MBC-B04 Zrc | 609.953288 | 9.56728 | 307.960868 | 4.486506 | 682.324092 | 15.847899 | 0.028001 | 4407672.776616 | 0.003596 | 0.761468 | 48.593 | nn | 189.059 | 53.237148 | 69.913868 | 0.751017 |
| 16MBC-B04 Zrd | 785.995214 | 12.432145 | 335.366772 | 4.929756 | 864.806406 | 23.656818 | 0.038414 | 5988111.843005 | 0.003951 | 0.746585 | 44.177 | nn | 251.337 | 57.054798 | 76.421011 | 0.822454 |
| 16MBC-B04 Zre | 311.396108 | 5.014579 | 271.733565 | 4.060121 | 375.253496 | 8.034081 | 0.022998 | 2355473.437552 | 0.003411 | 0.75809 | 47.9475 | nn | 184.208 | 51.70417 | 68.203204 | 0.706421 |
| 16MBC-B04 Zrf | 560.437415 | 8.842049 | 323.536438 | 4.774369 | 636.468478 | 14.500198 | 0.027172 | 3901818.353966 | 0.003716 | 0.73855 | 42.6225 | nn | 253.987 | 50.528376 | 68.415645 | 0.708544 |
| 16NBC-B02 Zra | 1024.466048 | 16.036219 | 203.669852 | 3.025976 | 1072.328463 | 18.107844 | 0.032892 | 4692722.849399 | 0.003859 | 0.765933 | 49.4765 | nn | 195.716 | 36.140123 | 47.184446 | 0.547272 |
| 16NBC-B02 Zrc | 566.044503 | 8.901598 | 121.126716 | 1.771331 | 594.509281 | 34.459432 | 0.027067 | 4940170.696622 | 0.006975 | 0.796455 | 56.101 | nn | 275.174 | 68.424645 | 85.911469 | 1.00819 |
| 16NBC-B02 Zrd | 516.555969 | 8.039913 | 63.543894 | 0.926113 | 531.488784 | 35.790216 | 0.033859 | 3489979.532064 | 0.010255 | 0.827931 | 67.8015 | nn | 276.978 | 54.149111 | 65.402899 | 0.832466 |
| 16NBC-B02 Zre | 788.948278 | 12.595294 | 300.961197 | 4.472314 | 859.674159 | 31.379622 | 0.028488 | 5918663.533436 | 0.005302 | 0.779186 | 51.681 | nn | 246.459 | 56.736487 | 72.815116 | 0.835934 |
| 16NBC-B02 Zrf | 678.272442 | 10.946681 | 236.69058 | 3.443293 | 733.894728 | 42.381018 | 0.038182 | 5302914.721129 | 0.007992 | 0.80083 | 56.977 | nn | 305.661 | 59.535327 | 74.341998 | 0.870755 |
| 16NBC-B02 Zrg | 667.943491 | 11.006093 | 105.43105 | 1.547555 | 692.719788 | 59.326153 | 0.02025 | 4602980.829303 | 0.012889 | 0.829547 | 66.921 | nn | 357.326 | 54.790117 | 66.048267 | 0.857947 |
| \* shapes: nn = complete grain, np = missing one termination, pp = missing both terminations | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN |

## Table 3. AHe results
| Table 3. Apatite (U-Th)/He results | Unnamed: 1 | Unnamed: 2 | Unnamed: 3 | Unnamed: 4 | Unnamed: 5 | Unnamed: 6 | Unnamed: 7 | Unnamed: 8 | Unnamed: 9 | Unnamed: 10 | Unnamed: 11 | Unnamed: 12 | Unnamed: 13 | Unnamed: 14 | Unnamed: 15 | Unnamed: 16 | Unnamed: 17 | Unnamed: 18 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Grain ID | [U] ppm | [U] SD | [Th] | [Th] SD | [Sm] | [Sm] SD | [eU] | 4He | 4He error | [4He] | Mass | FT | Half-width | Shape\* | Length | Uncorr. Age | Age | Age Error |
| NaN | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ncc | ncc | ncc/g | mg | NaN | µm | NaN | µm | Ma | Ma | Ma |
| 13BC-Aa | 39.551502 | 0.566994 | 38.899459 | 0.557641 | 368.503858 | 5.356982 | 50.385943 | 1.479811 | 0.001124 | 289474.036397 | 0.005112 | 0.787288 | 54.773 | nn | 211.566 | 48.476076 | 61.573514 | 0.56515 |
| 13BC-Ab | 28.452237 | 0.417028 | 24.96245 | 0.357914 | 135.146491 | 2.269128 | 34.928638 | 0.471072 | 0.000787 | 185326.982991 | 0.002542 | 0.763458 | 53.2455 | np | 111.318 | 44.113438 | 57.781074 | 0.551151 |
| 13BC-Ac | 56.289147 | 0.802041 | 44.979722 | 0.641887 | 327.476935 | 4.900417 | 68.353544 | 2.346515 | 0.001765 | 382043.526935 | 0.006142 | 0.804985 | 60.738 | nn | 206.715 | 46.7858 | 58.120089 | 0.568866 |
| 13BC-Ad | 52.79222 | 0.753858 | 34.8886 | 0.49718 | 180.823224 | 2.698469 | 61.806022 | 1.012442 | 0.001664 | 329043.870576 | 0.003077 | 0.768633 | 52.568 | np | 138.247 | 44.24095 | 57.557998 | 0.554701 |
| 13BC-Ba | 1.355406 | 0.027568 | 2.557655 | 0.037502 | 81.948235 | 1.188624 | 2.339054 | 0.053267 | 0.000283 | 13264.618476 | 0.004016 | 0.793719 | 60.735 | nn | 135.167 | 51.032557 | 64.295523 | 0.765935 |
| 13BC-Bb | 4.60929 | 0.072059 | 9.985907 | 0.146196 | 212.070831 | 3.053464 | 7.942725 | 0.044082 | 0.000315 | 30575.944148 | 0.001442 | 0.703761 | 40.4235 | pp | 109.546 | 33.269022 | 47.2732 | 0.443366 |
| 13BC-Bc | 7.020012 | 0.111109 | 20.604618 | 0.29562 | 254.072322 | 3.741556 | 13.035633 | 0.135402 | 0.000227 | 64229.347044 | 0.002108 | 0.729147 | 43.511 | nn | 138.253 | 42.761255 | 58.645587 | 0.479847 |
| 13BC-Bd | 6.62539 | 0.10246 | 17.419418 | 0.255513 | 231.842292 | 3.363205 | 11.791192 | 0.150393 | 0.000342 | 58319.27675 | 0.002579 | 0.754964 | 49.4865 | nn | 130.745 | 43.033022 | 57.000103 | 0.480969 |
| 13BC-Ca | 23.588425 | 0.337495 | 28.435891 | 0.40728 | 110.629525 | 1.691463 | 30.762382 | 0.44367 | 0.000939 | 157743.34754 | 0.002813 | 0.765699 | 52.577 | np | 126.328 | 42.557888 | 55.580464 | 0.493218 |
| 13BC-Cb | 45.321792 | 0.651881 | 51.619864 | 0.734586 | 212.94457 | 3.279894 | 58.40168 | 1.348771 | 0.001321 | 335695.320306 | 0.004018 | 0.792594 | 60.069 | np | 138.253 | 47.852185 | 60.374169 | 0.551081 |
| 13BC-Cc | 16.313206 | 0.232952 | 29.003265 | 0.4137 | 250.398578 | 4.010081 | 24.276843 | 0.490297 | 0.000889 | 134739.639776 | 0.003639 | 0.787799 | 59.1855 | np | 128.978 | 47.146644 | 59.846023 | 0.504091 |
| 13BC-Cd | 23.49086 | 0.337474 | 15.620492 | 0.227614 | 160.779854 | 2.464509 | 27.90172 | 0.41369 | 0.000706 | 140971.793623 | 0.002935 | 0.78601 | 64.7065 | np | 87.022 | 42.289755 | 53.803102 | 0.524101 |
| 13BC-Da | 36.312234 | 0.518211 | 34.108604 | 0.486526 | 84.90278 | 1.233996 | 44.692691 | 1.834311 | 0.001697 | 281955.8576 | 0.006506 | 0.819675 | 68.4665 | np | 172.313 | 52.220142 | 63.708387 | 0.619325 |
| 13BC-Db | 41.499745 | 0.592239 | 37.522663 | 0.531458 | 77.842942 | 1.161405 | 50.64591 | 1.3723 | 0.000916 | 301821.310582 | 0.004547 | 0.800567 | 62.5175 | np | 144.437 | 49.262005 | 61.533864 | 0.594454 |
| 13BC-Dc | 62.055287 | 0.889701 | 54.282462 | 0.777895 | 129.121173 | 1.909045 | 75.364252 | 0.861083 | 0.001023 | 376901.745923 | 0.002285 | 0.743879 | 47.058 | np | 128.095 | 41.357165 | 55.596635 | 0.512989 |
| 13BC-Dd | 67.459901 | 0.966626 | 63.473015 | 0.904963 | 122.945048 | 1.931264 | 82.890428 | 1.367666 | 0.001139 | 444121.627229 | 0.003079 | 0.786816 | 63.1605 | pp | 95.845 | 44.29591 | 56.297677 | 0.533242 |
| 13BC-Ea | 31.03098 | 0.448349 | 30.312707 | 0.441102 | 179.138628 | 2.671006 | 38.966105 | 0.88317 | 0.001036 | 219609.250271 | 0.004022 | 0.789793 | 58.5295 | np | 145.756 | 47.056043 | 59.580239 | 0.572568 |
| 13BC-Eb | 58.310995 | 0.83104 | 50.224373 | 0.712873 | 178.219579 | 2.755754 | 70.90113 | 1.559195 | 0.001145 | 422561.907563 | 0.00369 | 0.78274 | 56.3185 | np | 144.441 | 49.447955 | 63.17287 | 0.579624 |
| 13BC-Ec | 71.870255 | 1.027257 | 71.458434 | 1.011612 | 353.462842 | 5.159862 | 90.252804 | 1.138808 | 0.00137 | 426051.718709 | 0.002673 | 0.732068 | 42.6505 | nn | 182.441 | 39.363165 | 53.769791 | 0.472764 |
| 13BC-Ed | 22.590313 | 0.322845 | 20.418508 | 0.291361 | 215.813233 | 3.150451 | 28.382566 | 1.20459 | 0.001478 | 166102.049201 | 0.007252 | 0.837312 | 82.432 | np | 132.512 | 49.419301 | 59.021374 | 0.601488 |
| 13BC-Fa | 39.502726 | 0.564526 | 35.286118 | 0.501136 | 408.642724 | 5.88996 | 49.680298 | 0.872379 | 0.000658 | 258758.078203 | 0.003371 | 0.778518 | 55.652 | np | 135.155 | 44.072042 | 56.610185 | 0.523167 |
| 13BC-Fb | 90.377137 | 1.296319 | 22.063227 | 0.330487 | 190.558535 | 2.856219 | 96.435557 | 0.975351 | 0.001272 | 375520.742977 | 0.002597 | 0.772431 | 57.8675 | pp | 96.303 | 32.31643 | 41.837316 | 0.445912 |
| 13BC-Fc | 45.613329 | 0.655126 | 24.623654 | 0.35427 | 270.500726 | 4.023208 | 52.646618 | 1.016109 | 0.000685 | 293222.472859 | 0.003465 | 0.788921 | 60.972 | np | 115.735 | 46.652025 | 59.133979 | 0.592057 |
| 13BC-Fd | 30.777815 | 0.442241 | 7.067052 | 0.105839 | 55.557432 | 0.814034 | 32.692625 | 0.633885 | 0.001011 | 173401.252031 | 0.003656 | 0.773031 | 52.347 | np | 165.637 | 43.879955 | 56.763485 | 0.609675 |
| 13BC-Ga | 73.709658 | 1.062646 | 38.828163 | 0.557821 | 356.491351 | 5.194808 | 84.470957 | 1.208151 | 0.001006 | 462609.003921 | 0.002612 | 0.75533 | 49.4685 | pp | 132.505 | 45.742928 | 60.560179 | 0.590678 |
| 13BC-Gb | 46.841534 | 0.672805 | 12.533234 | 0.188183 | 111.731232 | 1.786706 | 50.299448 | 0.392854 | 0.000548 | 255072.727777 | 0.00154 | 0.714822 | 42.6505 | np | 105.124 | 41.947553 | 58.682548 | 0.572077 |
| 13BC-Gc | 29.634988 | 0.424389 | 9.636157 | 0.143849 | 83.845704 | 1.466398 | 32.283924 | 0.479504 | 0.000691 | 155227.337228 | 0.003089 | 0.752678 | 47.0645 | nn | 173.149 | 39.865571 | 52.964976 | 0.533755 |
| 13BC-Gd | 76.348124 | 1.087207 | 35.030162 | 0.505771 | 379.240135 | 5.660513 | 86.32761 | 1.472435 | 0.000937 | 428019.016596 | 0.00344 | 0.769626 | 51.6845 | np | 159.895 | 41.472914 | 53.887112 | 0.522785 |
| 16MBC-B01a | 12.980445 | 0.199687 | 38.83154 | 0.561712 | 129.67662 | 2.085344 | 22.676505 | 0.290445 | 0.001012 | 107521.266611 | 0.002701 | 0.756482 | 49.4925 | np | 136.922 | 39.460654 | 52.163367 | 0.455285 |
| 16MBC-B01b | 37.256745 | 0.537341 | 95.811943 | 1.383212 | 153.071654 | 2.3877 | 60.396176 | 2.973148 | 0.002747 | 332857.260841 | 0.008932 | 0.816937 | 63.1795 | nn | 277.836 | 45.651253 | 55.880962 | 0.471174 |
| 16MBC-B01c | 18.947004 | 0.277903 | 73.919495 | 1.062096 | 142.477624 | 2.2933 | 36.913811 | 0.6062 | 0.00105 | 190711.399691 | 0.003179 | 0.756305 | 47.927 | nn | 171.815 | 42.829415 | 56.62983 | 0.444268 |
| 16MBC-B01d | 16.815134 | 0.245936 | 55.596374 | 0.798245 | 141.307661 | 2.180336 | 30.488832 | 1.109619 | 0.00155 | 165909.207777 | 0.006688 | 0.811596 | 63.177 | nn | 208.05 | 45.323776 | 55.845272 | 0.471508 |
| 16MBC-B02a | 20.359031 | 0.299374 | 10.302957 | 0.148586 | 299.064852 | 4.701025 | 24.175528 | 1.729272 | 0.002711 | 136284.219585 | 0.012689 | 0.844086 | 76.0325 | nn | 272.522 | 48.504101 | 57.463435 | 0.636684 |
| 16MBC-B02b | 43.365999 | 0.624386 | 24.11946 | 0.345589 | 349.433721 | 5.348936 | 50.652291 | 1.290387 | 0.001756 | 267887.421228 | 0.004817 | 0.786065 | 54.7905 | nn | 199.223 | 44.604454 | 56.74398 | 0.570328 |
| 16MBC-B02c | 24.109067 | 0.357498 | 10.935128 | 0.163664 | 410.434364 | 6.442745 | 28.596929 | 0.737276 | 0.001291 | 146018.311127 | 0.005049 | 0.789308 | 55.668 | np | 202.299 | 44.203472 | 56.0028 | 0.594888 |
| 16MBC-B02d | 30.385253 | 0.443795 | 14.830473 | 0.213815 | 329.501004 | 4.910569 | 35.404238 | 0.430611 | 0.000684 | 163269.272235 | 0.002637 | 0.740771 | 44.885 | pp | 162.54 | 39.128725 | 52.821633 | 0.513887 |
| 16MBC-B03a | 3.403525 | 0.05782 | 6.127821 | 0.093965 | 17.537112 | 0.303121 | 4.91986 | 0.048087 | 0.000541 | 20485.479862 | 0.002347 | 0.747455 | 47.9475 | pp | 126.775 | 33.191606 | 44.406152 | 0.562655 |
| 16MBC-B03b | 3.055965 | 0.047164 | 4.406084 | 0.068175 | 10.960203 | 0.181134 | 4.138502 | 0.045163 | 0.00054 | 14740.985133 | 0.003064 | 0.744351 | 44.8575 | nn | 189.045 | 28.245533 | 37.946514 | 0.478979 |
| 16MBC-B03c | 21.833127 | 0.314404 | 7.776606 | 0.114415 | 14.873796 | 0.254163 | 23.72276 | 0.256285 | 0.000515 | 88512.185586 | 0.002895 | 0.766776 | 52.6165 | pp | 129.855 | 30.626624 | 39.942062 | 0.417041 |
| 16MBC-B03d | 2.894022 | 0.048906 | 4.112691 | 0.06534 | 11.943605 | 0.247353 | 3.912527 | 0.037023 | 0.000485 | 13168.639908 | 0.002811 | 0.765664 | 52.568 | np | 126.321 | 26.446311 | 34.540356 | 0.492552 |
| 16MBC-B04a | 3.38599 | 0.052456 | 27.740264 | 0.404318 | 141.387085 | 2.168146 | 10.541731 | 0.155392 | 0.000575 | 42928.651782 | 0.00362 | 0.773394 | 52.583 | nn | 162.545 | 34.525842 | 44.642005 | 0.396378 |
| 16MBC-B04b | 5.729081 | 0.085746 | 40.427207 | 0.584111 | 82.671789 | 1.389797 | 15.577605 | 0.147006 | 0.000636 | 68859.406547 | 0.002135 | 0.748104 | 49.4925 | pp | 108.212 | 36.37806 | 48.626982 | 0.421436 |
| 16MBC-B04c | 4.649286 | 0.091957 | 36.649167 | 0.528691 | 62.514285 | 0.963792 | 13.519008 | 0.216546 | 0.000764 | 56285.199116 | 0.003847 | 0.787156 | 57.8645 | np | 142.664 | 34.330521 | 43.61339 | 0.404486 |
| 16MBC-B04d | 6.534519 | 0.102159 | 66.296613 | 0.950852 | 193.020876 | 2.904106 | 22.955125 | 0.168758 | 0.000728 | 95540.551352 | 0.001766 | 0.723233 | 43.5335 | np | 115.721 | 34.665634 | 47.931477 | 0.408908 |
| 16NBC-B01a | 16.871415 | 0.247109 | 95.1744 | 1.359343 | 333.957805 | 5.120259 | 40.711826 | 0.859366 | 0.002939 | 241486.770826 | 0.003559 | 0.772315 | 52.347 | np | 161.244 | 49.916225 | 64.631951 | 0.53394 |
| 16NBC-B01b | 19.650471 | 0.286478 | 55.788159 | 0.799434 | 264.439817 | 3.96703 | 33.947767 | 0.385486 | 0.001107 | 174282.396329 | 0.002212 | 0.749444 | 49.473 | np | 112.202 | 43.118088 | 57.533434 | 0.464956 |
| 16NBC-B01c | 16.268733 | 0.240445 | 68.673484 | 0.992578 | 267.439272 | 4.240948 | 33.595293 | 0.748092 | 0.001622 | 151092.944366 | 0.004951 | 0.816161 | 72.881 | pp | 115.735 | 37.860955 | 46.389061 | 0.390586 |
| 16NBC-B01d | 12.168706 | 0.177987 | 54.138813 | 0.771988 | 253.347149 | 3.787605 | 26.027919 | 0.525225 | 0.001349 | 117100.235589 | 0.004485 | 0.757842 | 46.385 | np | 258.83 | 38.065128 | 50.228344 | 0.390542 |
| 16NBC-B02a | 12.000757 | 0.176858 | 2.238369 | 0.034098 | 235.584151 | 3.742312 | 13.631781 | 0.253548 | 0.000816 | 57833.792766 | 0.004384 | 0.77075 | 50.139 | np | 216.526 | 36.975114 | 47.97288 | 0.520743 |
| 16NBC-B02b | 9.178599 | 0.139881 | 1.175699 | 0.020233 | 290.804194 | 4.515501 | 10.820492 | 0.133335 | 0.000505 | 46711.882745 | 0.002854 | 0.769614 | 54.1135 | np | 121.029 | 38.722075 | 50.313631 | 0.581986 |
| 16NBC-B02c | 10.174972 | 0.155798 | 1.134822 | 0.030437 | 249.315561 | 3.717621 | 11.612303 | 0.10419 | 0.000472 | 50047.06433 | 0.002082 | 0.741189 | 47.26 | np | 115.729 | 37.704324 | 50.870067 | 0.579982 |
| 16NBC-B02d | 9.630949 | 0.148009 | 2.301388 | 0.037458 | 219.424978 | 3.336489 | 11.200771 | 0.149126 | 0.000418 | 50635.948079 | 0.002945 | 0.765037 | 51.677 | np | 136.925 | 39.49374 | 51.623311 | 0.564021 |
| 16FM-B06a | 14.944647 | 0.218076 | 72.355286 | 1.042487 | 135.152082 | 2.15563 | 32.510999 | 0.759827 | 0.000853 | 137611.817895 | 0.005522 | 0.807098 | 63.167 | np | 171.815 | 35.142362 | 43.541638 | 0.359061 |
| 16FM-B06b | 10.62857 | 0.15835 | 40.376691 | 0.58665 | 165.214424 | 2.470559 | 20.853223 | 0.263793 | 0.000654 | 99539.767656 | 0.00265 | 0.720366 | 40.1985 | nn | 203.624 | 39.979241 | 55.498516 | 0.428057 |
| 16FM-B06c | 15.437858 | 0.242188 | 62.902758 | 0.900857 | 139.460307 | 2.163759 | 30.812567 | 0.231869 | 0.000738 | 113772.477512 | 0.002038 | 0.746171 | 49.4765 | pp | 103.369 | 30.528536 | 40.913599 | 0.335153 |
| 16FM-B06d | 8.867083 | 0.139466 | 50.34517 | 0.722635 | 253.852748 | 4.004035 | 21.840961 | 0.203857 | 0.000543 | 102751.578533 | 0.001984 | 0.738744 | 47.044 | np | 111.304 | 39.789548 | 53.861043 | 0.43708 |
| \* shapes: nn = complete grain, np = missing one termination, pp = missing both terminations | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN |