# Supplementary data

# Table S1. Zircon U-Pb LA-ICPMS data OF zircon grains FROM Paleozoic volcanic AND intrusive rocks FROM THE core OF THE Kalatage inlier.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sample number |  | Element contents (ppm) and ratio | | | |  | Isotopic ratio | | | | | |  | Isotopic age（Ma） | | | | | |
|  | U | Th | Pb | Th/U |  | 207Pb/206Pb | 1σ (%) | 207Pb/235U | 1σ (%) | 206Pb/238U | 1σ (%) |  | 207Pb/206Pb | 1σ | 207Pb/235U | 1σ | 206Pb/238U | 1σ |
| 10KL04: Granite of the Kalatage pluton | | | | | | | |  |  |  |  |  |  |  |  |  |  |  |  |
| 10KL04-1 |  | 74 | 657 | 966 | 0.68 |  | 0.0564 | 0.0005 | 0.5384 | 0.0062 | 0.0692 | 0.0006 |  | 470 | 21 | 437 | 5 | 431 | 4 |
| 10KL04-2 |  | 74 | 283 | 1087 | 0.26 |  | 0.0556 | 0.0004 | 0.5262 | 0.0089 | 0.0687 | 0.0009 |  | 435 | 17 | 429 | 7 | 428 | 6 |
| 10KL04-3 |  | 60 | 447 | 828 | 0.54 |  | 0.0505 | 0.0004 | 0.482 | 0.0068 | 0.0692 | 0.0008 |  | 220 | 20 | 399 | 6 | 431 | 5 |
| 10KL04-4 |  | 41 | 202 | 578 | 0.35 |  | 0.0563 | 0.0021 | 0.5468 | 0.0224 | 0.0704 | 0.0011 |  | 466 | 83 | 443 | 18 | 439 | 7 |
| 10KL04-5 |  | 66 | 696 | 838 | 0.83 |  | 0.0567 | 0.0005 | 0.5359 | 0.0061 | 0.0685 | 0.0005 |  | 481 | 18 | 436 | 5 | 427 | 3 |
| 10KL04-6 |  | 97 | 513 | 1386 | 0.37 |  | 0.0564 | 0.0004 | 0.5365 | 0.0062 | 0.0689 | 0.0006 |  | 470 | 16 | 436 | 5 | 430 | 4 |
| 10KL04-7 |  | 70 | 705 | 915 | 0.77 |  | 0.0559 | 0.0007 | 0.5194 | 0.0084 | 0.0674 | 0.0006 |  | 447 | 29 | 425 | 7 | 421 | 4 |
| 10KL04-8 |  | 74 | 687 | 954 | 0.72 |  | 0.0555 | 0.0004 | 0.5303 | 0.007 | 0.0693 | 0.0006 |  | 433 | 18 | 432 | 6 | 432 | 4 |
| 10KL04-9 |  | 41 | 392 | 523 | 0.75 |  | 0.0587 | 0.003 | 0.5544 | 0.0289 | 0.0685 | 0.0006 |  | 556 | 112 | 448 | 23 | 427 | 4 |
| 10KL04-10 |  | 71 | 706 | 905 | 0.78 |  | 0.059 | 0.0018 | 0.548 | 0.0173 | 0.0674 | 0.0006 |  | 567 | 65 | 444 | 14 | 420 | 4 |
| 10KL04-11 |  | 69 | 251 | 1002 | 0.25 |  | 0.0562 | 0.0012 | 0.5387 | 0.0132 | 0.0695 | 0.0007 |  | 460 | 48 | 438 | 11 | 433 | 4 |
| 10KL04-12 |  | 71 | 558 | 946 | 0.59 |  | 0.0549 | 0.0005 | 0.5225 | 0.007 | 0.069 | 0.0007 |  | 408 | 19 | 427 | 6 | 430 | 4 |
| 10KL04-13 |  | 84 | 773 | 1089 | 0.71 |  | 0.0548 | 0.0003 | 0.5226 | 0.0056 | 0.0691 | 0.0007 |  | 405 | 12 | 427 | 5 | 431 | 5 |
| 10KL04-14 |  | 41 | 302 | 549 | 0.55 |  | 0.0565 | 0.0008 | 0.547 | 0.0106 | 0.0702 | 0.0009 |  | 472 | 31 | 443 | 9 | 438 | 6 |
| 10KL04-15 |  | 94 | 199 | 1420 | 0.14 |  | 0.0566 | 0.0004 | 0.5415 | 0.0059 | 0.0694 | 0.0006 |  | 477 | 15 | 439 | 5 | 432 | 4 |
| 10KL04-16 |  | 77 | 570 | 1036 | 0.55 |  | 0.0561 | 0.0007 | 0.5381 | 0.01 | 0.0696 | 0.0009 |  | 456 | 29 | 437 | 8 | 434 | 6 |
| 10KL05: Granite of the Kalatage pluton | | | | | | | | | | | | | | | | | | | |
| 10KL05-1 |  | 160 | 1190 | 2141 | 0.56 |  | 0.0557 | 0.0008 | 0.5355 | 0.0063 | 0.0697 | 0.0009 |  | 440 | 30 | 435 | 5 | 435 | 5 |
| 10KL05-2 |  | 147 | 592 | 2097 | 0.28 |  | 0.0546 | 0.0011 | 0.519 | 0.0126 | 0.0689 | 0.0008 |  | 398 | 47 | 424 | 10 | 429 | 5 |
| 10KL05-3 |  | 114 | 426 | 1648 | 0.26 |  | 0.0557 | 0.0008 | 0.5318 | 0.0092 | 0.0692 | 0.0006 |  | 442 | 31 | 433 | 7 | 431 | 4 |
| 10KL05-4 |  | 105 | 441 | 1475 | 0.3 |  | 0.0628 | 0.0006 | 0.5844 | 0.0082 | 0.0675 | 0.0006 |  | 702 | 20 | 467 | 7 | 421 | 4 |
| 10KL05-5 |  | 130 | 467 | 1864 | 0.25 |  | 0.0552 | 0.0016 | 0.5228 | 0.016 | 0.0687 | 0.0007 |  | 420 | 66 | 427 | 13 | 428 | 5 |
| 10KL05-6 |  | 114 | 673 | 1570 | 0.43 |  | 0.0564 | 0.0013 | 0.5367 | 0.014 | 0.069 | 0.0007 |  | 469 | 52 | 436 | 11 | 430 | 4 |
| 10KL05-7 |  | 101 | 443 | 1179 | 0.38 |  | 0.0617 | 0.0006 | 0.6858 | 0.0088 | 0.0807 | 0.0006 |  | 663 | 22 | 530 | 7 | 500 | 4 |
| 10KL05-8 |  | 99 | 341 | 1225 | 0.28 |  | 0.0637 | 0.001 | 0.6951 | 0.0129 | 0.0791 | 0.0008 |  | 733 | 32 | 536 | 10 | 491 | 5 |
| 10KL05-9 |  | 119 | 542 | 1617 | 0.34 |  | 0.058 | 0.0011 | 0.5693 | 0.015 | 0.0712 | 0.0012 |  | 529 | 43 | 458 | 12 | 443 | 7 |
| 10KL05-10 |  | 153 | 804 | 2189 | 0.37 |  | 0.0568 | 0.0006 | 0.5322 | 0.0058 | 0.068 | 0.0013 |  | 482 | 24 | 433 | 5 | 424 | 8 |
| 10KL05-11 |  | 135 | 498 | 1955 | 0.25 |  | 0.0545 | 0.0005 | 0.5243 | 0.0099 | 0.0697 | 0.0011 |  | 393 | 22 | 428 | 8 | 435 | 7 |
| 10KL05-12 |  | 138 | 618 | 1961 | 0.32 |  | 0.0545 | 0.0006 | 0.5165 | 0.0097 | 0.0688 | 0.0009 |  | 390 | 26 | 423 | 8 | 429 | 6 |
| 10KL05-13 |  | 160 | 910 | 2243 | 0.41 |  | 0.0565 | 0.0004 | 0.5382 | 0.0077 | 0.0691 | 0.0009 |  | 473 | 14 | 437 | 6 | 431 | 6 |
| 10KL05-14 |  | 150 | 501 | 2097 | 0.24 |  | 0.0605 | 0.0015 | 0.573 | 0.0185 | 0.0687 | 0.0013 |  | 620 | 53 | 460 | 15 | 429 | 8 |
| 10KL05-15 |  | 94 | 318 | 1381 | 0.23 |  | 0.0563 | 0.0012 | 0.5276 | 0.0124 | 0.068 | 0.0007 |  | 463 | 46 | 430 | 10 | 424 | 5 |
| 10KL05-16 |  | 163 | 1570 | 2100 | 0.75 |  | 0.0551 | 0.0008 | 0.5255 | 0.0062 | 0.0692 | 0.0008 |  | 417 | 32 | 429 | 5 | 431 | 5 |
| 10KL05-17 |  | 165 | 642 | 2301 | 0.28 |  | 0.0581 | 0.0008 | 0.5545 | 0.0123 | 0.0692 | 0.001 |  | 534 | 31 | 448 | 10 | 431 | 6 |
| 10KL05-18 |  | 158 | 1187 | 2140 | 0.55 |  | 0.0558 | 0.0011 | 0.5218 | 0.0089 | 0.0678 | 0.0016 |  | 444 | 45 | 426 | 7 | 423 | 10 |
| 10KL07: Granodiorite of the Kalatage pluton | | | | | | | | | | | | | | | | | | | |
| 10KL07.1 |  | 143 | 1308 | 1843 | 0.71 |  | 0.0559 | 0.0003 | 0.5372 | 0.0059 | 0.0697 | 0.0006 |  | 449 | 13 | 437 | 5 | 434 | 4 |
| 10KL07.2 |  | 198 | 1890 | 2533 | 0.75 |  | 0.055 | 0.0006 | 0.5271 | 0.009 | 0.0695 | 0.0009 |  | 412 | 24 | 430 | 7 | 433 | 6 |
| 10KL07.3 |  | 127 | 2203 | 1376 | 1.6 |  | 0.0551 | 0.0005 | 0.5203 | 0.0073 | 0.0685 | 0.0004 |  | 417 | 21 | 425 | 6 | 427 | 3 |
| 10KL07.4 |  | 137 | 2388 | 1483 | 1.61 |  | 0.0573 | 0.0004 | 0.5365 | 0.0061 | 0.0679 | 0.0007 |  | 505 | 14 | 436 | 5 | 423 | 4 |
| 10KL07.5 |  | 148 | 2481 | 1646 | 1.51 |  | 0.0555 | 0.0003 | 0.5147 | 0.0053 | 0.0673 | 0.0006 |  | 432 | 10 | 422 | 4 | 420 | 4 |
| 10KL07.6 |  | 194 | 4398 | 1787 | 2.46 |  | 0.0554 | 0.0007 | 0.5265 | 0.0088 | 0.0689 | 0.0008 |  | 428 | 27 | 429 | 7 | 430 | 5 |
| 10KL07.7 |  | 199 | 3985 | 1948 | 2.05 |  | 0.0555 | 0.0004 | 0.5296 | 0.0065 | 0.0693 | 0.0006 |  | 431 | 17 | 432 | 5 | 432 | 4 |
| 10KL07.8 |  | 169 | 2795 | 1861 | 1.5 |  | 0.0548 | 0.0006 | 0.5155 | 0.0098 | 0.0682 | 0.001 |  | 404 | 25 | 422 | 8 | 425 | 6 |
| 10KL07.9 |  | 34 | 371 | 428 | 0.87 |  | 0.0561 | 0.0006 | 0.5278 | 0.0074 | 0.0682 | 0.0006 |  | 456 | 24 | 430 | 6 | 426 | 4 |
| 10KL07.10 |  | 24 | 130 | 339 | 0.38 |  | 0.0545 | 0.0007 | 0.5134 | 0.0084 | 0.0683 | 0.0007 |  | 393 | 29 | 421 | 7 | 426 | 4 |
| 10KL07.11 |  | 44 | 375 | 586 | 0.64 |  | 0.0564 | 0.0004 | 0.5342 | 0.0072 | 0.0687 | 0.0008 |  | 469 | 17 | 435 | 6 | 428 | 5 |
| 10KL07.12 |  | 49 | 445 | 652 | 0.68 |  | 0.0558 | 0.0004 | 0.5246 | 0.0059 | 0.0682 | 0.0007 |  | 443 | 15 | 428 | 5 | 426 | 4 |
| 10KL07.13 |  | 20 | 163 | 274 | 0.6 |  | 0.0573 | 0.001 | 0.5333 | 0.0104 | 0.0675 | 0.0007 |  | 503 | 37 | 434 | 8 | 421 | 4 |
| 10KL07.14 |  | 64 | 433 | 887 | 0.49 |  | 0.0564 | 0.0005 | 0.5355 | 0.0082 | 0.0689 | 0.0008 |  | 466 | 21 | 435 | 7 | 430 | 5 |
| 10KL07.15 |  | 9 | 50 | 129 | 0.38 |  | 0.057 | 0.0028 | 0.5422 | 0.0278 | 0.069 | 0.0007 |  | 492 | 110 | 440 | 23 | 430 | 4 |
| 10KL07.16 |  | 103 | 910 | 1335 | 0.68 |  | 0.054 | 0.0004 | 0.5215 | 0.0076 | 0.07 | 0.0009 |  | 373 | 16 | 426 | 6 | 436 | 5 |
| 10KL07.17 |  | 71 | 495 | 994 | 0.5 |  | 0.0559 | 0.0003 | 0.523 | 0.0057 | 0.0679 | 0.0006 |  | 447 | 13 | 427 | 5 | 423 | 4 |
| 10KL06: Diorite of the Kalatage pluton | | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 10KL06.1 |  | 26 | 175 | 371 | 0.47 |  | 0.0566 | 0.0054 | 0.5263 | 0.0515 | 0.0675 | 0.0012 |  | 475 | 212 | 429 | 42 | 421 | 7 |
| 10KL06.2 |  | 20 | 149 | 282 | 0.53 |  | 0.0565 | 0.0016 | 0.5304 | 0.0163 | 0.0681 | 0.0008 |  | 473 | 62 | 432 | 13 | 424 | 5 |
| 10KL06.3 |  | 31 | 200 | 439 | 0.46 |  | 0.0554 | 0.0004 | 0.5172 | 0.0063 | 0.0677 | 0.0007 |  | 427 | 17 | 423 | 5 | 423 | 4 |
| 10KL06.4 |  | 34 | 270 | 453 | 0.6 |  | 0.0555 | 0.0019 | 0.5264 | 0.0191 | 0.0687 | 0.0008 |  | 434 | 77 | 429 | 16 | 429 | 5 |
| 10KL06.5 |  | 50 | 364 | 671 | 0.54 |  | 0.055 | 0.0006 | 0.5265 | 0.0069 | 0.0694 | 0.0006 |  | 412 | 23 | 429 | 6 | 433 | 4 |
| 10KL06.6 |  | 45 | 383 | 616 | 0.62 |  | 0.0548 | 0.0005 | 0.508 | 0.0068 | 0.0673 | 0.0006 |  | 403 | 21 | 417 | 6 | 420 | 4 |
| 10KL06.7 |  | 19 | 126 | 269 | 0.47 |  | 0.056 | 0.0011 | 0.5208 | 0.011 | 0.0674 | 0.0006 |  | 454 | 45 | 426 | 9 | 421 | 4 |
| 10KL06.8 |  | 24 | 169 | 332 | 0.51 |  | 0.0558 | 0.0007 | 0.521 | 0.0073 | 0.0678 | 0.0006 |  | 443 | 28 | 426 | 6 | 423 | 4 |
| 10KL06.9 |  | 150 | 1110 | 2020 | 0.55 |  | 0.0552 | 0.0006 | 0.5306 | 0.0063 | 0.0697 | 0.0008 |  | 421 | 24 | 432 | 5 | 434 | 5 |
| 10KL06.10 |  | 35 | 280 | 483 | 0.58 |  | 0.0555 | 0.0005 | 0.5197 | 0.0064 | 0.0679 | 0.0008 |  | 432 | 22 | 425 | 5 | 424 | 5 |
| 10KL06.11 |  | 67 | 431 | 939 | 0.46 |  | 0.0554 | 0.0003 | 0.5224 | 0.0064 | 0.0684 | 0.0006 |  | 429 | 12 | 427 | 5 | 426 | 4 |
| 10KL06.12 |  | 51 | 322 | 724 | 0.44 |  | 0.0556 | 0.0005 | 0.5225 | 0.006 | 0.0682 | 0.0005 |  | 436 | 20 | 427 | 5 | 425 | 3 |
| 10KL06.13 |  | 53 | 336 | 743 | 0.45 |  | 0.0556 | 0.0003 | 0.5279 | 0.006 | 0.0689 | 0.0006 |  | 435 | 14 | 430 | 5 | 430 | 4 |
| 10KL06.14 |  | 71 | 537 | 966 | 0.56 |  | 0.0558 | 0.0003 | 0.5271 | 0.0064 | 0.0685 | 0.0008 |  | 445 | 11 | 430 | 5 | 427 | 5 |
| 10KL06.15 |  | 66 | 477 | 907 | 0.53 |  | 0.0555 | 0.0004 | 0.5299 | 0.0066 | 0.0692 | 0.0007 |  | 433 | 17 | 432 | 5 | 431 | 4 |
| 13KL02: Granodiorite north to Meiling | | | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 13KL02-1 |  | 49.0 | 19.1 | 2.88 | 0.39 |  | 0.0536 | 0.0030 | 0.3932 | 0.0205 | 0.0532 | 0.0013 |  | 354 | 119 | 337 | 15 | 334 | 8 |
| 13KL02-2 |  | 69.2 | 26.7 | 4.23 | 0.39 |  | 0.0550 | 0.0025 | 0.4017 | 0.0178 | 0.0542 | 0.0012 |  | 409 | 102 | 343 | 13 | 340 | 7 |
| 13KL02-3 |  | 82.5 | 47.1 | 5.70 | 0.57 |  | 0.0629 | 0.0048 | 0.4466 | 0.0294 | 0.0531 | 0.0017 |  | 706 | 129 | 375 | 21 | 334 | 11 |
| 13KL02-4 |  | 76.1 | 25.7 | 4.65 | 0.34 |  | 0.0591 | 0.0041 | 0.4234 | 0.0236 | 0.0541 | 0.0017 |  | 569 | 155 | 358 | 17 | 339 | 10 |
| 13KL02-5 |  | 53.9 | 24.1 | 3.46 | 0.45 |  | 0.0610 | 0.0051 | 0.4365 | 0.0358 | 0.0535 | 0.0025 |  | 639 | 177 | 368 | 25 | 336 | 15 |
| 13KL02-6 |  | 140 | 74.1 | 8.88 | 0.53 |  | 0.0556 | 0.0027 | 0.3903 | 0.0198 | 0.0515 | 0.0015 |  | 435 | 109 | 335 | 14 | 324 | 9 |
| 13KL02-7 |  | 61.8 | 19.7 | 3.75 | 0.32 |  | 0.0570 | 0.0038 | 0.4098 | 0.0267 | 0.0539 | 0.0015 |  | 500 | 146 | 349 | 19 | 338 | 9 |
| 13KL02-8 |  | 78.6 | 30.7 | 5.14 | 0.39 |  | 0.0678 | 0.0042 | 0.4892 | 0.0323 | 0.0528 | 0.0016 |  | 865 | 130 | 404 | 22 | 331 | 10 |
| 13KL02-9 |  | 51.0 | 18.1 | 3.17 | 0.36 |  | 0.0571 | 0.0039 | 0.4224 | 0.0305 | 0.0541 | 0.0017 |  | 494 | 147 | 358 | 22 | 339 | 10 |
| 13KL02-10 |  | 65.7 | 18.5 | 3.34 | 0.28 |  | 0.0563 | 0.0044 | 0.4018 | 0.0371 | 0.0516 | 0.0019 |  | 465 | 174 | 343 | 27 | 324 | 12 |
| 13KL02-11 |  | 67.2 | 23.3 | 3.98 | 0.35 |  | 0.0558 | 0.0027 | 0.4048 | 0.0216 | 0.0528 | 0.0015 |  | 456 | 103 | 345 | 16 | 332 | 9 |
| 13KL02-12 |  | 69.2 | 27.3 | 4.25 | 0.39 |  | 0.0577 | 0.0030 | 0.4162 | 0.0225 | 0.0523 | 0.0011 |  | 517 | 118 | 353 | 16 | 328 | 6 |
| 13KL02-13 |  | 61.1 | 20.3 | 3.66 | 0.33 |  | 0.0601 | 0.0043 | 0.4325 | 0.0294 | 0.0538 | 0.0014 |  | 609 | 162 | 365 | 21 | 338 | 9 |
| 13KL02-14 |  | 62.2 | 20.0 | 3.63 | 0.32 |  | 0.0572 | 0.0035 | 0.4095 | 0.0227 | 0.0535 | 0.0012 |  | 498 | 133 | 348 | 16 | 336 | 7 |
| 13KL10: Granite north to Meiling | | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 13KL10-1 |  | 289 | 29.7 | 13.89 | 0.10 |  | 0.0561 | 0.0061 | 0.3887 | 0.0437 | 0.0501 | 0.0034 |  | 244 | 333 | 32 | 315 | 21 | 244 |
| 13KL10-2 |  | 191 | 22.9 | 9.35 | 0.12 |  | 0.0653 | 0.0058 | 0.4348 | 0.0371 | 0.0492 | 0.0024 |  | 188 | 367 | 26 | 310 | 15 | 188 |
| 13KL10-3 |  | 269 | 32.2 | 13.80 | 0.12 |  | 0.0559 | 0.0035 | 0.3965 | 0.0243 | 0.0517 | 0.0018 |  | 139 | 339 | 18 | 325 | 11 | 139 |
| 13KL10-4 |  | 244 | 27.1 | 12.19 | 0.11 |  | 0.0537 | 0.0025 | 0.3885 | 0.0175 | 0.0529 | 0.0013 |  | 106 | 333 | 13 | 333 | 8 | 106 |
| 13KL10-5 |  | 261 | 27.5 | 13.38 | 0.11 |  | 0.0558 | 0.0021 | 0.3894 | 0.0133 | 0.0514 | 0.0009 |  | 81 | 334 | 10 | 323 | 6 | 81 |
| 13KL10-6 |  | 263 | 29.1 | 12.80 | 0.11 |  | 0.0565 | 0.0018 | 0.3917 | 0.0122 | 0.0509 | 0.0008 |  | 70 | 336 | 9 | 320 | 5 | 70 |
| 13KL10-7 |  | 246 | 29.7 | 11.95 | 0.12 |  | 0.0533 | 0.0020 | 0.3697 | 0.0136 | 0.0511 | 0.0010 |  | 83 | 319 | 10 | 321 | 6 | 83 |
| 13KL10-8 |  | 161 | 20.4 | 8.57 | 0.13 |  | 0.0528 | 0.0020 | 0.3818 | 0.0155 | 0.0522 | 0.0009 |  | 87 | 328 | 11 | 328 | 5 | 87 |
| 13KL10-9 |  | 325 | 37.4 | 16.45 | 0.11 |  | 0.0633 | 0.0044 | 0.4902 | 0.0637 | 0.0510 | 0.0010 |  | 147 | 405 | 43 | 320 | 6 | 147 |
| 13KL10-10 |  | 299 | 31.3 | 15.37 | 0.10 |  | 0.0560 | 0.0021 | 0.3987 | 0.0149 | 0.0522 | 0.0012 |  | 81 | 341 | 11 | 328 | 7 | 81 |
| 13KL10-11 |  | 209 | 25.4 | 11.11 | 0.12 |  | 0.0574 | 0.0021 | 0.4119 | 0.0147 | 0.0527 | 0.0010 |  | 75 | 350 | 11 | 331 | 6 | 75 |
| 13KL10-12 |  | 307 | 30.3 | 14.63 | 0.10 |  | 0.0548 | 0.0021 | 0.3836 | 0.0166 | 0.0509 | 0.0013 |  | 92 | 330 | 12 | 320 | 8 | 92 |
| 13KL10-13 |  | 222 | 24.4 | 10.85 | 0.11 |  | 0.0546 | 0.0018 | 0.3749 | 0.0120 | 0.0505 | 0.0010 |  | 72 | 323 | 9 | 317 | 6 | 72 |
| 13KL10-14 |  | 263 | 31.2 | 14.28 | 0.12 |  | 0.0560 | 0.0021 | 0.3825 | 0.0148 | 0.0498 | 0.0011 |  | 116 | 329 | 11 | 314 | 7 | 116 |
| 13KL05: Granite at Meiling | | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 13KL05-1 |  | 252 | 27 | 13 | 0.11 |  | 0.0538 | 0.0088 | 0.3834 | 0.0629 | 0.0519 | 0.0048 |  | 365 | 330 | 330 | 46 | 326 | 30 |
| 13KL05-2 |  | 168 | 19 | 9 | 0.11 |  | 0.0526 | 0.0073 | 0.3749 | 0.0525 | 0.0514 | 0.0041 |  | 322 | 289 | 323 | 39 | 323 | 25 |
| 13KL05-3 |  | 154 | 17 | 8 | 0.11 |  | 0.0636 | 0.0074 | 0.4549 | 0.0535 | 0.0515 | 0.0034 |  | 728 | 253 | 381 | 37 | 324 | 21 |
| 13KL05-4 |  | 229 | 30 | 12 | 0.13 |  | 0.0533 | 0.0049 | 0.3786 | 0.0350 | 0.0514 | 0.0027 |  | 339 | 240 | 326 | 26 | 323 | 16 |
| 13KL05-5 |  | 188 | 27 | 10 | 0.15 |  | 0.0540 | 0.0038 | 0.3950 | 0.0278 | 0.0532 | 0.0021 |  | 369 | 155 | 338 | 20 | 334 | 13 |
| 13KL05-6 |  | 189 | 23 | 10 | 0.12 |  | 0.0558 | 0.0027 | 0.4135 | 0.0201 | 0.0537 | 0.0015 |  | 443 | 101 | 351 | 14 | 337 | 9 |
| 13KL05-7 |  | 275 | 30 | 14 | 0.11 |  | 0.0573 | 0.0018 | 0.4020 | 0.0133 | 0.0510 | 0.0009 |  | 502 | 70 | 343 | 10 | 321 | 5 |
| 13KL05-8 |  | 181 | 24 | 10 | 0.13 |  | 0.0685 | 0.0034 | 0.4645 | 0.0225 | 0.0498 | 0.0012 |  | 883 | 104 | 387 | 16 | 313 | 7 |
| 13KL05-9 |  | 251 | 29 | 13 | 0.12 |  | 0.0570 | 0.0016 | 0.4042 | 0.0123 | 0.0513 | 0.0010 |  | 494 | 63 | 345 | 9 | 322 | 6 |
| 13KL05-10 |  | 228 | 30 | 12 | 0.13 |  | 0.0565 | 0.0017 | 0.3961 | 0.0118 | 0.0514 | 0.0009 |  | 472 | 36 | 339 | 9 | 323 | 5 |
| 13KL05-11 |  | 220 | 26 | 12 | 0.12 |  | 0.0569 | 0.0022 | 0.3957 | 0.0158 | 0.0510 | 0.0014 |  | 500 | 53 | 339 | 11 | 321 | 9 |
| 13KL05-12 |  | 161 | 18 | 9 | 0.11 |  | 0.0539 | 0.0022 | 0.3870 | 0.0152 | 0.0525 | 0.0012 |  | 365 | 62 | 332 | 11 | 330 | 7 |
| 13KL05-13 |  | 146 | 17 | 8 | 0.12 |  | 0.0565 | 0.0021 | 0.4001 | 0.0155 | 0.0516 | 0.0011 |  | 472 | 81 | 342 | 11 | 324 | 7 |
| 13KL05-14 |  | 214 | 27 | 11 | 0.13 |  | 0.0532 | 0.0032 | 0.3688 | 0.0222 | 0.0505 | 0.0019 |  | 339 | 140 | 319 | 16 | 318 | 12 |
| 13KL05-15 |  | 207 | 25 | 11 | 0.12 |  | 0.0519 | 0.0038 | 0.3833 | 0.0290 | 0.0535 | 0.0026 |  | 283 | 168 | 329 | 21 | 336 | 16 |
| 13KL05-16 |  | 279 | 32 | 14 | 0.11 |  | 0.0546 | 0.0044 | 0.3676 | 0.0300 | 0.0494 | 0.0026 |  | 398 | 179 | 318 | 22 | 311 | 16 |
| 10ZB46: Granite dike at Meiling | | | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 10ZB46.1 |  | 6 | 100 | 104 | 0.96 |  | 0.0531 | 0.0035 | 0.3721 | 0.025 | 0.0509 | 0.0008 |  | 331 | 148 | 321 | 22 | 320 | 5 |
| 10ZB46.2 |  | 16 | 91 | 326 | 0.28 |  | 0.0545 | 0.0013 | 0.3746 | 0.01 | 0.0498 | 0.0006 |  | 392 | 53 | 323 | 9 | 313 | 4 |
| 10ZB46.3 |  | 18 | 59 | 380 | 0.15 |  | 0.0531 | 0.0014 | 0.3645 | 0.0108 | 0.0497 | 0.0007 |  | 335 | 60 | 316 | 9 | 313 | 4 |
| 10ZB46.4 |  | 5 | 69 | 94 | 0.74 |  | 0.0524 | 0.0038 | 0.3617 | 0.0261 | 0.0501 | 0.0009 |  | 303 | 164 | 313 | 23 | 315 | 6 |
| 10ZB46.5 |  | 4 | 55 | 67 | 0.82 |  | 0.0534 | 0.003 | 0.3668 | 0.0211 | 0.0498 | 0.0006 |  | 347 | 129 | 317 | 18 | 313 | 4 |
| 10ZB46.6 |  | 10 | 121 | 172 | 0.7 |  | 0.054 | 0.0047 | 0.3766 | 0.0329 | 0.0505 | 0.001 |  | 373 | 195 | 325 | 28 | 318 | 6 |
| 10ZB46.7 |  | 18 | 66 | 383 | 0.17 |  | 0.0515 | 0.0011 | 0.3549 | 0.0088 | 0.05 | 0.0006 |  | 262 | 49 | 308 | 8 | 315 | 4 |
| 10ZB46.8 |  | 3 | 45 | 57 | 0.78 |  | 0.0536 | 0.0034 | 0.3735 | 0.0231 | 0.0506 | 0.0014 |  | 353 | 145 | 322 | 20 | 318 | 9 |
| 10ZB46.9 |  | 6 | 105 | 98 | 1.07 |  | 0.0538 | 0.0033 | 0.3703 | 0.0233 | 0.0499 | 0.0007 |  | 362 | 138 | 320 | 20 | 314 | 4 |
| 10ZB46.10 |  | 18 | 67 | 374 | 0.18 |  | 0.0553 | 0.0042 | 0.3776 | 0.0164 | 0.0495 | 0.0005 |  | 425 | 169 | 325 | 14 | 312 | 3 |
| 10ZB46.11 |  | 13 | 38 | 267 | 0.14 |  | 0.0559 | 0.0031 | 0.3854 | 0.0218 | 0.05 | 0.0005 |  | 449 | 123 | 331 | 19 | 314 | 3 |
| 10ZB46.12 |  | 13 | 59 | 261 | 0.23 |  | 0.0535 | 0.0018 | 0.3797 | 0.0141 | 0.0505 | 0.0007 |  | 349 | 78 | 327 | 12 | 318 | 5 |
| 10ZB46.13 |  | 25 | 84 | 513 | 0.16 |  | 0.0549 | 0.0043 | 0.3824 | 0.0302 | 0.0505 | 0.0006 |  | 409 | 174 | 329 | 26 | 318 | 3 |
| 10ZB46.14 |  | 5 | 77 | 86 | 0.89 |  | 0.0515 | 0.0035 | 0.3632 | 0.0253 | 0.0502 | 0.0008 |  | 262 | 158 | 315 | 22 | 316 | 5 |
| 10ZB46.15 |  | 12 | 42 | 255 | 0.16 |  | 0.0543 | 0.0036 | 0.3733 | 0.0252 | 0.0499 | 0.001 |  | 382 | 149 | 322 | 22 | 314 | 6 |
| 10ZB46.16 |  | 16 | 62 | 340 | 0.18 |  | 0.0563 | 0.0042 | 0.3829 | 0.0293 | 0.0493 | 0.0008 |  | 465 | 167 | 329 | 25 | 310 | 5 |
| 10ZB46.17 |  | 10 | 111 | 181 | 0.61 |  | 0.0558 | 0.0038 | 0.3813 | 0.026 | 0.0495 | 0.0007 |  | 446 | 151 | 328 | 22 | 312 | 5 |
| 12KL20: Dacitic ignimbrite at Meiling | | | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 12KL20-1 |  | 439 | 281 | 260 | 1.08 |  | 0.0661 | 0.0008 | 0.4228 | 0.0065 | 0.0463 | 0.0004 |  | 809 | 24 | 358 | 5 | 292 | 2 |
| 12KL20-2 |  | 90 | 70 | 133 | 0.53 |  | 0.0542 | 0.0004 | 0.3559 | 0.004 | 0.0475 | 0.0004 |  | 389 | 17 | 309 | 3 | 299 | 2 |
| 12KL20-3 |  | 195 | 134 | 129 | 1.04 |  | 0.0539 | 0.0027 | 0.358 | 0.0174 | 0.0481 | 0.0002 |  | 369 | 113 | 311 | 13 | 303 | 1 |
| 12KL20-4 |  | 21 | 33 | 38 | 0.87 |  | 0.0554 | 0.0032 | 0.41 | 0.0145 | 0.0538 | 0.0017 |  | 428 | 130 | 349 | 10 | 338 | 10 |
| 12KL20-5 |  | 143 | 123 | 192 | 0.64 |  | 0.0554 | 0.0003 | 0.3634 | 0.0035 | 0.0475 | 0.0004 |  | 428 | 15 | 315 | 3 | 299 | 2 |
| 12KL20-6 |  | 232 | 217 | 316 | 0.69 |  | 0.0543 | 0.0002 | 0.3576 | 0.0026 | 0.0477 | 0.0003 |  | 383 | 9 | 310 | 2 | 300 | 2 |
| 12KL20-7 |  | 180 | 137 | 191 | 0.72 |  | 0.0552 | 0.0006 | 0.3606 | 0.004 | 0.0474 | 0.0004 |  | 420 | 29 | 313 | 3 | 299 | 2 |
| 12KL20-8 |  | 647 | 348 | 385 | 0.9 |  | 0.0545 | 0.0002 | 0.4119 | 0.0023 | 0.0549 | 0.0003 |  | 391 | 7 | 350 | 2 | 344 | 2 |
| 12KL20-9 |  | 222 | 121 | 202 | 0.6 |  | 0.0557 | 0.0007 | 0.3704 | 0.0041 | 0.0483 | 0.0004 |  | 439 | 32 | 320 | 3 | 304 | 2 |
| 12KL20-10 |  | 70 | 49 | 49 | 1 |  | 0.0576 | 0.0008 | 0.3773 | 0.0048 | 0.0476 | 0.0004 |  | 522 | 30 | 325 | 4 | 300 | 2 |
| 12KL20-11 |  | 1242 | 646 | 351 | 1.84 |  | 0.0546 | 0.0002 | 0.3596 | 0.0021 | 0.0477 | 0.0002 |  | 398 | 9 | 312 | 2 | 301 | 1 |
| 12KL20-12 |  | 571 | 258 | 220 | 1.17 |  | 0.0547 | 0.0003 | 0.3621 | 0.0025 | 0.048 | 0.0003 |  | 467 | 11 | 314 | 2 | 302 | 2 |
| 12KL20-13 |  | 641 | 293 | 201 | 1.46 |  | 0.0549 | 0.0006 | 0.3533 | 0.0101 | 0.0467 | 0.0014 |  | 409 | 26 | 307 | 8 | 294 | 9 |
| 12KL20-14 |  | 249 | 121 | 134 | 0.9 |  | 0.0552 | 0.0004 | 0.3613 | 0.003 | 0.0475 | 0.0002 |  | 417 | -16 | 313 | 2 | 299 | 1 |
| 12KL20-15 |  | 267 | 153 | 223 | 0.69 |  | 0.0548 | 0.0003 | 0.3593 | 0.0024 | 0.0475 | 0.0002 |  | 467 | 9 | 312 | 2 | 299 | 1 |
| 12KL20-16 |  | 230 | 105 | 89 | 1.18 |  | 0.0674 | 0.0008 | 0.4421 | 0.0054 | 0.0476 | 0.0003 |  | 850 | 19 | 372 | 4 | 300 | 2 |
| 12KL20-17 |  | 830 | 506 | 224 | 2.26 |  | 0.055 | 0.0003 | 0.4031 | 0.0029 | 0.0532 | 0.0002 |  | 413 | 18 | 344 | 2 | 334 | 1 |
| 12KL20-18 |  | 255 | 148 | 121 | 1.22 |  | 0.0575 | 0.0003 | 0.5051 | 0.0033 | 0.0638 | 0.0003 |  | 509 | 11 | 415 | 2 | 398 | 2 |
| 12KL20-19 |  | 57 | 53 | 68 | 0.78 |  | 0.0544 | 0.0006 | 0.3595 | 0.0039 | 0.0479 | 0.0003 |  | 387 | 24 | 312 | 3 | 302 | 2 |
| 12KL20-20 |  | 102 | 167 | 93 | 1.8 |  | 0.0552 | 0.001 | 0.3618 | 0.0082 | 0.0475 | 0.0003 |  | 420 | 36 | 314 | 6 | 299 | 2 |
| 12KL20-21 |  | 296 | 313 | 161 | 1.94 |  | 0.0563 | 0.0004 | 0.4119 | 0.003 | 0.0531 | 0.0003 |  | 461 | 12 | 350 | 2 | 334 | 2 |
| 12KL20-22 |  | 334 | 345 | 332 | 1.04 |  | 0.055 | 0.0009 | 0.3619 | 0.0059 | 0.0477 | 0.0004 |  | 413 | 33 | 314 | 4 | 300 | 3 |
| 12KL19: Rhyolite at Meiling | | | | | | | |  |  |  |  |  |  |  |  |  |  |  |  |
| 12KL19-1 |  | 408 | 260 | 249 | 1.04 |  | 0.0578 | 0.0003 | 0.5577 | 0.0033 | 0.0699 | 0.0003 |  | 524 | 5 | 450 | 2 | 436 | 2 |
| 12KL19-2 |  | 238 | 135 | 163 | 0.83 |  | 0.059 | 0.001 | 0.5659 | 0.0221 | 0.0696 | 0.0015 |  | 565 | 42 | 455 | 14 | 433 | 9 |
| 12KL19-3 |  | 240 | 113 | 111 | 1.02 |  | 0.0685 | 0.0006 | 0.73 | 0.006 | 0.0774 | 0.0003 |  | 883 | 19 | 557 | 4 | 480 | 2 |
| 12KL19-4 |  | 150 | 126 | 170 | 0.74 |  | 0.054 | 0.0018 | 0.3508 | 0.0221 | 0.047 | 0.0014 |  | 372 | 81 | 305 | 17 | 296 | 8 |
| 12KL19-5 |  | 264 | 95 | 135 | 0.7 |  | 0.0572 | 0.0007 | 0.5451 | 0.0085 | 0.0691 | 0.0006 |  | 498 | 26 | 442 | 6 | 431 | 4 |
| 12KL19-6 |  | 207 | 66 | 68 | 0.97 |  | 0.0595 | 0.0006 | 0.6147 | 0.0076 | 0.0748 | 0.0005 |  | 587 | 22 | 487 | 5 | 465 | 3 |
| 12KL19-7 |  | 103 | 70 | 121 | 0.58 |  | 0.0559 | 0.0003 | 0.3964 | 0.0035 | 0.0515 | 0.0003 |  | 456 | 15 | 339 | 3 | 324 | 2 |
| 12KL19-8 |  | 125 | 84 | 69 | 1.22 |  | 0.0574 | 0.001 | 0.3788 | 0.0072 | 0.0479 | 0.0007 |  | 506 | 39 | 326 | 5 | 302 | 4 |
| 12KL19-9 |  | 384 | 280 | 349 | 0.8 |  | 0.0564 | 0.0008 | 0.5446 | 0.0096 | 0.07 | 0.0003 |  | 478 | 30 | 441 | 6 | 436 | 2 |
| 12KL19-10 |  | 75 | 86 | 156 | 0.55 |  | 0.0553 | 0.0003 | 0.3634 | 0.003 | 0.0477 | 0.0003 |  | 433 | 13 | 315 | 2 | 300 | 2 |
| 12KL19-11 |  | 201 | 238 | 100 | 2.38 |  | 0.055 | 0.0021 | 0.3582 | 0.0132 | 0.0472 | 0.0006 |  | 413 | 85 | 311 | 10 | 297 | 4 |
| 12KL19-12 |  | 184 | 161 | 211 | 0.76 |  | 0.0564 | 0.0002 | 0.5455 | 0.0047 | 0.0701 | 0.0005 |  | 478 | 9 | 442 | 3 | 437 | 3 |
| 12KL19-13 |  | 95 | 78 | 102 | 0.76 |  | 0.058 | 0.0007 | 0.5587 | 0.0101 | 0.0698 | 0.0009 |  | 532 | 32 | 451 | 7 | 435 | 6 |
| 12KL19-14 |  | 250 | 315 | 227 | 1.39 |  | 0.0546 | 0.0003 | 0.3552 | 0.0024 | 0.0472 | 0.0003 |  | 398 | 11 | 309 | 2 | 297 | 2 |
| 12KL18: Rhyolite at Hongshan | | | | | | | |  |  |  |  |  |  |  |  |  |  |  |  |
| 12KL18-1 |  | 146 | 86 | 102 | 0.84 |  | 0.1585 | 0.0059 | 1.1351 | 0.0545 | 0.05 | 0.0007 |  | 2439 | 63 | 770 | 26 | 314 | 4 |
| 12KL18-2 |  | 191 | 145 | 83 | 1.75 |  | 0.0557 | 0.0005 | 0.4096 | 0.0061 | 0.0538 | 0.0004 |  | 439 | 20 | 349 | 4 | 338 | 2 |
| 12KL18-3 |  | 93 | 86 | 116 | 0.74 |  | 0.057 | 0.0004 | 0.385 | 0.0032 | 0.0491 | 0.0003 |  | 500 | 15 | 331 | 2 | 309 | 2 |
| 12KL18-4 |  | 182 | 162 | 169 | 0.96 |  | 0.0535 | 0.0021 | 0.3465 | 0.0083 | 0.047 | 0.0013 |  | 354 | 89 | 302 | 6 | 296 | 8 |
| 12KL18-5 |  | 92 | 78 | 125 | 0.62 |  | 0.0569 | 0.0005 | 0.4467 | 0.0044 | 0.057 | 0.0004 |  | 487 | 14 | 375 | 3 | 357 | 2 |
| 12KL18-6 |  | 144 | 157 | 184 | 0.85 |  | 0.0554 | 0.0003 | 0.3633 | 0.0034 | 0.0475 | 0.0004 |  | 428 | 13 | 315 | 3 | 299 | 2 |
| 12KL18-7 |  | 252 | 328 | 241 | 1.36 |  | 0.0526 | 0.0014 | 0.3435 | 0.0145 | 0.0473 | 0.0009 |  | 322 | 59 | 300 | 11 | 298 | 5 |
| 12KL18-8 |  | 82 | 95 | 126 | 0.75 |  | 0.0531 | 0.0017 | 0.3539 | 0.0123 | 0.0483 | 0.0002 |  | 332 | 103 | 308 | 9 | 304 | 1 |
| 12KL18-9 |  | 93 | 121 | 149 | 0.81 |  | 0.0544 | 0.0005 | 0.3525 | 0.0049 | 0.047 | 0.0006 |  | 387 | 19 | 307 | 4 | 296 | 3 |
| 12KL18-10 |  | 141 | 133 | 166 | 0.8 |  | 0.0578 | 0.0003 | 0.5369 | 0.005 | 0.0673 | 0.0005 |  | 524 | 45 | 436 | 3 | 420 | 3 |
| 12KL18-11 |  | 69 | 84 | 83 | 1.01 |  | 0.0549 | 0.001 | 0.3596 | 0.0081 | 0.0476 | 0.0009 |  | 409 | 44 | 312 | 6 | 300 | 6 |
| 12KL18-12 |  | 139 | 176 | 189 | 0.93 |  | 0.0554 | 0.0003 | 0.3601 | 0.0028 | 0.0471 | 0.0003 |  | 432 | 11 | 312 | 2 | 297 | 2 |
| 12KL18-13 |  | 93 | 107 | 171 | 0.63 |  | 0.0555 | 0.0025 | 0.3617 | 0.0097 | 0.0474 | 0.0014 |  | 432 | 100 | 313 | 7 | 299 | 9 |
| 12KL18-14 |  | 70 | 78 | 68 | 1.15 |  | 0.0558 | 0.0025 | 0.3648 | 0.0182 | 0.0474 | 0.0007 |  | 456 | 100 | 316 | 14 | 298 | 4 |
| 12KL18-15 |  | 315 | 255 | 416 | 0.61 |  | 0.0564 | 0.0002 | 0.5265 | 0.0029 | 0.0678 | 0.0003 |  | 478 | 6 | 429 | 2 | 423 | 2 |

# Table S2. Zircon SIMS data of zircon grains FROM Paleozoic volcanic AND intrusive rocks FROM THE CORE OF THE Kalatage inlier

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sample number |  | Element contents(ppm) and ratio | | | |  | Isotopic ratio | | | | | |  | Isotopic age（Ma） | | | | | |
|  | U | Th | Pb | Th/U |  | 207Pb/206Pb | 1σ (%) | 207Pb/235U | 1σ (%) | 206Pb/238U | 1σ (%) |  | 207Pb/206Pb | 1σ | 207Pb/235U | 1σ | 206Pb/238U | 1σ |
| 08JK03-5: G[ranodiorite](http://dict.baidu.com/s?wd=granodiorite) at Honghai | | | | | | | |  |  |  |  |  |  |  |  |  |  |  |  |
| 08KL03-5@1 |  | 754 | 411 | 67 | 0.54 |  | 0.05579 | 0.83 | 0.56064 | 1.72 | 0.0729 | 1.50 |  | 444.2 | 18.4 | 451.9 | 6.3 | 453.5 | 6.6 |
| 08KL03-5@2 |  | 498 | 239 | 43 | 0.48 |  | 0.05464 | 1.14 | 0.53669 | 1.89 | 0.0712 | 1.50 |  | 397.4 | 25.3 | 436.2 | 6.7 | 443.6 | 6.5 |
| 08KL03-5@3 |  | 590 | 307 | 52 | 0.52 |  | 0.05542 | 0.93 | 0.55432 | 1.76 | 0.0725 | 1.50 |  | 429.2 | 20.5 | 447.8 | 6.4 | 451.5 | 6.5 |
| 08KL03-5@4 |  | 490 | 236 | 43 | 0.48 |  | 0.05500 | 1.13 | 0.54693 | 1.88 | 0.0721 | 1.50 |  | 412.2 | 25.0 | 443.0 | 6.8 | 448.9 | 6.5 |
| 08KL03-5@5 |  | 461 | 213 | 39 | 0.46 |  | 0.05539 | 1.06 | 0.54282 | 1.84 | 0.0711 | 1.50 |  | 427.8 | 23.5 | 440.3 | 6.6 | 442.7 | 6.4 |
| 08KL03-5@6 |  | 372 | 132 | 31 | 0.36 |  | 0.05540 | 1.39 | 0.54442 | 2.05 | 0.0713 | 1.50 |  | 428.4 | 30.7 | 441.3 | 7.4 | 443.8 | 6.4 |
| 08KL03-5@7 |  | 621 | 282 | 53 | 0.45 |  | 0.05606 | 0.86 | 0.55348 | 1.73 | 0.0716 | 1.50 |  | 454.5 | 19.0 | 447.3 | 6.3 | 445.9 | 6.5 |
| 08KL03-5@8 |  | 431 | 165 | 36 | 0.38 |  | 0.05535 | 1.05 | 0.54672 | 1.83 | 0.0716 | 1.50 |  | 426.5 | 23.3 | 442.8 | 6.6 | 446.0 | 6.5 |
| 08KL03-5@9 |  | 279 | 115 | 23 | 0.41 |  | 0.05629 | 1.39 | 0.54439 | 2.05 | 0.0701 | 1.50 |  | 464.0 | 30.6 | 441.3 | 7.4 | 437.0 | 6.4 |
| 08KL03-5@10 |  | 485 | 240 | 42 | 0.49 |  | 0.05601 | 1.10 | 0.54881 | 1.86 | 0.0711 | 1.50 |  | 452.8 | 24.2 | 444.2 | 6.7 | 442.6 | 6.4 |
| 08KL03-5@11 |  | 508 | 259 | 44 | 0.51 |  | 0.05594 | 0.99 | 0.55665 | 1.80 | 0.0722 | 1.50 |  | 450.2 | 21.9 | 449.3 | 6.6 | 449.2 | 6.5 |
| 08KL03-5@12 |  | 462 | 172 | 39 | 0.37 |  | 0.05654 | 1.00 | 0.55868 | 1.81 | 0.0717 | 1.50 |  | 473.5 | 22.0 | 450.7 | 6.6 | 446.2 | 6.5 |
| 08KL03-5@13 |  | 220 | 83 | 18 | 0.38 |  | 0.05561 | 1.69 | 0.53640 | 2.26 | 0.0700 | 1.50 |  | 437.0 | 37.2 | 436.0 | 8.0 | 435.9 | 6.3 |
| 08KL03-5@14 |  | 591 | 309 | 52 | 0.52 |  | 0.05634 | 0.91 | 0.55859 | 1.75 | 0.0719 | 1.50 |  | 465.7 | 20.0 | 450.6 | 6.4 | 447.7 | 6.5 |
| 08JK08-2: [Diorite](http://dict.baidu.com/s?wd=granodiorite) at Honghai | | | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 08KL08-2@1 |  | 1126 | 890 | 104 | 0.79 |  | 0.05553 | 0.65 | 0.54566 | 1.64 | 0.0713 | 1.50 |  | 433.6 | 14.5 | 442.2 | 5.9 | 443.8 | 6.4 |
| 08KL08-2@2 |  | 1311 | 640 | 110 | 0.49 |  | 0.05529 | 0.66 | 0.53469 | 1.64 | 0.0701 | 1.50 |  | 424.1 | 14.6 | 434.9 | 5.8 | 437.0 | 6.3 |
| 08KL08-2@3 |  | 1646 | 1333 | 153 | 0.81 |  | 0.05549 | 0.61 | 0.54709 | 1.62 | 0.0715 | 1.50 |  | 432.1 | 13.5 | 443.1 | 5.8 | 445.2 | 6.5 |
| 08KL08-2@4 |  | 1486 | 1163 | 137 | 0.78 |  | 0.05512 | 0.62 | 0.54408 | 1.62 | 0.0716 | 1.50 |  | 417.2 | 13.8 | 441.1 | 5.8 | 445.7 | 6.5 |
| 08KL08-2@5 |  | 576 | 263 | 48 | 0.46 |  | 0.05638 | 0.91 | 0.54487 | 1.75 | 0.0701 | 1.50 |  | 467.4 | 20.0 | 441.6 | 6.3 | 436.7 | 6.3 |
| 08KL08-2@6 |  | 216 | 83 | 18 | 0.38 |  | 0.05769 | 1.60 | 0.55163 | 2.20 | 0.0693 | 1.50 |  | 518.2 | 34.7 | 446.1 | 8.0 | 432.2 | 6.3 |
| 08KL08-2@7 |  | 591 | 263 | 48 | 0.45 |  | 0.05657 | 0.95 | 0.53444 | 1.78 | 0.0685 | 1.50 |  | 474.8 | 20.9 | 434.8 | 6.3 | 427.2 | 6.2 |
| 08KL08-2@8 |  | 693 | 486 | 60 | 0.70 |  | 0.05576 | 0.86 | 0.52439 | 1.73 | 0.0682 | 1.50 |  | 442.9 | 18.9 | 428.1 | 6.1 | 425.3 | 6.2 |
| 08KL08-2@9 |  | 623 | 335 | 53 | 0.54 |  | 0.05465 | 1.29 | 0.52148 | 2.01 | 0.0692 | 1.54 |  | 397.8 | 28.6 | 426.1 | 7.0 | 431.4 | 6.4 |
| 08KL08-2@10 |  | 1285 | 963 | 118 | 0.75 |  | 0.05470 | 0.60 | 0.53912 | 1.62 | 0.0715 | 1.50 |  | 400.1 | 13.4 | 437.8 | 5.8 | 445.1 | 6.5 |
| 08KL08-2@11 |  | 608 | 333 | 52 | 0.55 |  | 0.05577 | 0.90 | 0.53871 | 1.75 | 0.0701 | 1.50 |  | 443.1 | 19.9 | 437.6 | 6.2 | 436.5 | 6.3 |
| 08KL08-2@12 |  | 1434 | 1297 | 140 | 0.90 |  | 0.05576 | 0.74 | 0.56141 | 1.67 | 0.0730 | 1.50 |  | 443.0 | 16.4 | 452.4 | 6.1 | 454.3 | 6.6 |
| 08KL08-2@13 |  | 1575 | 649 | 135 | 0.41 |  | 0.05571 | 0.62 | 0.55619 | 1.62 | 0.0724 | 1.50 |  | 440.8 | 13.7 | 449.0 | 5.9 | 450.6 | 6.5 |
| 08KL03-10: [Dacite](http://dict.baidu.com/s?wd=granodiorite) at Honghai | | | | | | | |  |  |  |  |  |  |  |  |  |  |  |  |
| 09KL03-10@1 |  | 232 | 106 | 16 | 0.46 |  | 0.05447 | 1.78 | 0.42111 | 2.35 | 0.0561 | 1.54 |  | 390.5 | 39.5 | 356.8 | 7.1 | 351.7 | 5.3 |
| 09KL03-10@2 |  | 108 | 45 | 7 | 0.42 |  | 0.05261 | 2.84 | 0.41283 | 3.23 | 0.0569 | 1.54 |  | 311.9 | 63.4 | 350.9 | 9.6 | 356.8 | 5.4 |
| 09KL03-10@3 |  | 210 | 92 | 14 | 0.44 |  | 0.05178 | 1.88 | 0.40422 | 2.41 | 0.0566 | 1.50 |  | 275.9 | 42.5 | 344.7 | 7.1 | 355.0 | 5.2 |
| 09KL03-10@4 |  | 178 | 72 | 12 | 0.40 |  | 0.05065 | 2.43 | 0.39484 | 2.86 | 0.0565 | 1.51 |  | 224.8 | 55.2 | 337.9 | 8.3 | 354.6 | 5.2 |
| 09KL03-10@5 |  | 198 | 84 | 13 | 0.42 |  | 0.05251 | 2.09 | 0.40553 | 2.59 | 0.0560 | 1.52 |  | 307.5 | 47.0 | 345.7 | 7.6 | 351.3 | 5.2 |
| 09KL03-10@6 |  | 68 | 46 | 5 | 0.67 |  | 0.05019 | 3.33 | 0.39819 | 3.65 | 0.0575 | 1.50 |  | 203.8 | 75.4 | 340.3 | 10.6 | 360.7 | 5.3 |
| 09KL03-10@7 |  | 168 | 111 | 12 | 0.66 |  | 0.05291 | 2.21 | 0.40783 | 2.67 | 0.0559 | 1.50 |  | 324.9 | 49.3 | 347.3 | 7.9 | 350.7 | 5.1 |
| 09KL03-10@8 |  | 149 | 100 | 11 | 0.67 |  | 0.05552 | 1.95 | 0.43112 | 2.46 | 0.0563 | 1.50 |  | 433.3 | 42.9 | 364.0 | 7.6 | 353.2 | 5.2 |
| 09KL03-10@9 |  | 178 | 80 | 12 | 0.45 |  | 0.05422 | 2.27 | 0.42401 | 2.72 | 0.0567 | 1.51 |  | 380.0 | 50.2 | 358.9 | 8.3 | 355.7 | 5.2 |
| 09KL03-10@10 |  | 114 | 40 | 7 | 0.35 |  | 0.05403 | 2.47 | 0.41872 | 2.89 | 0.0562 | 1.51 |  | 372.5 | 54.6 | 355.1 | 8.7 | 352.5 | 5.2 |
| 09KL03-10@11 |  | 306 | 146 | 20 | 0.48 |  | 0.05366 | 1.70 | 0.40991 | 2.27 | 0.0554 | 1.50 |  | 357.0 | 37.8 | 348.8 | 6.7 | 347.6 | 5.1 |
| 09KL03-10@12 |  | 162 | 88 | 11 | 0.55 |  | 0.05219 | 2.06 | 0.40683 | 2.55 | 0.0565 | 1.50 |  | 293.8 | 46.3 | 346.6 | 7.5 | 354.5 | 5.2 |
| 09KL03-10@13 |  | 107 | 43 | 7 | 0.40 |  | 0.05299 | 3.73 | 0.41166 | 4.02 | 0.0563 | 1.50 |  | 328.3 | 82.4 | 350.1 | 12.0 | 353.4 | 5.2 |
| 09HSB01: [Dacite](http://dict.baidu.com/s?wd=granodiorite) at Hongshan | | | | | | | |  |  |  |  |  |  |  |  |  |  |  |  |
| 09HSB01@1 |  | 118 | 73 | 8 | 0.62 |  | 0.05294 | 3.93 | 0.39454 | 4.29 | 0.0540 | 1.71 |  | 326.3 | 86.8 | 337.7 | 12.4 | 339.3 | 5.7 |
| 09HSB01@2 |  | 49 | 57 | 4 | 1.17 |  | 0.05369 | 6.12 | 0.41319 | 6.30 | 0.0558 | 1.52 |  | 357.9 | 132.5 | 351.2 | 18.9 | 350.2 | 5.2 |
| 09HSB01@3 |  | 61 | 33 | 4 | 0.54 |  | 0.05112 | 5.60 | 0.40053 | 5.81 | 0.0568 | 1.55 |  | 246.2 | 124.2 | 342.0 | 17.0 | 356.3 | 5.4 |
| 09HSB01@4 |  | 38 | 40 | 3 | 1.06 |  | 0.05210 | 8.41 | 0.40481 | 8.55 | 0.0564 | 1.52 |  | 289.7 | 181.6 | 345.1 | 25.3 | 353.4 | 5.2 |
| 09HSB01@5 |  | 142 | 128 | 11 | 0.90 |  | 0.05281 | 2.55 | 0.41950 | 2.96 | 0.0576 | 1.50 |  | 320.8 | 56.8 | 355.7 | 8.9 | 361.1 | 5.3 |
| 09HSB01@6 |  | 110 | 96 | 8 | 0.88 |  | 0.05383 | 4.64 | 0.41488 | 4.88 | 0.0559 | 1.51 |  | 364.0 | 101.3 | 352.4 | 14.6 | 350.6 | 5.1 |
| 09HSB01@7 |  | 147 | 118 | 11 | 0.80 |  | 0.05301 | 2.92 | 0.40633 | 3.28 | 0.0556 | 1.51 |  | 329.4 | 64.9 | 346.2 | 9.7 | 348.7 | 5.1 |
| 09HSB01@8 |  | 53 | 67 | 4 | 1.26 |  | 0.05368 | 4.23 | 0.42607 | 4.49 | 0.0576 | 1.51 |  | 357.5 | 92.8 | 360.4 | 13.7 | 360.8 | 5.3 |
| 09HSB01@9 |  | 114 | 97 | 8 | 0.86 |  | 0.05172 | 4.64 | 0.38125 | 4.89 | 0.0535 | 1.53 |  | 273.2 | 103.0 | 328.0 | 13.8 | 335.7 | 5.0 |
| 09HSB01@10 |  | 109 | 91 | 8 | 0.83 |  | 0.05176 | 3.05 | 0.40291 | 3.40 | 0.0565 | 1.51 |  | 274.7 | 68.4 | 343.8 | 10.0 | 354.1 | 5.2 |
| 09HSB01@11 |  | 110 | 217 | 10 | 1.98 |  | 0.05142 | 4.54 | 0.38224 | 4.79 | 0.0539 | 1.52 |  | 259.5 | 101.2 | 328.7 | 13.5 | 338.5 | 5.0 |
| 09HSB01@12 |  | 40 | 50 | 3 | 1.25 |  | 0.05252 | 5.00 | 0.41220 | 5.22 | 0.0569 | 1.52 |  | 307.9 | 109.9 | 350.5 | 15.6 | 356.9 | 5.3 |
| 09HSB01@13 |  | 123 | 113 | 9 | 0.92 |  | 0.05295 | 2.73 | 0.41387 | 3.12 | 0.0567 | 1.50 |  | 326.7 | 60.8 | 351.7 | 9.3 | 355.5 | 5.2 |
| 09HSB01@14 |  | 73 | 111 | 6 | 1.52 |  | 0.05510 | 4.22 | 0.43551 | 4.50 | 0.0573 | 1.55 |  | 416.1 | 91.7 | 367.1 | 14.0 | 359.4 | 5.4 |
| 09HSB01@15 |  | 94 | 89 | 7 | 0.95 |  | 0.05209 | 4.54 | 0.39133 | 4.81 | 0.0545 | 1.60 |  | 289.5 | 100.6 | 335.3 | 13.8 | 342.0 | 5.3 |
| 09HSB01@16 |  | 163 | 153 | 12 | 0.94 |  | 0.05244 | 3.32 | 0.41129 | 3.67 | 0.0569 | 1.55 |  | 304.7 | 73.9 | 349.8 | 10.9 | 356.6 | 5.4 |

# Table S3. U-Pb SHRIMP isotopic data of zircons FROM volcaniclastic rocks OF THE Honghai deposit IN THE Kalatage inlier.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sample number |  | Element contents (ppm) and ratio | | | |  | Isotopic ratio | | | | | |  | Isotopic age  (Ma) | |
|  | U | Th | Pb | Th/U |  | 207Pb/206Pb | 1σ(%) | 207Pb/235U | 1σ(%) | 206Pb/238U | 1σ(%) |  | 206Pb/238U | 1σ |
| 14KLHK01-1 |  | 210 | 57 | 12.7 | 0.28 |  | 0.0528 | 5.1 | 0.51 | 5.3 | 0.0697 | 1.3 |  | 434.3 | 5.6 |
| 14KLHK01-2 |  | 319 | 102 | 19.1 | 0.33 |  | 0.0547 | 1.8 | 0.53 | 2.2 | 0.0699 | 1.2 |  | 435.7 | 4.9 |
| 14KLHK01-3 |  | 140 | 31 | 8.6 | 0.23 |  | 0.0619 | 6.3 | 0.62 | 6.4 | 0.0721 | 1.5 |  | 449.1 | 6.3 |
| 14KLHK01-4 |  | 114 | 43 | 6.9 | 0.39 |  | 0.0571 | 14.2 | 0.55 | 14.3 | 0.0697 | 1.8 |  | 434.3 | 7.7 |
| 14KLHK01-5 |  | 177 | 55 | 10.7 | 0.32 |  | 0.0539 | 2.6 | 0.52 | 3 | 0.0699 | 1.4 |  | 435.4 | 6 |
| 14KLHK01-6 |  | 53 | 15 | 3.2 | 0.29 |  | 0.0463 | 17.7 | 0.44 | 17.8 | 0.0692 | 2.3 |  | 431.4 | 9.6 |
| 14KLHK01-7 |  | 215 | 74 | 12.9 | 0.36 |  | 0.0567 | 2.2 | 0.55 | 2.5 | 0.0699 | 1.3 |  | 435.4 | 5.5 |
| 14KLHK01-8 |  | 170 | 52 | 10.6 | 0.32 |  | 0.0608 | 9 | 0.6 | 9.2 | 0.072 | 1.5 |  | 448.3 | 6.5 |
| 14KLHK01-9 |  | 262 | 82 | 15.4 | 0.32 |  | 0.0563 | 4.5 | 0.53 | 4.8 | 0.0682 | 1.5 |  | 425.3 | 6.1 |
| 14KLHK01-10 |  | 105 | 19 | 6.5 | 0.18 |  | 0.0625 | 7.5 | 0.63 | 7.7 | 0.0728 | 1.7 |  | 453.3 | 7.5 |

# Table S4. major (wt%), trace element (ppm) data of Paleozioc volcanic rocks from the core of the Kalatage inlier of the Dananhu-Haerlik arc, NW China.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Location |  | Fresh basalts at Hongshi | | | | | | | | |  | Basalt at Meiling | | | | | | | | | |
| Sample number |  | 08KL01-1 | 08KL01-2 | 08KL07-2 | 08KL07-3 | 08KL07-4 | 08KL07-5#1 | 08KL07-5#3 | 08KL07-6 | 08KL10-7 |  | 08KL11-2 | KL-11\* | KL-50\* | KL-52\* | KL-53\* | KL-54\* | KL-61\* | KL-64\* | KL-97\* | KL-98\* |
| Major oxides (wt%) | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| SiO2 |  | 52.47 | 49.85 | 48.74 | 48.46 | 52.44 | 50.05 | 49.82 | 47.70 | 49.04 |  | 57.79 | 52.36 | 58.58 | 56.69 | 60.47 | 58.34 | 52.03 | 55.02 | 53.04 | 54.03 |
| TiO2 |  | 0.62 | 0.68 | 0.67 | 0.69 | 0.59 | 0.58 | 0.57 | 0.52 | 0.56 |  | 0.93 | 0.81 | 0.66 | 0.55 | 0.58 | 0.64 | 0.60 | 0.65 | 0.79 | 0.74 |
| Al2O3 |  | 15.29 | 15.41 | 15.92 | 14.96 | 14.50 | 15.24 | 15.64 | 15.81 | 13.91 |  | 13.70 | 14.74 | 13.38 | 14.75 | 14.59 | 15.85 | 15.47 | 14.29 | 14.83 | 13.66 |
| Fe2O3T |  | 12.05 | 12.56 | 11.51 | 11.64 | 12.61 | 12.34 | 11.52 | 11.99 | 10.81 |  | 10.26 | 15.16 | 13.30 | 10.63 | 8.88 | 9.38 | 12.02 | 13.91 | 13.59 | 13.38 |
| MnO |  | 0.17 | 0.19 | 0.18 | 0.17 | 0.16 | 0.16 | 0.14 | 0.21 | 0.18 |  | 0.19 | 0.48 | 0.23 | 0.17 | 0.17 | 0.17 | 0.80 | 0.26 | 0.40 | 0.44 |
| MgO |  | 5.46 | 5.99 | 7.23 | 7.28 | 6.78 | 6.59 | 7.70 | 8.80 | 6.65 |  | 4.56 | 7.83 | 4.72 | 2.59 | 2.57 | 3.64 | 6.28 | 5.01 | 6.68 | 5.68 |
| CaO |  | 7.56 | 8.56 | 7.28 | 9.25 | 8.20 | 8.82 | 9.43 | 8.05 | 9.22 |  | 4.90 | 1.81 | 4.37 | 9.61 | 6.37 | 4.06 | 4.70 | 5.80 | 2.34 | 3.20 |
| Na2O |  | 2.57 | 3.35 | 4.30 | 3.69 | 2.72 | 3.76 | 2.41 | 2.48 | 2.27 |  | 4.09 | 3.50 | 1.87 | 2.92 | 4.10 | 3.33 | 3.84 | 1.61 | 4.18 | 3.96 |
| K2O |  | 1.00 | 0.60 | 0.56 | 0.30 | 0.51 | 0.57 | 0.44 | 0.35 | 0.77 |  | 0.23 | 0.04 | 0.13 | 0.13 | 0.09 | 1.77 | 0.01 | 0.10 | 0.08 | 0.02 |
| P2O5 |  | 0.10 | 0.09 | 0.11 | 0.12 | 0.07 | 0.09 | 0.06 | 0.07 | 0.09 |  | 0.27 | 0.09 | 0.12 | 0.16 | 0.17 | 0.18 | 0.11 | 0.12 | 0.10 | 0.13 |
| LOI |  | 2.27 | 2.28 | 3.08 | 2.99 | 1.05 | 1.43 | 1.87 | 3.65 | 6.04 |  | 2.65 | 5.57 | 4.32 | 3.05 | 3.09 | 3.22 | 5.60 | 4.81 | 5.66 | 6.81 |
| Tatol |  | 99.56 | 99.56 | 99.58 | 99.55 | 99.63 | 99.63 | 99.60 | 99.63 | 99.54 |  | 99.57 | 101.32 | 100.81 | 100.76 | 100.60 | 100.05 | 100.64 | 100.70 | 100.67 | 101.06 |
| Mg# |  | 51.36 | 52.64 | 59.41 | 59.31 | 55.62 | 55.45 | 60.90 | 63.11 | 58.91 |  | 50.88 | 54.63 | 45.26 | 36.21 | 40.28 | 47.49 | 54.90 | 45.63 | 53.39 | 49.73 |
| Trace elements (ppm) | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| V |  | 355.00 | 404.00 | 344.00 | 328.00 | 364.00 | 358.00 | 354.00 | 395.00 | 374.00 |  | 132.00 | 29.30 | 236.68 | 183.35 | 129.05 | 146.08 | 237.48 | 265.80 | 300.94 | 298.83 |
| Cr |  | 22.20 | 24.40 | 54.80 | 47.60 | 128.00 | 114.00 | 77.20 | 42.60 | 132.00 |  | 83.30 | 16.60 | 13.98 | 48.85 | 7.80 | 6.37 | 21.17 | 11.44 | 9.60 | 43.38 |
| Co |  | 35.60 | 39.20 | 37.20 | 39.60 | 42.60 | 45.30 | 40.60 | 41.10 | 37.30 |  | 17.60 | 35.02 | 14.78 | 13.24 | 14.45 | 15.00 | 27.41 | 19.41 | 30.16 | 29.92 |
| Ni |  | 21.40 | 25.00 | 33.00 | 38.10 | 55.30 | 63.40 | 53.30 | 37.60 | 42.60 |  | 1.48 | 15.56 | 18.24 | 56.83 | 8.96 | 7.94 | 23.27 | 20.31 | 12.86 | 15.66 |
| Ba |  | 414.00 | 186.00 | 176.00 | 92.60 | 117.00 | 187.00 | 82.50 | 251.00 | 481.00 |  | 116.00 | 103.37 | 92.27 | 80.00 | 39.78 | 386.34 | 21.99 | 61.44 | 73.53 | 230.12 |
| Rb |  | 9.85 | 6.18 | 6.18 | 3.30 | 6.73 | 6.88 | 5.88 | 4.48 | 11.30 |  | 2.67 | 0.97 | 1.85 | 3.36 | 1.15 | 11.28 | 0.39 | 1.53 | 1.30 | 0.51 |
| Sr |  | 257.00 | 275.00 | 314.00 | 302.00 | 342.00 | 315.00 | 311.00 | 335.00 | 341.00 |  | 330.00 | 28.56 | 175.12 | 527.14 | 270.09 | 235.27 | 144.83 | 223.12 | 44.96 | 37.19 |
| Y |  | 14.10 | 14.60 | 13.90 | 14.80 | 12.00 | 12.00 | 12.30 | 10.50 | 15.70 |  | 26.70 | 14.76 | 16.81 | 20.58 | 16.60 | 19.13 | 11.92 | 17.64 | 14.71 | 13.61 |
| Nb |  | 0.85 | 0.73 | 1.01 | 2.62 | 0.74 | 0.69 | 0.68 | 0.41 | 1.51 |  | 1.08 | 1.01 | 1.19 | 3.55 | 3.27 | 3.84 | 0.55 | 1.12 | 1.03 | 0.78 |
| Ta |  | 0.05 | 0.04 | 0.05 | 0.15 | 0.03 | 0.03 | 0.04 | 0.02 | 0.08 |  | 0.06 | 0.37 | 0.09 | 0.30 | 0.29 | 0.24 | 0.08 | 0.09 | 0.07 | 0.09 |
| La |  | 4.78 | 4.86 | 4.61 | 4.99 | 3.71 | 3.77 | 2.92 | 2.89 | 8.37 |  | 7.20 | 4.42 | 6.22 | 9.57 | 6.48 | 7.44 | 3.62 | 5.73 | 4.94 | 5.16 |
| Ce |  | 9.98 | 10.10 | 9.75 | 10.30 | 7.55 | 8.17 | 6.57 | 6.11 | 16.80 |  | 15.80 | 10.87 | 13.27 | 18.76 | 16.66 | 16.09 | 8.14 | 12.46 | 12.39 | 11.63 |
| Pr |  | 1.56 | 1.53 | 1.52 | 1.48 | 1.17 | 1.25 | 1.04 | 0.96 | 2.35 |  | 2.51 | 1.52 | 1.78 | 2.53 | 2.01 | 2.54 | 1.25 | 1.86 | 1.67 | 1.45 |
| Nd |  | 7.35 | 7.30 | 7.07 | 7.15 | 5.39 | 5.53 | 5.39 | 4.59 | 10.20 |  | 12.90 | 7.59 | 8.99 | 13.22 | 9.96 | 11.09 | 6.18 | 9.40 | 8.85 | 7.26 |
| Sm |  | 1.98 | 2.01 | 1.99 | 1.93 | 1.54 | 1.64 | 1.60 | 1.40 | 2.50 |  | 3.78 | 2.32 | 2.65 | 3.25 | 2.43 | 2.76 | 1.77 | 2.48 | 2.29 | 2.05 |
| Eu |  | 0.72 | 0.74 | 0.77 | 0.73 | 0.59 | 0.68 | 0.54 | 0.57 | 0.81 |  | 1.37 | 1.01 | 0.83 | 1.32 | 0.87 | 1.05 | 0.63 | 0.88 | 1.09 | 0.89 |
| Gd |  | 2.28 | 2.49 | 2.34 | 2.58 | 1.84 | 2.02 | 2.03 | 1.73 | 2.92 |  | 4.50 | 2.30 | 2.84 | 3.56 | 2.99 | 3.57 | 2.21 | 2.74 | 2.63 | 2.34 |
| Tb |  | 0.40 | 0.42 | 0.39 | 0.42 | 0.32 | 0.33 | 0.34 | 0.28 | 0.43 |  | 0.74 | 0.38 | 0.41 | 0.51 | 0.43 | 0.47 | 0.31 | 0.43 | 0.40 | 0.32 |
| Dy |  | 2.36 | 2.49 | 2.59 | 2.60 | 2.01 | 2.08 | 2.04 | 1.77 | 2.64 |  | 4.72 | 2.78 | 3.04 | 3.72 | 3.05 | 3.73 | 2.40 | 3.27 | 2.82 | 2.43 |
| Ho |  | 0.52 | 0.54 | 0.55 | 0.55 | 0.46 | 0.45 | 0.50 | 0.37 | 0.60 |  | 1.06 | 0.52 | 0.63 | 0.73 | 0.65 | 0.67 | 0.48 | 0.64 | 0.57 | 0.45 |
| Er |  | 1.64 | 1.72 | 1.70 | 1.75 | 1.45 | 1.42 | 1.59 | 1.15 | 1.88 |  | 3.19 | 1.63 | 1.74 | 2.20 | 2.05 | 2.05 | 1.36 | 1.99 | 1.74 | 1.45 |
| Tm |  | 0.23 | 0.24 | 0.23 | 0.25 | 0.21 | 0.20 | 0.22 | 0.17 | 0.25 |  | 0.45 | 0.24 | 0.29 | 0.32 | 0.29 | 0.30 | 0.19 | 0.27 | 0.27 | 0.23 |
| Yb |  | 1.52 | 1.65 | 1.59 | 1.67 | 1.43 | 1.43 | 1.44 | 1.14 | 1.77 |  | 2.94 | 1.67 | 1.73 | 2.26 | 1.99 | 2.31 | 1.41 | 2.03 | 1.87 | 1.47 |
| Lu |  | 0.24 | 0.25 | 0.25 | 0.27 | 0.21 | 0.22 | 0.23 | 0.17 | 0.27 |  | 0.47 | 0.27 | 0.28 | 0.37 | 0.31 | 0.32 | 0.24 | 0.31 | 0.31 | 0.24 |
| Pb |  | 9.29 | 2.60 | 1.89 | 1.53 | 1.42 | 1.32 | 1.52 | 1.56 | 3.47 |  | 2.43 | 138.84 | 4.59 | 160.79 | 6.22 | 3.67 | 8.97 | 4.18 | 31.07 | 6.13 |
| Th |  | 0.54 | 0.50 | 0.46 | 0.53 | 0.46 | 0.43 | 0.46 | 0.28 | 1.37 |  | 0.61 | 0.66 | 0.72 | 1.11 | 0.76 | 0.91 | 0.36 | 0.65 | 0.73 | 0.57 |
| U |  | 0.36 | 0.28 | 0.25 | 0.24 | 0.26 | 0.27 | 0.24 | 0.19 | 0.66 |  | 0.34 | 0.32 | 0.38 | 0.65 | 0.78 | 0.46 | 0.27 | 0.42 | 0.34 | 0.36 |
| Zr |  | 81.80 | 79.70 | 75.90 | 83.00 | 63.60 | 60.20 | 65.40 | 42.50 | 115.00 |  | 117.00 | 34.96 | 41.87 | 44.32 | 43.83 | 47.49 | 23.61 | 41.67 | 37.71 | 30.85 |
| Hf |  | 2.13 | 2.18 | 2.00 | 2.22 | 1.66 | 1.69 | 1.46 | 1.13 | 3.04 |  | 3.33 | 1.07 | 1.25 | 1.42 | 1.34 | 1.42 | 0.77 | 1.23 | 1.15 | 0.94 |
| Nb/La |  | 0.18 | 0.15 | 0.22 | 0.53 | 0.20 | 0.18 | 0.23 | 0.14 | 0.18 |  | 0.15 | 0.2 | 0.2 | 0.4 | 0.5 | 0.5 | 0.2 | 0.2 | 0.2 | 0.2 |
| Zr/Nb |  | 96.12 | 109.48 | 75.15 | 31.68 | 85.95 | 87.25 | 96.46 | 102.91 | 76.16 |  | 108.33 | 34.6 | 35.2 | 12.5 | 13.4 | 12.4 | 42.9 | 37.2 | 36.6 | 39.6 |
| Ba/La |  | 86.61 | 38.27 | 38.18 | 18.56 | 31.54 | 49.60 | 28.25 | 86.85 | 57.47 |  | 16.11 | 23.4 | 14.8 | 8.4 | 6.1 | 51.9 | 6.1 | 10.7 | 14.9 | 44.6 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Location |  | Alteration basalt at Hongshi |  | Altered basalt at Honghai | | | | | | | | | | | | | | |
| Sample number |  | 08KL01-3 |  | H08-1 | H08-2 | H04-1 | H04-2 | H07-1 | H07-2 | H03 | H16-1 | H16-2 | H16-3 | H16-4 | H16-14 | H16-16 | H13-10 | H13-14 |
| Major oxides (wt%) | | | | | | | | | | | | | | | | | | |
| SiO2 |  | 59.37 |  | 67.66 | 64.79 | 75.74 | 76.07 | 69.78 | 71.28 | 75.31 | 70.04 | 61.76 | 60.71 | 62.38 | 58.57 | 64.26 | 68.24 | 62.07 |
| TiO2 |  | 0.27 |  | 0.63 | 0.63 | 0.38 | 0.49 | 0.57 | 0.43 | 0.49 | 0.59 | 0.57 | 0.62 | 0.57 | 0.36 | 0.32 | 0.52 | 0.54 |
| Al2O3 |  | 8.77 |  | 15.51 | 15.56 | 8.89 | 10.50 | 13.97 | 10.00 | 11.42 | 14.02 | 13.83 | 14.89 | 13.81 | 13.11 | 12.06 | 12.09 | 12.97 |
| Fe2O3T |  | 8.92 |  | 5.59 | 7.48 | 6.04 | 4.08 | 4.63 | 6.92 | 3.77 | 4.74 | 9.55 | 8.64 | 9.50 | 11.24 | 9.21 | 7.37 | 10.23 |
| MnO |  | 0.20 |  | 0.12 | 0.24 | 0.01 | 0.01 | 0.01 | 0.13 | 0.01 | 0.03 | 0.23 | 0.36 | 0.22 | 0.26 | 0.28 | 0.04 | 0.17 |
| MgO |  | 4.67 |  | 2.25 | 3.65 | 0.25 | 0.40 | 0.65 | 1.57 | 0.55 | 1.00 | 4.56 | 5.97 | 4.81 | 6.39 | 5.83 | 1.18 | 3.20 |
| CaO |  | 15.42 |  | 0.30 | 0.29 | 0.15 | 0.22 | 0.27 | 0.80 | 0.20 | 0.23 | 0.28 | 0.28 | 0.26 | 0.84 | 0.41 | 0.26 | 0.26 |
| Na2O |  | 0.47 |  | 0.17 | 0.06 | <0.010 | 0.12 | 0.22 | 0.03 | 0.16 | 0.04 | 0.07 | 0.11 | 0.08 | 0.23 | 0.09 | 0.17 | 0.14 |
| K2O |  | 0.08 |  | 3.89 | 3.30 | 2.56 | 2.88 | 3.86 | 2.40 | 3.36 | 3.84 | 2.56 | 2.49 | 2.42 | 1.79 | 1.78 | 3.30 | 3.00 |
| P2O5 |  | 0.05 |  | 0.17 | 0.16 | 0.09 | 0.10 | 0.14 | 0.13 | 0.10 | 0.15 | 0.14 | 0.15 | 0.14 | 0.09 | 0.07 | 0.13 | 0.15 |
| LIO |  | 1.32 |  | 3.15 | 3.25 | 5.30 | 4.55 | 5.31 | 5.78 | 4.09 | 4.79 | 5.90 | 5.25 | 5.23 | 6.54 | 5.28 | 6.12 | 6.70 |
| Tatol |  | 99.54 |  | 99.42 | 99.42 | 99.40 | 99.42 | 99.41 | 99.46 | 99.47 | 99.47 | 99.45 | 99.47 | 99.42 | 99.41 | 99.58 | 99.42 | 99.43 |
| Mg# |  | 54.96 |  | 48.40 | 53.21 | 8.70 | 18.71 | 24.59 | 34.59 | 25.48 | 32.89 | 52.67 | 61.69 | 54.13 | 56.99 | 59.60 | 27.17 | 42.16 |
| Trace elements (ppm) | | | | | | | | | | | | | | | | | | |
| V |  | 277.00 |  | 192.00 | 228.00 | 100.00 | 132.00 | 187.00 | 99.50 | 155.00 | 194.00 | 202.00 | 209.00 | 191.00 | 253.00 | 198.00 | 163.00 | 118.00 |
| Cr |  | 460.00 |  | 9.61 | 9.80 | 7.75 | 9.57 | 7.34 | 2.43 | 5.04 | 9.31 | 10.00 | 13.70 | 7.42 | 146.00 | 34.50 | 18.90 | 6.61 |
| Co |  | 26.10 |  | 16.00 | 4.41 | 13.80 | 13.40 | 12.60 | 11.80 | 10.20 | 11.60 | 18.80 | 8.58 | 18.70 | 19.40 | 14.20 | 12.20 | 11.40 |
| Ni |  | 93.60 |  | 5.32 | 2.97 | 3.84 | 5.74 | 3.13 | 1.26 | 2.34 | 3.68 | 3.34 | 5.59 | 3.78 | 13.40 | 10.20 | 7.67 | 2.99 |
| Ba |  | 39.00 |  | 707.00 | 854.00 | 435.00 | 843.00 | 858.00 | 500.00 | 851.00 | 842.00 | 591.00 | 652.00 | 537.00 | 486.00 | 520.00 | 1495.00 | 888.00 |
| Rb |  | 1.14 |  | 53.80 | 47.60 | 32.70 | 31.90 | 43.60 | 30.10 | 38.70 | 45.30 | 36.80 | 37.10 | 32.90 | 25.50 | 24.70 | 40.70 | 38.50 |
| Sr |  | 458.00 |  | 6.98 | 5.31 | 10.90 | 14.30 | 11.80 | 16.60 | 8.06 | 11.40 | 7.87 | 6.53 | 7.23 | 5.92 | 5.78 | 11.10 | 9.33 |
| Y |  | 6.67 |  | 18.60 | 24.40 | 23.20 | 15.90 | 15.90 | 13.90 | 10.90 | 17.20 | 19.60 | 22.40 | 17.90 | 10.60 | 11.70 | 15.20 | 19.20 |
| Nb |  | 0.31 |  | 3.31 | 3.34 | 2.05 | 2.61 | 2.99 | 2.48 | 2.42 | 3.19 | 3.03 | 3.24 | 2.87 | 1.82 | 1.82 | 2.52 | 3.02 |
| Ta |  | 0.01 |  | 0.20 | 0.22 | 0.15 | 0.23 | 0.20 | 0.14 | 0.15 | 0.20 | 0.19 | 0.18 | 0.18 | 0.11 | 0.11 | 0.13 | 0.17 |
| La |  | 2.47 |  | 6.01 | 6.26 | 5.09 | 4.75 | 4.62 | 2.96 | 4.11 | 6.08 | 5.70 | 15.50 | 5.81 | 3.95 | 6.66 | 6.41 | 11.90 |
| Ce |  | 4.72 |  | 14.90 | 13.40 | 10.70 | 10.00 | 10.60 | 6.62 | 9.06 | 14.40 | 12.50 | 31.20 | 12.60 | 7.87 | 13.40 | 13.80 | 23.10 |
| Pr |  | 0.74 |  | 2.20 | 1.87 | 1.51 | 1.43 | 1.55 | 0.99 | 1.27 | 2.07 | 1.75 | 4.21 | 1.79 | 1.09 | 1.79 | 1.95 | 3.06 |
| Nd |  | 3.43 |  | 10.80 | 9.13 | 7.21 | 7.08 | 7.70 | 4.97 | 6.20 | 10.00 | 8.58 | 19.50 | 8.59 | 5.09 | 7.96 | 9.03 | 13.50 |
| Sm |  | 0.87 |  | 2.62 | 2.43 | 1.92 | 1.83 | 2.08 | 1.43 | 1.57 | 2.45 | 2.29 | 4.33 | 2.23 | 1.26 | 1.83 | 2.19 | 2.92 |
| Eu |  | 0.32 |  | 0.25 | 0.38 | 0.48 | 0.22 | 0.19 | 0.21 | 0.23 | 0.37 | 0.27 | 0.46 | 0.22 | 0.19 | 0.50 | 0.38 | 1.04 |
| Gd |  | 1.05 |  | 2.44 | 2.69 | 2.48 | 1.86 | 2.35 | 1.85 | 1.66 | 2.66 | 2.68 | 4.26 | 2.21 | 1.35 | 1.56 | 2.45 | 2.87 |
| Tb |  | 0.17 |  | 0.49 | 0.67 | 0.56 | 0.46 | 0.49 | 0.37 | 0.39 | 0.57 | 0.59 | 0.77 | 0.54 | 0.30 | 0.35 | 0.49 | 0.56 |
| Dy |  | 1.11 |  | 3.08 | 3.71 | 3.46 | 2.79 | 2.58 | 2.37 | 1.89 | 2.85 | 2.90 | 3.91 | 2.82 | 1.64 | 2.09 | 2.35 | 3.13 |
| Ho |  | 0.24 |  | 0.68 | 0.88 | 0.82 | 0.54 | 0.62 | 0.55 | 0.42 | 0.63 | 0.75 | 0.86 | 0.64 | 0.34 | 0.44 | 0.53 | 0.71 |
| Er |  | 0.80 |  | 2.21 | 2.72 | 2.34 | 1.78 | 1.96 | 1.65 | 1.22 | 1.84 | 2.04 | 2.67 | 1.99 | 1.09 | 1.22 | 1.67 | 2.06 |
| Tm |  | 0.11 |  | 0.39 | 0.47 | 0.39 | 0.32 | 0.30 | 0.30 | 0.26 | 0.36 | 0.42 | 0.45 | 0.37 | 0.22 | 0.25 | 0.34 | 0.37 |
| Yb |  | 0.78 |  | 2.18 | 3.34 | 2.48 | 2.08 | 2.41 | 1.85 | 1.65 | 2.06 | 2.28 | 2.72 | 2.56 | 1.42 | 1.71 | 2.34 | 2.66 |
| Lu |  | 0.12 |  | 0.39 | 0.48 | 0.34 | 0.33 | 0.35 | 0.29 | 0.24 | 0.28 | 0.37 | 0.44 | 0.33 | 0.23 | 0.22 | 0.30 | 0.32 |
| Pb |  | 3.63 |  | 5.99 | 1.60 | 8.87 | 4.84 | 6.95 | 3.13 | 7.25 | 8.83 | 5.78 | 2.23 | 3.47 | 2.88 | 2.53 | 11.10 | 8.30 |
| Th |  | 0.24 |  | 1.21 | 1.23 | 0.76 | 0.91 | 1.08 | 0.86 | 0.89 | 1.13 | 1.09 | 1.13 | 1.04 | 0.75 | 0.74 | 0.95 | 1.07 |
| U |  | 0.14 |  | 0.80 | 0.68 | 0.40 | 0.60 | 0.66 | 0.48 | 0.50 | 0.64 | 0.62 | 0.59 | 0.59 | 0.43 | 0.39 | 0.54 | 0.59 |
| Zr |  | 28.60 |  | 71.80 | 74.10 | 44.20 | 55.70 | 64.20 | 53.30 | 53.90 | 69.20 | 66.40 | 72.30 | 63.70 | 46.30 | 43.40 | 57.60 | 64.50 |
| Hf |  | 0.88 |  | 2.41 | 2.68 | 1.55 | 1.87 | 2.19 | 1.82 | 1.74 | 2.33 | 2.33 | 2.15 | 2.12 | 1.51 | 1.25 | 1.78 | 2.04 |
| Nb/La |  | 0.13 |  | 0.55 | 0.53 | 0.40 | 0.55 | 0.65 | 0.84 | 0.59 | 0.52 | 0.53 | 0.21 | 0.49 | 0.46 | 0.27 | 0.39 | 0.25 |
| Zr/Nb |  | 92.56 |  | 21.69 | 22.19 | 21.56 | 21.34 | 21.47 | 21.49 | 22.27 | 21.69 | 21.91 | 22.31 | 22.20 | 25.44 | 23.85 | 22.86 | 21.36 |
| Ba/La |  | 15.79 |  | 117.64 | 136.42 | 85.46 | 177.47 | 185.71 | 168.92 | 207.06 | 138.49 | 103.68 | 42.06 | 92.43 | 123.04 | 78.08 | 233.23 | 74.62 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Location |  | intermediate volcanic rocks ZK0001 at Honghai | | | | | | | | | |  | intermediate volcanic rocks ZK0302 at Honghai | | | | |  | intermediate volcanic rocks ZK0809 at Honghai | | | | |
| Sample number |  | ZB01 | ZB06 | ZB07 | ZB08 | ZB09 | ZB10 | ZB12 | ZB13 | ZB14 | ZB15 |  | ZB17 | ZB19 | ZB20 | ZB21 | ZB23 |  | | ZB26 | ZB28 | ZB29 | ZB30 |
| Major oxides (wt%) | | | | | | | | | | | | | | | | | | | | | | | |
| SiO2 |  | 59.45 | 78.60 | 75.42 | 63.49 | 75.64 | 69.73 | 78.42 | 70.00 | 70.94 | 78.24 |  | 75.95 | 71.51 | 76.26 | 72.96 | 66.11 |  | 65.10 | | 65.29 | 67.13 | 64.11 |
| TiO2 |  | 0.61 | 0.31 | 0.53 | 0.51 | 0.58 | 0.63 | 0.49 | 0.46 | 0.58 | 0.37 |  | 0.40 | 0.47 | 0.36 | 0.33 | 0.51 |  | 0.60 | | 0.52 | 0.37 | 0.57 |
| Al2O3 |  | 14.05 | 9.77 | 13.32 | 13.11 | 13.47 | 16.58 | 10.73 | 16.06 | 16.19 | 10.66 |  | 11.19 | 15.07 | 9.32 | 11.11 | 15.40 |  | 15.49 | | 13.73 | 14.12 | 13.87 |
| Fe2O3T |  | 11.19 | 4.33 | 3.18 | 8.30 | 2.96 | 3.67 | 3.60 | 4.00 | 3.54 | 3.70 |  | 4.61 | 3.81 | 5.79 | 5.39 | 5.43 |  | 7.41 | | 7.98 | 7.11 | 9.25 |
| MnO |  | 0.35 | 0.02 | 0.01 | 0.07 | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 | 0.03 |  | 0.02 | 0.03 | 0.16 | 0.07 | 0.14 |  | 0.17 | | 0.33 | 0.12 | 0.26 |
| MgO |  | 5.91 | 0.50 | 0.35 | 1.01 | 0.44 | 0.59 | 0.32 | 0.49 | 0.44 | 0.27 |  | 0.31 | 0.49 | 2.27 | 1.34 | 1.59 |  | 2.92 | | 4.78 | 2.73 | 4.46 |
| CaO |  | 1.28 | 0.21 | 0.25 | 1.58 | 0.29 | 0.35 | 0.14 | 0.30 | 0.25 | 0.20 |  | 0.21 | 0.27 | 0.31 | 0.35 | 0.36 |  | 0.29 | | 0.22 | 0.24 | 0.37 |
| Na2O |  | 3.02 | 0.35 | 0.28 | 0.21 | 0.37 | 0.39 | 0.36 | 0.41 | 0.31 | 0.25 |  | 0.31 | 0.28 | 0.21 | 0.45 | 0.29 |  | 0.25 | | 0.18 | 0.32 | 0.29 |
| K2O |  | 0.23 | 2.31 | 3.09 | 2.88 | 3.37 | 3.90 | 2.63 | 3.82 | 3.98 | 2.74 |  | 2.89 | 3.88 | 1.88 | 2.53 | 3.21 |  | 3.02 | | 2.08 | 2.79 | 2.13 |
| P2O5 |  | 0.10 | 0.07 | 0.10 | 0.09 | 0.10 | 0.14 | 0.04 | 0.15 | 0.13 | 0.10 |  | 0.09 | 0.14 | 0.09 | 0.09 | 0.13 |  | 0.16 | | 0.13 | 0.10 | 0.12 |
| LIO |  | 3.42 | 2.99 | 3.42 | 7.49 | 2.72 | 3.96 | 2.84 | 4.15 | 3.62 | 3.24 |  | 3.63 | 3.85 | 3.30 | 4.78 | 6.87 |  | 4.20 | | 4.37 | 4.42 | 4.42 |
| Tatol |  | 99.61 | 99.47 | 99.95 | 98.74 | 99.96 | 99.96 | 99.58 | 99.86 | 100.01 | 99.79 |  | 99.61 | 99.80 | 99.95 | 99.39 | 100.04 |  | 99.61 | | 99.61 | 99.45 | 99.85 |
| Mg# |  | 55.17 | 21.20 | 20.41 | 22.09 | 25.73 | 27.25 | 17.16 | 22.21 | 22.46 | 14.53 |  | 13.55 | 23.06 | 47.74 | 36.68 | 40.56 |  | 47.87 | | 58.26 | 47.22 | 52.91 |
| Trace elements (ppm) | | | | | | | | | | | | | | | | | | | | | | | |
| V |  | 140.00 | 6.71 | 1.54 | 1.63 | 1.59 | 1.22 | 9.81 | 38.50 | 2.72 | 2.36 |  | 4.83 | 2.46 | 2.58 | 6.08 | 1.19 |  | 6.42 | | 15.10 | 4.03 | 35.70 |
| Cr |  | 17.70 | 7.57 | 20.40 | 24.90 | 12.00 | 23.00 | 10.50 | 19.90 | 22.50 | 17.40 |  | 24.20 | 19.00 | 17.50 | 36.10 | 21.20 |  | 13.60 | | 15.70 | 14.90 | 24.00 |
| Co |  | 11.90 | 3.52 | 0.94 | 1.24 | 0.95 | 1.00 | 2.10 | 17.30 | 2.74 | 1.66 |  | 2.44 | 2.54 | 1.69 | 3.43 | 1.28 |  | 2.44 | | 3.68 | 4.94 | 9.00 |
| Ni |  | 134.00 | 50.70 | 85.30 | 91.90 | 106.00 | 115.00 | 103.00 | 228.00 | 184.00 | 109.00 |  | 133.00 | 175.00 | 102.00 | 99.70 | 125.00 |  | 190.00 | | 131.00 | 102.00 | 179.00 |
| Ba |  | 223.00 | 641.00 | 608.00 | 680.00 | 653.00 | 695.00 | 869.00 | 998.00 | 1256.00 | 597.00 |  | 723.00 | 925.00 | 586.00 | 632.00 | 734.00 |  | 790.00 | | 544.00 | 1175.00 | 591.00 |
| Rb |  | 2.82 | 29.60 | 39.00 | 41.90 | 44.10 | 50.20 | 33.60 | 52.40 | 58.70 | 39.70 |  | 41.80 | 53.70 | 27.30 | 33.70 | 39.10 |  | 40.30 | | 28.30 | 39.70 | 25.40 |
| Sr |  | 106.00 | 7.39 | 8.89 | 43.40 | 9.38 | 9.64 | 9.15 | 10.70 | 12.10 | 8.08 |  | 11.30 | 8.75 | 6.77 | 6.57 | 45.90 |  | 11.40 | | 5.64 | 14.90 | 12.30 |
| Y |  | 19.10 | 15.50 | 10.90 | 14.50 | 14.10 | 19.30 | 25.70 | 13.00 | 23.60 | 11.40 |  | 15.90 | 17.30 | 23.80 | 9.72 | 23.00 |  | 20.80 | | 23.00 | 16.60 | 16.10 |
| Nb |  | 3.84 | 3.70 | 4.69 | 4.56 | 4.87 | 5.37 | 3.94 | 2.82 | 3.56 | 2.54 |  | 2.83 | 3.18 | 2.14 | 2.13 | 2.84 |  | 3.43 | | 3.19 | 2.63 | 3.23 |
| Ta |  | 0.21 | 0.16 | 0.23 | 0.23 | 0.24 | 0.26 | 0.20 | 0.13 | 0.19 | 0.12 |  | 0.15 | 0.17 | 0.10 | 0.13 | 0.16 |  | 0.43 | | 0.18 | 0.13 | 0.17 |
| La |  | 13.00 | 15.90 | 10.10 | 15.50 | 4.72 | 15.80 | 13.00 | 8.13 | 7.93 | 5.45 |  | 4.30 | 6.69 | 9.91 | 4.56 | 7.30 |  | 6.58 | | 5.44 | 5.82 | 5.93 |
| Ce |  | 24.50 | 32.90 | 23.90 | 35.50 | 11.10 | 35.40 | 26.60 | 17.30 | 17.80 | 11.70 |  | 9.45 | 14.60 | 23.50 | 10.60 | 15.20 |  | 15.60 | | 12.30 | 12.80 | 14.00 |
| Pr |  | 2.94 | 4.32 | 3.29 | 4.93 | 1.55 | 4.85 | 3.52 | 2.33 | 2.46 | 1.59 |  | 1.30 | 2.03 | 3.32 | 1.45 | 2.02 |  | 2.27 | | 1.75 | 1.76 | 1.92 |
| Nd |  | 11.90 | 18.30 | 14.70 | 21.40 | 7.40 | 21.60 | 16.00 | 11.00 | 12.00 | 7.43 |  | 6.25 | 9.69 | 15.70 | 7.20 | 8.97 |  | 10.80 | | 8.42 | 8.76 | 9.16 |
| Sm |  | 2.52 | 3.92 | 3.51 | 5.04 | 1.97 | 5.15 | 3.79 | 2.69 | 3.12 | 1.69 |  | 1.62 | 2.38 | 4.08 | 1.69 | 2.33 |  | 2.76 | | 2.30 | 2.36 | 2.45 |
| Eu |  | 0.95 | 0.94 | 0.88 | 1.49 | 0.57 | 1.03 | 1.02 | 1.05 | 1.11 | 0.54 |  | 0.38 | 0.58 | 0.93 | 0.35 | 0.49 |  | 0.45 | | 0.49 | 0.57 | 0.65 |
| Gd |  | 2.38 | 3.01 | 3.01 | 4.40 | 2.10 | 4.41 | 3.49 | 2.38 | 3.28 | 1.71 |  | 1.86 | 2.42 | 3.88 | 1.52 | 2.61 |  | 2.91 | | 2.55 | 2.23 | 2.33 |
| Tb |  | 0.53 | 0.52 | 0.48 | 0.77 | 0.50 | 0.84 | 0.71 | 0.46 | 0.70 | 0.33 |  | 0.41 | 0.47 | 0.80 | 0.29 | 0.61 |  | 0.58 | | 0.60 | 0.47 | 0.46 |
| Dy |  | 3.20 | 2.99 | 2.88 | 4.13 | 3.29 | 4.84 | 4.38 | 2.56 | 4.47 | 2.01 |  | 2.69 | 2.99 | 4.64 | 1.70 | 4.09 |  | 3.47 | | 3.81 | 2.81 | 2.78 |
| Ho |  | 0.76 | 0.58 | 0.48 | 0.71 | 0.61 | 0.86 | 0.91 | 0.53 | 0.93 | 0.43 |  | 0.58 | 0.65 | 0.86 | 0.34 | 0.84 |  | 0.76 | | 0.83 | 0.61 | 0.61 |
| Er |  | 2.48 | 1.78 | 1.41 | 1.89 | 1.90 | 2.59 | 2.86 | 1.72 | 2.99 | 1.43 |  | 1.89 | 2.09 | 2.36 | 1.19 | 2.59 |  | 2.38 | | 2.59 | 2.06 | 1.92 |
| Tm |  | 0.45 | 0.31 | 0.21 | 0.31 | 0.30 | 0.41 | 0.50 | 0.28 | 0.50 | 0.26 |  | 0.33 | 0.38 | 0.37 | 0.21 | 0.44 |  | 0.41 | | 0.45 | 0.37 | 0.33 |
| Yb |  | 2.83 | 2.09 | 1.31 | 2.02 | 2.09 | 2.55 | 3.14 | 1.93 | 3.22 | 1.69 |  | 2.19 | 2.51 | 2.21 | 1.43 | 2.82 |  | 2.79 | | 2.85 | 2.48 | 2.21 |
| Lu |  | 0.42 | 0.34 | 0.20 | 0.29 | 0.29 | 0.37 | 0.53 | 0.35 | 0.55 | 0.32 |  | 0.37 | 0.43 | 0.34 | 0.26 | 0.44 |  | 0.47 | | 0.48 | 0.45 | 0.41 |
| Pb |  | 8.40 | 9.92 | 11.10 | 17.30 | 7.32 | 15.20 | 7.74 | 15.10 | 21.90 | 16.80 |  | 16.10 | 25.60 | 14.70 | 14.30 | 12.10 |  | 7.94 | | 3.61 | 3.06 | 4.64 |
| Th |  | 2.40 | 1.89 | 1.92 | 2.00 | 2.06 | 2.36 | 1.70 | 1.13 | 1.30 | 0.87 |  | 0.92 | 1.13 | 0.76 | 0.79 | 1.01 |  | 1.22 | | 1.16 | 1.17 | 1.19 |
| U |  | 3.92 | 2.96 | 1.56 | 1.03 | 1.00 | 1.34 | 0.99 | 0.61 | 1.21 | 0.38 |  | 0.55 | 0.59 | 0.41 | 0.34 | 0.59 |  | 0.61 | | 0.64 | 0.68 | 0.50 |
| Zr |  | 144.00 | 133.00 | 144.00 | 148.00 | 158.00 | 174.00 | 123.00 | 86.20 | 117.00 | 82.70 |  | 84.90 | 104.00 | 67.50 | 68.90 | 86.20 |  | 112.00 | | 108.00 | 112.00 | 104.00 |
| Hf |  | 3.96 | 3.59 | 3.87 | 4.04 | 4.29 | 4.91 | 3.39 | 2.65 | 3.39 | 2.27 |  | 2.43 | 2.88 | 2.01 | 2.01 | 2.63 |  | 3.26 | | 3.12 | 3.20 | 2.93 |
| Nb/La |  | 0.30 | 0.23 | 0.46 | 0.29 | 1.03 | 0.34 | 0.30 | 0.35 | 0.45 | 0.47 |  | 0.66 | 0.48 | 0.22 | 0.47 | 0.39 |  | 0.52 | | 0.59 | 0.45 | 0.54 |
| Zr/Nb |  | 37.50 | 35.95 | 30.70 | 32.46 | 32.44 | 32.40 | 31.22 | 30.57 | 32.87 | 32.56 |  | 30.00 | 32.70 | 31.54 | 32.35 | 30.35 |  | 32.65 | | 33.86 | 42.59 | 32.20 |
| Ba/La |  | 17.15 | 40.31 | 60.20 | 43.87 | 138.35 | 43.99 | 66.85 | 122.76 | 158.39 | 109.54 |  | 168.14 | 138.27 | 59.13 | 138.60 | 100.55 |  | 120.06 | | 100.00 | 201.89 | 99.66 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Location |  | Dacitic rocks from ZK0001 at Honghai | | | | | | | | | | |  | Dacitic ignimbrite at Honghait | |  | Dacite at Meiling（Tang et al.，2006） | | | | | | |
| Sample number |  | ZB89-1 | ZB51 | ZB52 | ZB53 | ZB54 | ZB57 | ZB58 | ZB59 | ZB56 | ZB60 | ZB61 |  | 8KL03-4 | 8KL03-7 |  | KL-19\* | KL-37\* | KL-39\* | KL-35\* | KL-36\* | KL-40\* | KL-45\* |
| Major oxides (wt%) | | | | | | | | | | | | | | | | | | | | | | | |
| SiO2 |  | 64.53 | 64.38 | 65.39 | 72.31 | 69.52 | 70.56 | 70.16 | 69.09 | 64.81 | 59.21 | 66.66 |  | 61.02 | 60.24 |  | 64.25 | 65.36 | 66.49 | 70.67 | 67.69 | 67.54 | 68.45 |
| TiO2 |  | 0.50 | 0.48 | 0.68 | 0.38 | 0.45 | 0.43 | 0.40 | 0.36 | 0.52 | 0.47 | 0.46 |  | 0.63 | 0.77 |  | 0.44 | 0.43 | 0.42 | 0.34 | 0.42 | 0.42 | 0.41 |
| Al2O3 |  | 14.94 | 13.59 | 14.45 | 10.64 | 11.58 | 12.71 | 12.29 | 12.96 | 14.07 | 14.39 | 13.77 |  | 15.01 | 14.60 |  | 13.78 | 13.82 | 14.26 | 11.63 | 13.71 | 13.80 | 13.75 |
| Fe2O3T |  | 5.97 | 5.11 | 5.87 | 4.08 | 7.27 | 4.39 | 4.89 | 4.17 | 6.04 | 7.89 | 5.54 |  | 5.70 | 6.59 |  | 7.21 | 6.40 | 5.81 | 3.11 | 6.05 | 5.83 | 5.60 |
| MnO |  | 0.11 | 0.15 | 0.09 | 0.12 | 0.11 | 0.08 | 0.06 | 0.05 | 0.14 | 0.11 | 0.10 |  | 0.14 | 0.13 |  | 0.13 | 0.14 | 0.11 | 0.11 | 0.09 | 0.09 | 0.09 |
| MgO |  | 3.62 | 2.55 | 2.70 | 2.10 | 2.38 | 1.64 | 1.96 | 3.15 | 3.33 | 7.40 | 3.04 |  | 2.87 | 3.61 |  | 2.41 | 2.39 | 2.20 | 0.44 | 2.24 | 2.33 | 1.54 |
| CaO |  | 2.91 | 3.98 | 1.90 | 2.75 | 1.53 | 1.70 | 1.78 | 1.25 | 3.00 | 2.40 | 2.89 |  | 4.02 | 4.25 |  | 2.26 | 2.67 | 1.76 | 4.20 | 1.23 | 1.10 | 1.28 |
| Na2O |  | 3.47 | 2.88 | 4.54 | 4.25 | 3.67 | 4.50 | 4.55 | 4.27 | 2.49 | 2.34 | 3.99 |  | 7.17 | 4.16 |  | 5.38 | 5.14 | 6.24 | 5.35 | 5.27 | 5.68 | 5.58 |
| K2O |  | 0.95 | 2.02 | 1.55 | 0.53 | 0.86 | 1.16 | 1.76 | 2.25 | 2.02 | 1.03 | 0.70 |  | 0.25 | 2.31 |  | 1.15 | 1.45 | 0.27 | 0.72 | 1.79 | 1.23 | 1.43 |
| P2O5 |  | 0.17 | 0.11 | 0.17 | 0.10 | 0.11 | 0.11 | 0.12 | 0.12 | 0.12 | 0.11 | 0.15 |  | 0.17 | 0.26 |  | 0.11 | 0.11 | 0.11 | 0.09 | 0.11 | 0.11 | 0.10 |
| LIO |  | 2.41 | 4.31 | 2.24 | 2.29 | 2.16 | 2.36 | 1.65 | 1.93 | 3.05 | 4.19 | 2.29 |  | 2.51 | 2.66 |  | 3.53 | 2.79 | 2.29 | 3.91 | 1.86 | 2.12 | 2.16 |
| Tatol |  | 99.58 | 99.56 | 99.58 | 99.55 | 99.64 | 99.64 | 99.62 | 99.60 | 99.59 | 99.54 | 99.59 |  | 99.49 | 99.58 |  | 100.65 | 100.70 | 99.96 | 100.57 | 100.46 | 100.25 | 100.39 |
| Mg# |  | 58.56 | 53.77 | 51.74 | 54.54 | 43.28 | 46.54 | 48.30 | 63.77 | 56.23 | 68.61 | 56.12 |  | 53.99 | 56.08 |  | 43.79 | 46.53 | 46.88 | 24.80 | 46.32 | 48.22 | 39.06 |
| Trace elements (ppm) | | | | | | | | | | | | | | | | | | | | | | | |
| V |  | 83.60 | 63.60 | 75.70 | 52.80 | 71.90 | 46.60 | 54.50 | 46.30 | 101.00 | 121.00 | 71.30 |  | 107.00 | 142.00 |  | 101.08 | 68.50 | 68.04 | 35.44 | 76.31 | 58.02 | 52.44 |
| Cr |  | 126.00 | 63.60 | 79.60 | 40.30 | 34.70 | 29.40 | 400.00 | 395.00 | 81.30 | 189.00 | 221.00 |  | 27.80 | 117.00 |  | 23.11 | 25.82 | 21.86 | 8.83 | 19.71 | 45.59 | 21.57 |
| Co |  | 8.20 | 10.30 | 11.90 | 5.70 | 23.50 | 6.45 | 6.94 | 7.45 | 11.70 | 16.00 | 10.60 |  | 11.90 | 20.40 |  | 11.93 | 9.68 | 8.31 | 3.01 | 10.21 | 8.88 | 7.54 |
| Ni |  | 5.47 | 39.00 | 52.30 | 23.90 | 20.60 | 18.90 | 10.20 | 29.10 | 32.70 | 50.30 | 8.93 |  | 11.20 | 42.40 |  | 21.47 | 11.92 | 21.32 | 10.22 | 10.87 | 20.69 | 8.72 |
| Ba |  | 503.00 | 496.00 | 315.00 | 131.00 | 281.00 | 225.00 | 679.00 | 1185.00 | 642.00 | 390.00 | 380.00 |  | 91.20 | 673.00 |  | 376.33 | 495.28 | 99.55 | 415.63 | 682.77 | 571.32 | 391.29 |
| Rb |  | 10.50 | 24.90 | 19.60 | 6.80 | 10.10 | 11.60 | 12.40 | 17.60 | 27.90 | 8.31 | 7.14 |  | 2.64 | 41.10 |  | 13.88 | 17.92 | 9.12 | 9.96 | 20.78 | 10.98 | 16.45 |
| Sr |  | 302.00 | 211.00 | 206.00 | 150.00 | 111.00 | 182.00 | 227.00 | 228.00 | 120.00 | 222.00 | 296.00 |  | 228.00 | 392.00 |  | 155.84 | 227.48 | 172.97 | 145.11 | 196.99 | 207.15 | 181.41 |
| Y |  | 23.30 | 23.90 | 19.70 | 20.50 | 16.80 | 20.80 | 18.10 | 21.80 | 25.40 | 16.40 | 21.50 |  | 27.40 | 24.30 |  | 19.04 | 22.67 | 20.52 | 21.91 | 18.21 | 20.91 | 21.56 |
| Nb |  | 3.51 | 4.27 | 4.41 | 3.07 | 3.15 | 3.84 | 3.79 | 3.99 | 4.07 | 3.63 | 3.59 |  | 4.04 | 4.74 |  | 3.47 | 4.27 | 4.30 | 3.60 | 3.59 | 4.48 | 4.18 |
| Ta |  | 0.19 | 0.24 | 0.27 | 0.15 | 0.17 | 0.20 | 0.18 | 0.21 | 0.20 | 0.19 | 0.19 |  | 0.19 | 0.29 |  | 0.29 | 0.27 | 0.31 | 0.22 | 0.26 | 0.51 | 0.26 |
| La |  | 14.70 | 14.50 | 12.80 | 11.50 | 9.78 | 10.70 | 14.30 | 11.60 | 9.76 | 8.05 | 18.50 |  | 12.40 | 18.50 |  | 12.55 | 20.50 | 7.82 | 13.60 | 16.54 | 10.99 | 15.49 |
| Ce |  | 29.90 | 28.70 | 27.20 | 22.20 | 20.20 | 20.30 | 29.40 | 22.60 | 19.20 | 17.50 | 34.30 |  | 25.90 | 38.70 |  | 28.46 | 33.47 | 21.06 | 27.52 | 34.35 | 25.02 | 31.78 |
| Pr |  | 3.64 | 3.76 | 3.46 | 2.87 | 2.61 | 2.68 | 3.77 | 3.10 | 2.54 | 2.20 | 4.54 |  | 3.61 | 5.29 |  | 3.46 | 4.10 | 2.72 | 3.43 | 4.47 | 2.81 | 3.57 |
| Nd |  | 14.80 | 15.20 | 14.10 | 11.80 | 10.60 | 11.30 | 15.40 | 13.40 | 10.60 | 9.29 | 18.20 |  | 15.50 | 22.00 |  | 13.61 | 18.02 | 11.63 | 15.25 | 16.01 | 12.89 | 15.81 |
| Sm |  | 3.43 | 3.63 | 3.20 | 2.66 | 2.40 | 2.54 | 3.53 | 3.23 | 2.81 | 2.32 | 3.82 |  | 3.86 | 4.82 |  | 2.70 | 3.70 | 2.94 | 3.15 | 3.40 | 3.20 | 3.05 |
| Eu |  | 0.95 | 1.04 | 0.79 | 0.87 | 0.65 | 0.62 | 0.84 | 0.90 | 0.84 | 0.73 | 1.09 |  | 0.77 | 1.44 |  | 0.78 | 1.26 | 0.68 | 0.90 | 0.90 | 0.76 | 0.78 |
| Gd |  | 3.82 | 4.12 | 3.47 | 3.48 | 2.80 | 2.92 | 3.54 | 3.76 | 3.59 | 2.68 | 4.01 |  | 4.13 | 5.05 |  | 3.09 | 4.40 | 3.07 | 3.48 | 3.15 | 3.26 | 3.30 |
| Tb |  | 0.59 | 0.65 | 0.52 | 0.57 | 0.46 | 0.48 | 0.54 | 0.53 | 0.56 | 0.44 | 0.60 |  | 0.67 | 0.75 |  | 0.43 | 0.55 | 0.45 | 0.44 | 0.45 | 0.45 | 0.44 |
| Dy |  | 3.65 | 3.85 | 3.25 | 3.35 | 2.85 | 3.04 | 2.85 | 3.39 | 3.74 | 2.71 | 3.60 |  | 4.23 | 4.42 |  | 3.25 | 3.83 | 3.56 | 3.28 | 3.43 | 3.02 | 3.22 |
| Ho |  | 0.75 | 0.83 | 0.71 | 0.73 | 0.63 | 0.70 | 0.65 | 0.74 | 0.81 | 0.61 | 0.78 |  | 0.94 | 0.89 |  | 0.62 | 0.69 | 0.67 | 0.65 | 0.65 | 0.66 | 0.67 |
| Er |  | 2.49 | 2.69 | 2.38 | 2.28 | 2.04 | 2.40 | 2.11 | 2.63 | 2.79 | 1.87 | 2.38 |  | 3.13 | 2.74 |  | 1.95 | 2.28 | 2.35 | 2.00 | 2.31 | 2.08 | 2.02 |
| Tm |  | 0.36 | 0.41 | 0.36 | 0.30 | 0.30 | 0.36 | 0.32 | 0.39 | 0.41 | 0.28 | 0.34 |  | 0.46 | 0.38 |  | 0.29 | 0.35 | 0.36 | 0.30 | 0.35 | 0.34 | 0.33 |
| Yb |  | 2.46 | 2.47 | 2.38 | 2.09 | 2.10 | 2.37 | 2.30 | 2.69 | 2.69 | 2.03 | 2.35 |  | 3.40 | 2.56 |  | 2.07 | 2.60 | 2.45 | 2.10 | 2.24 | 2.14 | 2.16 |
| Lu |  | 0.39 | 0.43 | 0.36 | 0.33 | 0.34 | 0.39 | 0.36 | 0.43 | 0.43 | 0.31 | 0.36 |  | 0.54 | 0.39 |  | 0.36 | 0.36 | 0.41 | 0.32 | 0.38 | 0.37 | 0.37 |
| Pb |  | 1.70 | 7.20 | 4.88 | 2.82 | 3.87 | 2.66 | 4.89 | 2.24 | 4.51 | 3.70 | 2.21 |  | 2.98 | 7.07 |  | 8.36 | 66.32 | 11.80 | 7.14 | 9.00 | 6.86 | 7.64 |
| Th |  | 2.69 | 2.89 | 2.88 | 1.95 | 2.38 | 3.00 | 2.96 | 3.20 | 2.69 | 1.86 | 2.84 |  | 2.89 | 2.89 |  | 2.90 | 3.11 | 3.94 | 2.74 | 2.95 | 3.98 | 3.62 |
| U |  | 1.52 | 1.45 | 1.31 | 0.95 | 1.22 | 1.27 | 1.24 | 1.48 | 1.23 | 1.51 | 1.37 |  | 1.43 | 1.17 |  | 1.57 | 1.55 | 1.39 | 1.82 | 1.77 | 1.45 | 1.50 |
| Zr |  | 270.00 | 275.00 | 260.00 | 182.00 | 226.00 | 290.00 | 281.00 | 328.00 | 267.00 | 278.00 | 263.00 |  | 319.00 | 383.00 |  | 94.75 | 108.78 | 113.12 | 101.87 | 104.43 | 124.10 | 113.53 |
| Hf |  | 6.70 | 6.85 | 6.44 | 4.50 | 5.59 | 6.99 | 7.03 | 7.98 | 6.94 | 6.79 | 6.52 |  | 8.52 | 8.59 |  | 2.53 | 2.83 | 3.16 | 2.57 | 3.00 | 3.44 | 3.02 |
| Nb/La |  | 0.24 | 0.29 | 0.34 | 0.27 | 0.32 | 0.36 | 0.27 | 0.34 | 0.42 | 0.45 | 0.19 |  | 0.33 | 0.26 |  | 0.28 | 0.21 | 0.55 | 0.26 | 0.22 | 0.41 | 0.27 |
| Zr/Nb |  | 76.92 | 64.40 | 58.96 | 59.28 | 71.75 | 75.52 | 74.14 | 82.21 | 65.60 | 76.58 | 73.26 |  | 78.96 | 80.80 |  | 27.31 | 25.48 | 26.31 | 28.30 | 29.09 | 27.70 | 27.16 |
| Ba/La |  | 34.22 | 34.21 | 24.61 | 11.39 | 28.73 | 21.03 | 47.48 | 102.16 | 65.78 | 48.45 | 20.54 |  | 7.35 | 36.38 |  | 29.99 | 24.16 | 12.73 | 30.56 | 41.28 | 51.99 | 25.26 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Location | |  | Dacitic ignimbrite at Hongshi and Meiling | | |  | Rhyolite at Hongshan and Meiling | | | | | |
| Sample number | |  | 08KL09-7 | 8KL11-3 | 8KL07 |  | 8KL09-8 | 10ZB48-1 | 10ZB47 | 10ZB48 | 10ZB67-2 | 10ZB67-4 |
| Major oxides (wt%) | | | | | | | | | | | | |
| SiO2 | |  | 67.59 | 70.23 | 71.85 |  | 74.12 | 76.11 | 76.38 | 77.37 | 82.27 | 80.78 |
| TiO2 | |  | 0.46 | 0.34 | 0.44 |  | 0.27 | 0.28 | 0.27 | 0.27 | 0.28 | 0.28 |
| Al2O3 | |  | 14.00 | 12.60 | 11.93 |  | 11.67 | 10.67 | 6.76 | 5.27 | 7.87 | 6.46 |
| Fe2O3T | |  | 3.25 | 3.55 | 4.89 |  | 2.55 | 3.04 | 5.06 | 4.49 | 2.25 | 3.59 |
| MnO | |  | 0.06 | 0.04 | 0.09 |  | 0.07 | 0.01 | 0.01 | 0.03 | 0.02 | 0.02 |
| MgO | |  | 0.48 | 1.38 | 1.66 |  | 0.54 | 0.49 | 0.41 | 0.53 | 0.45 | 0.36 |
| CaO | |  | 1.60 | 4.42 | 1.90 |  | 0.83 | 0.14 | 0.18 | 0.28 | 0.17 | 0.15 |
| Na2O | |  | 6.52 | 4.46 | 4.62 |  | 4.34 | 0.52 | 0.38 | 1.56 | 0.82 | 0.70 |
| K2O | |  | 3.31 | 0.41 | 0.56 |  | 3.82 | 2.85 | 2.26 | 1.44 | 2.44 | 2.33 |
| P2O5 | |  | 0.12 | 0.11 | 0.11 |  | 0.06 | 0.04 | 0.04 | 0.07 | 0.03 | 0.02 |
| LIO | |  | 2.25 | 2.10 | 1.55 |  | 1.39 | 5.32 | 7.76 | 8.15 | 2.81 | 5.05 |
| Tatol | |  | 99.64 | 99.64 | 99.60 |  | 99.66 | 99.48 | 99.52 | 99.47 | 99.41 | 99.74 |
| Mg# | |  | 25.61 | 47.53 | 44.17 |  | 33.04 | 27.31 | 15.88 | 21.57 | 31.79 | 18.94 |
| Trace elements (ppm) | | | | | | | | | | | | |
| V | |  | 39.10 | 72.20 | 41.50 |  | 24.30 | 16.90 | 16.00 | 17.20 | 16.60 | 14.20 |
| Cr | |  | 61.30 | 354.00 | 266.00 |  | 395.00 | 4.54 | 1.29 | 2.08 | 7.22 | 3.13 |
| Co | |  | 4.17 | 7.23 | 4.87 |  | 2.89 | 1.20 | 2.17 | 1.54 | 0.50 | 0.42 |
| Ni | |  | 37.20 | 8.78 | 1.39 |  | 1.82 | 1.04 | 1.74 | 1.09 | 1.20 | 1.00 |
| Ba | |  | 1022.00 | 155.00 | 187.00 |  | 304.00 | 360.00 | 380.00 | 393.00 | 371.00 | 347.00 |
| Rb | |  | 33.00 | 3.37 | 7.56 |  | 59.50 | 38.80 | 25.90 | 15.20 | 36.40 | 31.30 |
| Sr | |  | 225.00 | 329.00 | 131.00 |  | 116.00 | 4.95 | 11.60 | 18.80 | 33.40 | 33.60 |
| Y | |  | 31.40 | 24.10 | 31.30 |  | 48.20 | 22.00 | 22.50 | 16.50 | 16.00 | 23.00 |
| Nb | |  | 9.87 | 3.33 | 3.54 |  | 11.50 | 1.79 | 1.31 | 1.72 | 1.91 | 1.96 |
| Ta | |  | 0.64 | 0.18 | 0.19 |  | 0.78 | 0.09 | 0.08 | 0.08 | 0.10 | 0.11 |
| La | |  | 25.70 | 16.50 | 15.60 |  | 36.80 | 8.42 | 5.71 | 6.25 | 7.40 | 9.27 |
| Ce | |  | 57.90 | 33.00 | 31.10 |  | 71.80 | 18.50 | 12.50 | 14.40 | 17.10 | 21.40 |
| Pr | |  | 7.92 | 4.31 | 4.25 |  | 9.41 | 2.65 | 1.84 | 2.05 | 2.29 | 2.93 |
| Nd | |  | 30.60 | 17.70 | 18.80 |  | 35.10 | 11.80 | 9.37 | 9.80 | 10.40 | 13.30 |
| Sm | |  | 6.43 | 3.91 | 4.47 |  | 7.30 | 2.97 | 2.56 | 2.23 | 2.23 | 3.12 |
| Eu | |  | 1.70 | 0.98 | 1.16 |  | 0.80 | 0.47 | 0.40 | 0.37 | 0.22 | 0.47 |
| Gd | |  | 6.80 | 4.45 | 5.05 |  | 7.44 | 3.02 | 2.44 | 2.08 | 1.94 | 2.85 |
| Tb | |  | 0.98 | 0.70 | 0.84 |  | 1.25 | 0.61 | 0.55 | 0.45 | 0.38 | 0.59 |
| Dy | |  | 5.40 | 4.12 | 5.31 |  | 7.33 | 3.81 | 3.44 | 2.85 | 2.57 | 3.63 |
| Ho | |  | 1.14 | 0.89 | 1.13 |  | 1.61 | 0.85 | 0.77 | 0.62 | 0.58 | 0.79 |
| Er | |  | 3.55 | 2.88 | 3.72 |  | 5.25 | 2.64 | 2.40 | 2.05 | 1.95 | 2.43 |
| Tm | |  | 0.49 | 0.43 | 0.55 |  | 0.85 | 0.47 | 0.42 | 0.37 | 0.35 | 0.45 |
| Yb | |  | 3.38 | 2.99 | 3.76 |  | 5.94 | 3.07 | 2.77 | 2.57 | 2.59 | 2.88 |
| Lu | |  | 0.54 | 0.49 | 0.62 |  | 0.92 | 0.50 | 0.46 | 0.41 | 0.44 | 0.50 |
| Pb | |  | 11.20 | 1.95 | 2.06 |  | 10.80 | 6.01 | 5.65 | 6.28 | 3.35 | 3.59 |
| Th | |  | 4.65 | 2.72 | 2.26 |  | 6.07 | 0.97 | 0.79 | 0.89 | 1.09 | 1.11 |
| U | |  | 2.29 | 1.45 | 1.20 |  | 1.97 | 0.46 | 0.24 | 0.41 | 0.55 | 0.56 |
| Zr | |  | 579.00 | 226.00 | 269.00 |  | 739.00 | 105.00 | 88.20 | 102.00 | 107.00 | 108.00 |
| Hf | |  | 13.40 | 6.26 | 7.61 |  | 17.80 | 2.90 | 2.51 | 2.80 | 3.03 | 2.97 |
| Nb/La | |  | 0.38 | 0.20 | 0.23 |  | 0.31 | 0.21 | 0.23 | 0.28 | 0.26 | 0.21 |
| Zr/Nb | |  | 58.66 | 67.87 | 75.99 |  | 64.26 | 58.66 | 67.33 | 59.30 | 56.02 | 55.10 |
| Ba/La | |  | 39.77 | 9.39 | 11.99 |  | 8.26 | 42.76 | 66.55 | 62.88 | 50.14 | 37.43 |
| Note: \* The data after Tang et al. (2006)  Mg# = (MgO/40.31)/(MgO/40.31+Fe2O3T\*0.8998/71.85\*(1-0.15))\*100 | | | | | | | | | | | | |
|  | | | | | | | | | | | |

# Table S5. major (wt%), trace element (ppm) data of Paleozioc intrusive rocks from the core of the Kalatage inlier of the Dananhu-Haerlik arc, NW China.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Intrusion type |  | 445Ma granodiorite | | | |  | 439Ma diorite | | | |  | Kalatage pluton（426-429Ma） | | | | | | | | | | | | | |
| Sample number |  | 08KL03-5 | 08KL03-5-1 | 08KL03-5-2 | 08KL03-6 |  | 08KL08-2 | 08KL08-2-1 | 08KL08-2#2 | 08KL08-2-3 |  | 10KL04-1 | 10KL04-2 | 10KL04-4 | 10KL04-5 | 10KL05-2 | 10KL05-3 | 10KL05-4 | 10KL07-1 | 10KL07-3 | 10KL07-4 | 10KL07-5 | 10KL06-2 | 10KL06-3 | 10KL06-4 |
| Major oxides (wt%) | | | | | | | | | | | | | | | | | | | | | | | | | |
| SiO2 |  | 71.23 | 73.6 | 73.02 | 71.27 |  | 60.29 | 60.76 | 60.72 | 60.51 |  | 74.87 | 76.27 | 75.63 | 77.08 | 79.25 | 76.35 | 78.28 | 73.19 | 75.75 | 72.95 | 71.52 | 58.96 | 58.53 | 60.36 |
| TiO2 |  | 0.41 | 0.4 | 0.43 | 0.41 |  | 0.62 | 0.63 | 0.62 | 0.62 |  | 0.32 | 0.3 | 0.38 | 0.26 | 0.27 | 0.3 | 0.32 | 0.33 | 0.34 | 0.35 | 0.4 | 0.66 | 0.66 | 0.61 |
| Al2O3 |  | 11.41 | 11.33 | 11.69 | 11.89 |  | 13.68 | 13.58 | 13.72 | 13.76 |  | 10.86 | 10.78 | 11.28 | 11.1 | 9.65 | 10.1 | 10.05 | 11.66 | 10.76 | 11.61 | 12.12 | 13.62 | 13.8 | 14.29 |
| Fe2O3T |  | 5.15 | 5.05 | 5.13 | 5.66 |  | 8.15 | 8.25 | 7.96 | 8.05 |  | 2.89 | 2.7 | 3.27 | 2.49 | 2.88 | 3.84 | 3.13 | 3.8 | 3.28 | 4.8 | 5.36 | 9.73 | 9.76 | 8.54 |
| MnO |  | 0.11 | 0.098 | 0.095 | 0.088 |  | 0.12 | 0.13 | 0.12 | 0.12 |  | 0.027 | 0.031 | 0.038 | 0.026 | 0.058 | 0.098 | 0.061 | 0.072 | 0.065 | 0.065 | 0.096 | 0.15 | 0.15 | 0.15 |
| MgO |  | 1.4 | 1.18 | 1.18 | 1.43 |  | 4 | 3.61 | 3.48 | 3.54 |  | 0.65 | 0.69 | 0.75 | 0.57 | 0.34 | 0.58 | 0.29 | 1.67 | 1.09 | 1.53 | 1.6 | 3.44 | 3.55 | 3.24 |
| CaO |  | 4.91 | 3.53 | 3.52 | 2.24 |  | 5.72 | 5.87 | 6.07 | 5.81 |  | 1.37 | 2.02 | 2.04 | 1.41 | 1.66 | 2.85 | 1.39 | 2.76 | 2.55 | 2.51 | 2.21 | 7.82 | 7.73 | 7.2 |
| Na2O |  | 3.07 | 2.81 | 2.97 | 4.43 |  | 3.04 | 3.17 | 3.14 | 3.06 |  | 3.91 | 4.34 | 3.96 | 4.2 | 4.64 | 4.21 | 4.95 | 4.57 | 4.83 | 4.01 | 4.88 | 2.78 | 2.9 | 2.77 |
| K2O |  | 0.33 | 0.46 | 0.53 | 0.76 |  | 1.66 | 1.56 | 1.52 | 1.83 |  | 2.15 | 1.4 | 1.73 | 2.17 | 0.65 | 0.43 | 0.65 | 0.24 | 0.25 | 0.48 | 0.25 | 1.13 | 1.21 | 1.05 |
| P2O5 |  | 0.14 | 0.13 | 0.14 | 0.12 |  | 0.18 | 0.19 | 0.18 | 0.17 |  | 0.056 | 0.061 | 0.081 | 0.051 | 0.038 | 0.064 | 0.041 | 0.097 | 0.059 | 0.094 | 0.11 | 0.21 | 0.23 | 0.2 |
| LIO |  | 1.45 | 1.05 | 0.93 | 1.32 |  | 2.16 | 1.87 | 2.1 | 2.12 |  | 2.42 | 1.1 | 0.6 | 0.49 | 0.26 | 0.74 | 0.51 | 1.27 | 0.71 | 1.12 | 1.02 | 1.3 | 1.3 | 1 |
| Total |  | 99.61 | 99.64 | 99.64 | 99.62 |  | 99.62 | 99.62 | 99.63 | 99.59 |  | 99.52 | 99.69 | 99.76 | 99.85 | 99.7 | 99.56 | 99.67 | 99.66 | 99.68 | 99.52 | 99.57 | 99.8 | 99.82 | 99.41 |
| Mg# |  | 38.8 | 35.3 | 34.9 | 37.1 |  | 53.4 | 50.5 | 50.5 | 50.6 |  | 34.4 | 37.3 | 34.8 | 34.8 | 21.6 | 26.0 | 17.8 | 50.6 | 43.6 | 42.6 | 41.0 | 45.2 | 45.9 | 46.9 |
| Trace elements (ppm) | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sc |  | 19.6 | 20.4 | 19.7 | 18.9 |  | 30.2 | 30.3 | 31.8 | 32.1 |  | 9.52 | 11 | 10.9 | 9.51 | 8.58 | 11.4 | 9.25 | 15.9 | 16.4 | 16.8 | 19.3 | 35.8 | 33.1 | 32.3 |
| V |  | 56.7 | 55.4 | 53.8 | 55.1 |  | 210 | 198 | 218 | 210 |  | 25.4 | 27 | 33.9 | 21.8 | 15.7 | 29 | 9.94 | 48.4 | 39.2 | 51.7 | 60.1 | 244 | 248 | 231 |
| Cr |  | 28.3 | 26.9 | 25.9 | 25.4 |  | 80.6 | 84.7 | 88.6 | 86 |  | 5.24 | 2.89 | 15.3 | 5.8 | 5.41 | 4.36 | 3.17 | 8.21 | 8.61 | 6.98 | 8.31 | 83 | 81.7 | 78.3 |
| Co |  | 9.16 | 9.21 | 8.88 | 3.74 |  | 23.5 | 22.4 | 23.2 | 24.1 |  | 5.72 | 2.53 | 6.85 | 3.85 | 2.63 | 4.47 | 2.91 | 5.56 | 4.81 | 6.6 | 8.4 | 26.8 | 25.8 | 25.6 |
| Ni |  | 15.4 | 14.7 | 14.2 | 14.9 |  | 26.7 | 33.1 | 34.6 | 31.7 |  | 1.34 | 1.76 | 1.96 | 1.48 | 1.49 | 1.82 | 1.56 | 1.79 | 1.62 | 1.65 | 1.92 | 25.6 | 25.2 | 23.4 |
| Cu |  | 20.3 | 133 | 133 | 783 |  | 137 | 159 | 128 | 122 |  | 38.5 | 8.25 | 174 | 96.1 | 81.1 | 4.94 | 5.3 | 4.43 | 41.9 | 4.45 | 4.55 | 106 | 109 | 102 |
| Zn |  | 45.3 | 40.2 | 73.5 | 1516 |  | 76.3 | 140 | 83.9 | 77.2 |  | 15.8 | 11.5 | 14.3 | 13.3 | 18.3 | 18.6 | 15.4 | 17.3 | 18.4 | 14.1 | 19.4 | 82.5 | 86.1 | 81 |
| Ga |  | 13.2 | 13.6 | 12.7 | 13.2 |  | 14.9 | 15 | 15.7 | 15.8 |  | 12 | 11.6 | 11.7 | 11.3 | 10.8 | 12.6 | 10.9 | 11.5 | 12.2 | 12.2 | 11.6 | 16 | 15.2 | 15.5 |
| Cs |  | 0.077 | 0.062 | 0.062 | 0.048 |  | 0.192 | 0.211 | 0.197 | 0.215 |  | 0.151 | 0.106 | 0.132 | 0.136 | 0.098 | 0.101 | 0.105 | 0.046 | 0.073 | 0.156 | 0.043 | 0.329 | 0.34 | 0.381 |
| Ba |  | 205 | 223 | 258 | 388 |  | 520 | 536 | 560 | 628 |  | 509 | 382 | 417 | 500 | 348 | 99.8 | 373 | 82.4 | 72.1 | 182 | 62.1 | 405 | 411 | 428 |
| Rb |  | 2.9 | 4.19 | 4.73 | 10.1 |  | 26.9 | 26.3 | 24.3 | 35.8 |  | 30 | 18.6 | 22.5 | 23.4 | 4.75 | 4.04 | 4.52 | 1.99 | 2.16 | 4.79 | 2.62 | 18.1 | 19 | 14.5 |
| Sr |  | 308 | 295 | 292 | 126 |  | 353 | 363 | 375 | 387 |  | 141 | 158 | 180 | 129 | 155 | 202 | 146 | 167 | 149 | 195 | 129 | 373 | 381 | 355 |
| Y |  | 36.7 | 37 | 33.1 | 30.2 |  | 21.8 | 23.7 | 24.2 | 24 |  | 31.2 | 33.6 | 26.3 | 33.2 | 26.5 | 24.6 | 27.4 | 26 | 30.6 | 26.7 | 27.7 | 20.7 | 20.2 | 21.6 |
| Nb |  | 4.15 | 4.19 | 3.83 | 3.5 |  | 2.64 | 2.9 | 3.05 | 2.91 |  | 6.87 | 7.34 | 6.99 | 7.62 | 4.23 | 4.14 | 5.28 | 3.02 | 3.22 | 2.55 | 2.82 | 2.61 | 2.26 | 2.69 |
| Ta |  | 0.226 | 0.229 | 0.221 | 0.176 |  | 0.126 | 0.134 | 0.143 | 0.137 |  | 0.469 | 0.463 | 0.447 | 0.46 | 0.299 | 0.289 | 0.325 | 0.161 | 0.203 | 0.142 | 0.157 | 0.13 | 0.109 | 0.125 |
| La |  | 14.9 | 15.1 | 13.9 | 15 |  | 17.4 | 19.3 | 18.5 | 18.3 |  | 21 | 10.8 | 10.1 | 7.47 | 16.4 | 11.7 | 15.3 | 6.7 | 13.9 | 6.55 | 4.95 | 12.7 | 13.4 | 14.9 |
| Ce |  | 30.3 | 30.4 | 28.6 | 30 |  | 33.3 | 35.8 | 35.8 | 35 |  | 41.5 | 25.6 | 20.9 | 17.5 | 32.3 | 23.1 | 31.4 | 14.5 | 30.6 | 14.1 | 12.8 | 25.9 | 26.9 | 30.1 |
| Pr |  | 4.27 | 4.37 | 4.08 | 4.21 |  | 4.42 | 4.68 | 4.83 | 4.58 |  | 5.18 | 3.67 | 2.78 | 2.5 | 4.11 | 3.03 | 4.05 | 2.27 | 3.69 | 1.9 | 2.13 | 3.43 | 3.49 | 3.9 |
| Nd |  | 19.6 | 19.4 | 18.3 | 18.2 |  | 18.4 | 20 | 19.6 | 19 |  | 20.4 | 16.3 | 12.7 | 12.3 | 17.6 | 13.7 | 18.5 | 11.4 | 15.9 | 9.01 | 11.3 | 14.5 | 14.9 | 16.8 |
| Sm |  | 4.97 | 4.91 | 4.48 | 4.53 |  | 4.12 | 4.41 | 4.17 | 4.32 |  | 4.41 | 3.99 | 3.19 | 3.56 | 4.06 | 3.32 | 4.19 | 3.02 | 3.51 | 2.66 | 3.41 | 3.35 | 3.43 | 3.68 |
| Eu |  | 1.2 | 1.18 | 1.16 | 1.2 |  | 1.18 | 1.21 | 1.18 | 1.27 |  | 0.837 | 0.895 | 0.897 | 0.818 | 0.992 | 1.04 | 1.01 | 0.78 | 0.844 | 0.796 | 0.814 | 1.06 | 1.14 | 1.01 |
| Gd |  | 5.34 | 5.62 | 5.12 | 4.74 |  | 4.31 | 4.62 | 4.72 | 4.56 |  | 4.36 | 4.12 | 3.28 | 3.84 | 3.77 | 3.15 | 4.06 | 3.32 | 3.54 | 3 | 3.51 | 3.27 | 3.31 | 3.5 |
| Tb |  | 0.919 | 0.932 | 0.865 | 0.799 |  | 0.611 | 0.7 | 0.713 | 0.691 |  | 0.836 | 0.863 | 0.677 | 0.826 | 0.742 | 0.62 | 0.768 | 0.694 | 0.714 | 0.648 | 0.733 | 0.598 | 0.629 | 0.636 |
| Dy |  | 5.64 | 5.93 | 5.68 | 4.89 |  | 3.53 | 4.07 | 4.14 | 4.09 |  | 5.2 | 5.55 | 4.18 | 5.31 | 4.55 | 4.04 | 4.96 | 4.03 | 4.65 | 4.12 | 4.6 | 3.66 | 3.45 | 3.81 |
| Ho |  | 1.28 | 1.34 | 1.25 | 1.07 |  | 0.794 | 0.851 | 0.884 | 0.853 |  | 1.1 | 1.17 | 0.872 | 1.17 | 0.972 | 0.86 | 1.01 | 0.906 | 1.06 | 0.948 | 0.993 | 0.737 | 0.715 | 0.786 |
| Er |  | 4.08 | 4.34 | 4.02 | 3.53 |  | 2.53 | 2.71 | 2.82 | 2.62 |  | 3.55 | 3.75 | 2.79 | 3.69 | 3.01 | 2.81 | 3.07 | 2.79 | 3.26 | 2.97 | 3.13 | 2.17 | 2.22 | 2.39 |
| Tm |  | 0.608 | 0.601 | 0.577 | 0.519 |  | 0.352 | 0.383 | 0.396 | 0.401 |  | 0.613 | 0.675 | 0.501 | 0.628 | 0.503 | 0.481 | 0.508 | 0.486 | 0.608 | 0.521 | 0.512 | 0.372 | 0.38 | 0.413 |
| Yb |  | 4.12 | 4.31 | 3.91 | 3.7 |  | 2.46 | 2.62 | 2.73 | 2.54 |  | 3.91 | 4.42 | 3.33 | 4.24 | 3.39 | 3.45 | 3.6 | 3.21 | 4.18 | 3.56 | 3.41 | 2.46 | 2.39 | 2.54 |
| Lu |  | 0.647 | 0.665 | 0.626 | 0.574 |  | 0.383 | 0.402 | 0.412 | 0.407 |  | 0.652 | 0.732 | 0.54 | 0.709 | 0.586 | 0.559 | 0.576 | 0.515 | 0.725 | 0.593 | 0.581 | 0.405 | 0.359 | 0.398 |
| Pb |  | 2.41 | 3.54 | 3.01 | 8.88 |  | 5.95 | 6.03 | 7.31 | 5.84 |  | 1.82 | 1.96 | 2.88 | 1.89 | 3.61 | 2.49 | 1.82 | 3 | 2.63 | 1.54 | 1.95 | 4.96 | 5.34 | 5.42 |
| Th |  | 2.17 | 2.34 | 2.06 | 2.24 |  | 2.61 | 3.21 | 2.87 | 2.86 |  | 2.82 | 2.14 | 6.09 | 1.79 | 2.39 | 1.37 | 1.91 | 1.24 | 1.8 | 1.27 | 1.25 | 1.86 | 1.52 | 2.44 |
| U |  | 1.29 | 1.41 | 1.19 | 1.34 |  | 1.31 | 1.37 | 1.37 | 1.49 |  | 1.24 | 1.17 | 1.45 | 1.18 | 1.36 | 1.23 | 1.11 | 0.548 | 1.17 | 0.798 | 0.495 | 0.835 | 0.785 | 0.891 |
| Zr |  | 175 | 219 | 215 | 262 |  | 142 | 130 | 145 | 153 |  | 146 | 141 | 119 | 126 | 204 | 212 | 137 | 106 | 154 | 118 | 110 | 74.4 | 38.8 | 58.7 |
| Hf |  | 5.49 | 6.65 | 6.41 | 6.82 |  | 4.02 | 3.76 | 4.27 | 4.76 |  | 4.76 | 4.51 | 3.61 | 3.72 | 5.92 | 6.37 | 4.23 | 3.06 | 4.67 | 3.48 | 3.29 | 2.15 | 1.33 | 1.96 |
| Nb/La |  | 0.28 | 0.28 | 0.28 | 0.23 |  | 0.15 | 0.15 | 0.16 | 0.16 |  | 0.33 | 0.68 | 0.69 | 1.02 | 0.26 | 0.35 | 0.35 | 0.45 | 0.23 | 0.39 | 0.57 | 0.21 | 0.17 | 0.18 |
| Zr/Nb |  | 42.17 | 52.27 | 56.14 | 74.86 |  | 53.79 | 44.83 | 47.54 | 52.58 |  | 21.25 | 19.21 | 17.02 | 16.54 | 48.23 | 51.21 | 25.95 | 35.1 | 47.83 | 46.27 | 39.01 | 28.51 | 17.17 | 21.82 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Intrusion type |  | 334Ma diorite dike | |  | 323Ma porphyritic granite dikes | | | | | | |
| Sample number |  | 13KL02-2 | 13KL02-3 |  | 13KL05-1 | 13KL05-2 | 13KL05-3 | 13KL06-1 | 13KL06-2 | 13KL12-1 | 13KL12-2 |
| Major oxides (wt%) | | | | | | | | | | | |
| SiO2 |  | 61.74 | 61.19 |  | 75.55 | 69.23 | 73.81 | 75.87 | 74.35 | 76.78 | 73.34 |
| TiO2 |  | 0.57 | 0.57 |  | 0.09 | 0.09 | 0.1 | 0.09 | 0.09 | 0.07 | 0.09 |
| Al2O3 |  | 16.94 | 16.73 |  | 14.12 | 13.21 | 13.66 | 13.76 | 13.67 | 12.25 | 12.79 |
| Fe2O3T |  | 5.86 | 6.06 |  | 1.06 | 1.33 | 1.32 | 0.99 | 1.3 | 0.68 | 1 |
| MnO |  | 0.13 | 0.18 |  | 0.04 | 0.28 | 0.11 | 0.11 | 0.12 | 0.11 | 0.17 |
| MgO |  | 1.74 | 1.75 |  | 0.61 | 0.8 | 0.36 | 0.52 | 0.49 | 0.37 | 0.84 |
| CaO |  | 4.83 | 4.73 |  | 0.28 | 3.17 | 1.18 | 1.02 | 1.05 | 1.77 | 2.58 |
| Na2O |  | 4.87 | 4.79 |  | 3.44 | 3.53 | 4.46 | 3.08 | 4.13 | 3.71 | 2.86 |
| K2O |  | 0.97 | 0.67 |  | 2.31 | 2.01 | 1.77 | 2.3 | 1.87 | 1.8 | 2.38 |
| P2O5 |  | 0.28 | 0.27 |  | 0.09 | 0.07 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| LIO |  | 2.8 | 3.28 |  | 2.58 | 5.34 | 2.6 | 3.02 | 2.92 | 3.03 | 4.54 |
| Total |  | 100.73 | 100.22 |  | 100.17 | 99.06 | 99.45 | 100.84 | 100.07 | 100.65 | 100.67 |
| Mg# |  | 21.6 | 26.0 |  | 17.8 | 50.6 | 43.6 | 42.6 | 41.0 | 45.2 | 45.9 |
| Trace elements (ppm) | | | | | | | | | | | |
| Sc |  | 7.89 | 8.03 |  | 4 | 4.07 | 4.19 | 3.68 | 4.36 | 3.27 | 3.59 |
| V |  | 44.1 | 44.2 |  | 2.1 | 1.3 | 2.49 | 1.94 | 1.55 | 1.68 | 1.9 |
| Cr |  | 2.68 | 1.48 |  | 10.6 | 3.96 | 1.4 | 1.98 | 0.9 | 2.3 | 2.09 |
| Co |  | 3.05 | 3.09 |  | 0.635 | 0.413 | 0.397 | 0.484 | 0.363 | 0.217 | 0.431 |
| Ni |  | 2.25 | 2.13 |  | 8.26 | 4.43 | 1.02 | 1.25 | 0.683 | 1.44 | 1.71 |
| Cu |  | 6.24 | 71 |  | 1.61 | 2.82 | 1.38 | 1.07 | 1.18 | 0.901 | 1.04 |
| Zn |  | 57.6 | 58.5 |  | 73 | 48.2 | 49.5 | 30.3 | 29.3 | 22.6 | 30.3 |
| Ga |  | 14.9 | 15.6 |  | 16.1 | 15.1 | 13.6 | 14.8 | 15.1 | 12.8 | 14 |
| Cs |  | 0.059 | 0.087 |  | 0.641 | 0.532 | 0.299 | 0.487 | 0.342 | 0.262 | 0.417 |
| Ba |  | 236 | 220 |  | 132 | 437 | 298 | 129 | 316 | 117 | 389 |
| Rb |  | 10.7 | 8.53 |  | 46.4 | 27.4 | 26.4 | 36.5 | 26.6 | 35.1 | 34 |
| Sr |  | 691 | 658 |  | 44.6 | 163 | 94 | 59.5 | 94.4 | 36.9 | 72.1 |
| Y |  | 20.6 | 21.2 |  | 30.5 | 25.9 | 25.3 | 27.2 | 29.3 | 23.7 | 24.9 |
| Nb |  | 3.6 | 3.68 |  | 8.68 | 5.41 | 5.37 | 8.11 | 5.89 | 6.81 | 7.84 |
| Ta |  | 0.213 | 0.193 |  | 0.678 | 0.36 | 0.336 | 0.635 | 0.385 | 0.546 | 0.607 |
| La |  | 11.5 | 11.4 |  | 11.4 | 16.8 | 16 | 9.48 | 16.2 | 6.96 | 8.26 |
| Ce |  | 26.2 | 25.6 |  | 24.6 | 37.1 | 34.4 | 21.1 | 35.7 | 15.6 | 18.2 |
| Pr |  | 3.95 | 3.86 |  | 3.5 | 5.22 | 4.87 | 3 | 5.1 | 2.28 | 2.54 |
| Nd |  | 18.6 | 18.4 |  | 14 | 22.7 | 21 | 12.1 | 22.2 | 9.24 | 10.8 |
| Sm |  | 4.13 | 4.24 |  | 3.65 | 5 | 4.77 | 3.22 | 4.97 | 2.57 | 2.92 |
| Eu |  | 1.37 | 1.42 |  | 0.449 | 0.854 | 0.846 | 0.435 | 0.894 | 0.377 | 0.417 |
| Gd |  | 3.93 | 3.8 |  | 3.59 | 4.38 | 4.1 | 3.4 | 4.62 | 2.71 | 3.09 |
| Tb |  | 0.668 | 0.679 |  | 0.776 | 0.796 | 0.772 | 0.694 | 0.843 | 0.599 | 0.661 |
| Dy |  | 3.63 | 3.76 |  | 4.75 | 4.49 | 4.42 | 4.3 | 4.89 | 3.66 | 4 |
| Ho |  | 0.702 | 0.724 |  | 0.961 | 0.863 | 0.833 | 0.85 | 0.922 | 0.723 | 0.792 |
| Er |  | 2.01 | 2.11 |  | 2.96 | 2.48 | 2.48 | 2.59 | 2.68 | 2.28 | 2.57 |
| Tm |  | 0.332 | 0.341 |  | 0.495 | 0.431 | 0.404 | 0.455 | 0.439 | 0.401 | 0.428 |
| Yb |  | 2.1 | 2.18 |  | 3.46 | 2.77 | 2.73 | 3.25 | 2.86 | 2.86 | 3.17 |
| Lu |  | 0.334 | 0.363 |  | 0.586 | 0.425 | 0.398 | 0.521 | 0.454 | 0.456 | 0.496 |
| Pb |  | 1.98 | 1.93 |  | 4.8 | 5.34 | 6.77 | 5.73 | 3.24 | 2.91 | 6.2 |
| Th |  | 0.699 | 0.696 |  | 1.81 | 1.57 | 1.46 | 1.63 | 1.5 | 1.29 | 1.5 |
| U |  | 0.253 | 0.262 |  | 0.976 | 0.808 | 0.51 | 1.29 | 0.688 | 1.16 | 1.34 |
| Zr |  | 108 | 105 |  | 85.7 | 74.6 | 78.8 | 79.4 | 77.9 | 68.6 | 77.1 |
| Hf |  | 3.13 | 3.1 |  | 3.8 | 3.03 | 3.1 | 3.57 | 3.27 | 3.11 | 3.52 |
| Nb/La |  | 0.31 | 0.32 |  | 0.76 | 0.32 | 0.34 | 0.86 | 0.36 | 0.98 | 0.95 |
| Zr/Nb |  | 30 | 28.53 |  | 9.87 | 13.79 | 14.67 | 9.79 | 13.23 | 10.07 | 9.83 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Intrusion type |  | 323Ma porphyritic granite | | |  | Granite (intruded into dacite) | | |  | 314Ma porphyritic granite | |  | Granodiorite (intruded into rhyolite) | | |  | Diorite (intruded into rhyolite) | |
| Sample number |  | 13KL10-1 | 13KL10-2 | 13KL10-3 |  | 13KL03-1 | 13KL03-2 | 13KL03-3 |  | 10ZB44 | 10ZB45 |  | 08KL11-4 | 08KL11-4-1 | 08KL11-4-2 |  | 08KL10-4-1 | 08KL10-5-1 |
| Major oxides (wt%) | | | | | | | | | | | | | | | | | | |
| SiO2 |  | 74.05 | 73.2 | 74.51 |  | 77.33 | 77.43 | 78.23 |  | 74.44 | 72.6 |  | 69.83 | 69.79 | 70.35 |  | 59.52 | 59.77 |
| TiO2 |  | 0.09 | 0.08 | 0.08 |  | 0.28 | 0.29 | 0.27 |  | 0.088 | 0.087 |  | 0.36 | 0.36 | 0.35 |  | 0.54 | 0.56 |
| Al2O3 |  | 13.19 | 13.03 | 13.26 |  | 10.98 | 11.1 | 10.83 |  | 15.08 | 15.48 |  | 12.84 | 12.71 | 12.72 |  | 14.48 | 14.23 |
| Fe2O3T |  | 1.37 | 1.46 | 1.25 |  | 2.32 | 2.12 | 1.98 |  | 1.55 | 1.71 |  | 3.73 | 3.68 | 3.55 |  | 7.78 | 8.19 |
| MnO |  | 0.17 | 0.2 | 0.14 |  | 0.03 | 0.03 | 0.03 |  | 0.074 | 0.093 |  | 0.047 | 0.051 | 0.042 |  | 0.13 | 0.26 |
| MgO |  | 0.64 | 0.73 | 0.53 |  | 0.47 | 0.52 | 0.47 |  | 0.62 | 0.99 |  | 1.66 | 1.65 | 1.37 |  | 4.25 | 3.79 |
| CaO |  | 1.98 | 2.49 | 1.6 |  | 1.51 | 1.65 | 1.62 |  | 0.2 | 0.68 |  | 4.42 | 4.42 | 4.19 |  | 4.16 | 3.23 |
| Na2O |  | 2.88 | 2.67 | 3.36 |  | 4.9 | 5.13 | 5 |  | 2.19 | 2.54 |  | 0.33 | 0.38 | 0.36 |  | 1.75 | 0.87 |
| K2O |  | 1.53 | 1.54 | 1.42 |  | 0.46 | 0.37 | 0.33 |  | 2.87 | 2.32 |  | 4.58 | 4.41 | 4.51 |  | 4.11 | 5.07 |
| P2O5 |  | 0.07 | 0.08 | 0.07 |  | 0.04 | 0.04 | 0.03 |  | 0.07 | 0.11 |  | 0.11 | 0.11 | 0.11 |  | 0.17 | 0.19 |
| LIO |  | 4.57 | 5.17 | 4.09 |  | 1.64 | 1.6 | 1.44 |  | 2.76 | 3.25 |  | 1.71 | 2.09 | 2.09 |  | 2.72 | 3.37 |
| Total |  | 100.54 | 100.65 | 100.31 |  | 99.96 | 100.28 | 100.23 |  | 99.94 | 99.86 |  | 99.62 | 99.65 | 99.64 |  | 99.61 | 99.53 |
| Mg# |  | 38.8 | 35.3 | 34.9 |  | 37.1 | 53.4 | 50.5 |  | 50.5 | 50.6 |  | 34.4 | 37.3 | 34.8 |  | 34.8 | 21.6 |
| Trace elements (ppm) | | | | | | | | | | | | | | | | | | |
| Sc |  | 4.13 | 4.2 | 4.21 |  | 9.25 | 9.81 | 8.39 |  | 3.65 | 4.18 |  | 49.6 | 18.4 | 20.1 |  | 33.4 | 30.7 |
| V |  | 1.51 | 1.15 | 1.25 |  | 12.8 | 11.8 | 11.4 |  | 4.35 | 2.32 |  | 374 | 72.2 | 85.6 |  | 206 | 177 |
| Cr |  | 0.752 | 4.6 | 1.21 |  | 6.22 | 3.65 | 5.4 |  | 3.15 | 1.97 |  | 132 | 354 | 35.8 |  | 119 | 145 |
| Co |  | 0.329 | 0.399 | 0.386 |  | 3.57 | 4.03 | 3.12 |  | 3.14 | 1.55 |  | 37.3 | 7.23 | 7.72 |  | 21 | 16.9 |
| Ni |  | 0.774 | 2.68 | 1.03 |  | 3.48 | 1.83 | 3.57 |  | 1.91 | 1.35 |  | 42.6 | 8.78 | 19.8 |  | 12.6 | 8.98 |
| Cu |  | 1.25 | 0.97 | 1.18 |  | 2.24 | 2.11 | 2.45 |  | 452 | 17.1 |  | 156 | 14.6 | 15 |  | 99.2 | 86.3 |
| Zn |  | 31.1 | 30.9 | 26.4 |  | 8.64 | 9.38 | 8.48 |  | 289 | 786 |  | 86.1 | 13.5 | 17.7 |  | 70.7 | 203 |
| Ga |  | 14.2 | 14.2 | 13.5 |  | 10.1 | 10.9 | 10 |  | 14.6 | 16.5 |  | 16 | 13 | 13.2 |  | 15.7 | 15.7 |
| Cs |  | 0.644 | 0.642 | 0.571 |  | 0.146 | 0.115 | 0.101 |  | 0.546 | 0.366 |  | 0.323 | 0.088 | 0.078 |  | 0.295 | 0.136 |
| Ba |  | 609 | 169 | 152 |  | 90.8 | 87.7 | 81.4 |  | 133 | 215 |  | 481 | 155 | 172 |  | 450 | 298 |
| Rb |  | 20.1 | 20.4 | 19.1 |  | 7.34 | 5.8 | 4.78 |  | 41 | 39.8 |  | 11.3 | 3.37 | 2.35 |  | 24.9 | 13.1 |
| Sr |  | 159 | 304 | 169 |  | 157 | 164 | 158 |  | 24.5 | 27.5 |  | 341 | 329 | 340 |  | 329 | 337 |
| Y |  | 26.6 | 26.7 | 26.8 |  | 22.2 | 23.6 | 28.1 |  | 18.9 | 22.5 |  | 15.7 | 24.1 | 23.9 |  | 19.7 | 19.3 |
| Nb |  | 5.26 | 5.61 | 5.36 |  | 6.67 | 6.84 | 6.39 |  | 8.42 | 8.54 |  | 1.51 | 3.33 | 3.14 |  | 3.11 | 3.01 |
| Ta |  | 0.344 | 0.355 | 0.336 |  | 0.339 | 0.353 | 0.326 |  | 0.591 | 0.624 |  | 0.079 | 0.182 | 0.174 |  | 0.16 | 0.161 |
| La |  | 17.7 | 17.4 | 16.8 |  | 11.9 | 11.7 | 18.8 |  | 11.9 | 9.5 |  | 8.37 | 16.5 | 13.4 |  | 13.5 | 13.2 |
| Ce |  | 39.1 | 38.2 | 36.6 |  | 30.1 | 31.4 | 40.4 |  | 26.8 | 22.5 |  | 16.8 | 33 | 28.4 |  | 26 | 25.7 |
| Pr |  | 5.61 | 5.49 | 5.23 |  | 3.31 | 4.14 | 4.49 |  | 3.59 | 3 |  | 2.35 | 4.31 | 3.66 |  | 3.5 | 3.38 |
| Nd |  | 24.7 | 24.7 | 23.6 |  | 14.2 | 19.3 | 18.6 |  | 14.5 | 12.9 |  | 10.2 | 17.7 | 14.6 |  | 13.9 | 13.6 |
| Sm |  | 5.19 | 5.19 | 4.87 |  | 3.41 | 4.41 | 3.91 |  | 3.16 | 3.28 |  | 2.5 | 3.91 | 3.48 |  | 3.31 | 3.23 |
| Eu |  | 0.941 | 0.884 | 0.821 |  | 0.685 | 0.841 | 0.677 |  | 0.44 | 0.509 |  | 0.814 | 0.981 | 0.94 |  | 0.861 | 0.917 |
| Gd |  | 4.55 | 4.64 | 4.23 |  | 3.25 | 4.04 | 3.77 |  | 2.63 | 2.96 |  | 2.92 | 4.45 | 3.81 |  | 3.64 | 3.67 |
| Tb |  | 0.825 | 0.816 | 0.829 |  | 0.603 | 0.695 | 0.746 |  | 0.549 | 0.595 |  | 0.433 | 0.701 | 0.626 |  | 0.56 | 0.554 |
| Dy |  | 4.78 | 4.7 | 4.67 |  | 3.65 | 4.13 | 4.59 |  | 3.11 | 3.62 |  | 2.64 | 4.12 | 3.93 |  | 3.41 | 3.39 |
| Ho |  | 0.848 | 0.883 | 0.888 |  | 0.768 | 0.821 | 0.958 |  | 0.638 | 0.676 |  | 0.6 | 0.893 | 0.868 |  | 0.712 | 0.703 |
| Er |  | 2.56 | 2.57 | 2.54 |  | 2.52 | 2.56 | 2.98 |  | 1.99 | 2.06 |  | 1.88 | 2.88 | 2.79 |  | 2.27 | 2.25 |
| Tm |  | 0.406 | 0.424 | 0.403 |  | 0.446 | 0.456 | 0.529 |  | 0.373 | 0.384 |  | 0.251 | 0.43 | 0.425 |  | 0.299 | 0.317 |
| Yb |  | 2.74 | 2.74 | 2.81 |  | 3.04 | 3.11 | 3.5 |  | 2.47 | 2.52 |  | 1.77 | 2.99 | 2.86 |  | 2.18 | 2.2 |
| Lu |  | 0.413 | 0.433 | 0.435 |  | 0.522 | 0.494 | 0.556 |  | 0.381 | 0.452 |  | 0.269 | 0.489 | 0.451 |  | 0.365 | 0.335 |
| Pb |  | 9.31 | 11 | 6.27 |  | 1.08 | 1.11 | 1.08 |  | 8.24 | 6.26 |  | 3.47 | 1.95 | 1.8 |  | 3.23 | 2.39 |
| Th |  | 1.52 | 1.48 | 1.49 |  | 3.87 | 4.04 | 3.7 |  | 1.98 | 1.73 |  | 1.37 | 2.72 | 2.77 |  | 2.32 | 2.3 |
| U |  | 0.551 | 0.583 | 0.562 |  | 1.91 | 1.92 | 1.99 |  | 1.22 | 0.851 |  | 0.664 | 1.45 | 1.37 |  | 1.14 | 1.13 |
| Zr |  | 72.5 | 71.9 | 73.6 |  | 169 | 167 | 162 |  | 63 | 63.4 |  | 115 | 226 | 231 |  | 208 | 205 |
| Hf |  | 3.03 | 2.85 | 3.12 |  | 5.37 | 5.42 | 5.04 |  | 3.04 | 3.05 |  | 3.04 | 6.26 | 6.08 |  | 5.16 | 5.12 |
| Nb/La |  | 0.3 | 0.32 | 0.32 |  | 0.56 | 0.58 | 0.34 |  | 0.71 | 0.9 |  | 0.18 | 0.2 | 0.23 |  | 0.23 | 0.23 |
| Zr/Nb |  | 13.78 | 12.82 | 13.73 |  | 25.34 | 24.42 | 25.35 |  | 7.48 | 7.42 |  | 76.16 | 67.87 | 73.57 |  | 66.88 | 68.11 |
| Note: Mg# = (MgO/40.31)/(MgO/40.31+Fe2O3T\*0.8998/71.85\*(1-0.15))\*100 | | | | | | | |  |  |  |  |  |  |  |  |  |  |  |