Table A1. Argon data collected from muscovite and phlogopite (Beluga occurrence)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Step | 40Ar/39Ar | 2σ | 38Ar/39Ar | 2σ | 37Ar/39Ar | 2σ | 36Ar/39Ar | 2σ | Ca/K | Cl/K | %40Ar (atm) | f 39Ar | 40Ar\*/39ArK | 2σ | Age | 2σ |
| Phlogopite-A | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 86.792 | 0.008 | 0.083 | 0.135 | 0.041 | 0.130 | 0.139 | 0.040 | 0.160 | 0.010 | 47.07 | 0.76 | 45.993 | 1.675 | 1564.28 | 38.11 |
| 2 | 55.846 | 0.007 | 0.032 | 0.070 | 0.008 | 0.231 | 0.022 | 0.077 | 0.032 | 0.003 | 11.64 | 2.34 | 49.408 | 0.601 | 1640.31 | 13.11 |
| 3 | 50.105 | 0.005 | 0.018 | 0.087 | 0.001 | 0.767 | 0.003 | 0.142 | 0.004 | 0.001 | 1.96 | 8.27 | 49.185 | 0.272 | 1635.45 | 5.96 |
| 4 | 55.968 | 0.008 | 0.052 | 0.084 | 0.005 | 1.152 | 0.023 | 0.103 | 0.020 | 0.008 | 11.88 | 0.96 | 49.380 | 0.797 | 1639.71 | 17.38 |
| 5 | 49.880 | 0.005 | 0.017 | 0.098 | 0.001 | 1.319 | 0.002 | 0.392 | 0.004 | 0.001 | 1.27 | 5.39 | 49.307 | 0.363 | 1638.12 | 7.93 |
| 6 | 49.965 | 0.005 | 0.016 | 0.053 | 0.002 | 0.405 | 0.003 | 0.144 | 0.007 | 0.000 | 1.73 | 6.91 | 49.160 | 0.288 | 1634.90 | 6.29 |
| 7 | 49.821 | 0.006 | 0.014 | 0.155 | 0.001 | 1.245 | 0.001 | 1.207 | 0.005 | 0.000 | 0.59 | 5.57 | 49.590 | 0.469 | 1644.27 | 10.20 |
| 8 | 49.877 | 0.004 | 0.017 | 0.057 | 0.002 | 0.412 | 0.003 | 0.118 | 0.007 | 0.001 | 1.98 | 6.13 | 48.950 | 0.252 | 1630.30 | 5.52 |
| 9 | 49.820 | 0.005 | 0.016 | 0.077 | 0.001 | 0.361 | 0.002 | 0.182 | 0.005 | 0.000 | 1.36 | 8.99 | 49.205 | 0.269 | 1635.89 | 5.89 |
| 10 | 49.519 | 0.005 | 0.016 | 0.061 | 0.002 | 0.432 | 0.002 | 0.271 | 0.007 | 0.000 | 1.16 | 8.21 | 49.005 | 0.294 | 1631.51 | 6.43 |
| 11 | 49.787 | 0.006 | 0.016 | 0.115 | 0.002 | 0.403 | 0.001 | 0.430 | 0.006 | 0.000 | 0.86 | 6.22 | 49.419 | 0.347 | 1640.56 | 7.57 |
| 12 | 49.642 | 0.005 | 0.014 | 0.098 | 0.001 | 0.954 | 0.001 | 0.717 | 0.004 | 0.000 | 0.61 | 6.12 | 49.402 | 0.346 | 1640.20 | 7.54 |
| 13 | 49.536 | 0.005 | 0.015 | 0.084 | 0.002 | 0.386 | 0.001 | 0.769 | 0.007 | 0.000 | 0.47 | 6.86 | 49.364 | 0.323 | 1639.35 | 7.05 |
| 14 | 49.463 | 0.005 | 0.014 | 0.096 | 0.002 | 0.485 | 0.001 | 0.709 | 0.007 | 0.000 | 0.46 | 7.16 | 49.295 | 0.312 | 1637.84 | 6.81 |
| 15 | 49.466 | 0.006 | 0.015 | 0.124 | 0.000 | 2.291 | 0.001 | 0.892 | 0.002 | 0.000 | 0.47 | 4.67 | 49.293 | 0.377 | 1637.81 | 8.23 |
| 16 | 49.200 | 0.006 | 0.014 | 0.083 | 0.001 | 0.526 | 0.001 | 0.326 | 0.005 | 0.000 | 0.69 | 7.61 | 48.922 | 0.314 | 1629.69 | 6.88 |
| 17 | 49.049 | 0.004 | 0.015 | 0.085 | 0.001 | 0.787 | 0.001 | 0.618 | 0.003 | 0.000 | 0.36 | 7.83 | 48.931 | 0.249 | 1629.88 | 5.46 |
| Total/Avg | 50.227 | 0.001 | 0.017 | 0.011 | 0.004 | 0.029 | 0.003 | 0.024 |  | 0.001 |  | 100.00 | 49.205 | 0.047 |  |  |
|  | J = 0.030003 ± 0.000060, Volume 39ArK = 442.9 × 10-13 cm3 | | | | | | |  |  |  |  |  |  |  |  |  |
| Phlogopite-B | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 60.154 | 0.009 | 0.037 | 0.312 | 0.007 | 0.580 | 0.040 | 0.133 | 0.227 | 0.004 | 19.73 | 0.48 | 48.175 | 1.634 | 1613.22 | 36.16 |
| 2 | 55.607 | 0.005 | 0.018 | 0.126 | 0.001 | 1.354 | 0.007 | 0.117 | 0.033 | 0.001 | 3.93 | 3.43 | 53.300 | 0.389 | 1723.25 | 8.10 |
| 3 | 52.427 | 0.005 | 0.016 | 0.072 | 0.001 | 0.396 | 0.002 | 0.128 | 0.043 | 0.000 | 1.32 | 6.74 | 51.619 | 0.296 | 1687.90 | 6.29 |
| 4 | 51.976 | 0.006 | 0.016 | 0.058 | 0.000 | 3.278 | 0.003 | 0.128 | 0.005 | 0.000 | 1.74 | 9.57 | 50.953 | 0.314 | 1673.70 | 6.72 |
| 5 | 50.200 | 0.004 | 0.015 | 0.053 | 0.000 | 1.188 | 0.001 | 0.166 | 0.006 | 0.000 | 0.71 | 16.03 | 49.730 | 0.226 | 1647.33 | 4.90 |
| 6 | 51.229 | 0.011 | 0.016 | 0.258 | 0.003 | 1.742 | 0.003 | 0.420 | 0.085 | 0.000 | 1.93 | 1.52 | 50.124 | 0.679 | 1655.87 | 14.67 |
| 7 | 49.842 | 0.005 | 0.014 | 0.061 | 0.000 | 1.596 | 0.001 | 0.308 | 0.009 | 0.000 | 0.48 | 15.88 | 49.488 | 0.257 | 1642.07 | 5.60 |
| 8 | 49.954 | 0.005 | 0.015 | 0.068 | 0.000 | 1.082 | 0.001 | 0.450 | 0.013 | 0.000 | 0.33 | 9.75 | 49.675 | 0.242 | 1646.13 | 5.25 |
| 9 | 50.105 | 0.007 | 0.015 | 0.091 | 0.001 | 0.922 | 0.001 | 0.735 | 0.026 | 0.000 | 0.56 | 7.68 | 49.709 | 0.399 | 1646.86 | 8.67 |
| 10 | 50.267 | 0.006 | 0.013 | 0.057 | 0.000 | 2.067 | 0.001 | 0.555 | 0.004 | 0.000 | 0.32 | 12.82 | 49.989 | 0.339 | 1652.94 | 7.34 |
| 11 | 50.588 | 0.006 | 0.015 | 0.099 | 0.000 | 1.444 | 0.001 | 0.300 | 0.000 | 0.000 | 0.60 | 7.97 | 50.167 | 0.294 | 1656.79 | 6.34 |
| 12 | 50.839 | 0.007 | 0.014 | 0.104 | 0.000 | 1.859 | 0.001 | 0.512 | 0.000 | 0.000 | 0.41 | 6.28 | 50.512 | 0.349 | 1664.23 | 7.50 |
| 13 | 51.765 | 0.011 | 0.014 | 0.222 | -0.001 | 2.903 | 0.004 | 0.586 | 0.000 | 0.000 | 2.05 | 1.84 | 50.586 | 0.850 | 1665.81 | 18.28 |
| Total/Avg | 50.703 | 0.001 | 0.015 | 0.011 | 0.007 | 0.012 | 0.002 | 0.036 |  | 0.000 |  | 100.00 | 49.617 | 0.053 |  |  |
|  | J = 0.030003 ± 0.000060, Volume 39ArK = 269.57 × 10-13 cm3 | | | | | | |  |  |  |  |  |  |  |  |  |
| Muscovite-A | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 33.725 | 0.006 | 0.094 | 0.038 | 0.027 | 0.077 | 0.050 | 0.038 | 0.110 | 0.016 | 43.09 | 3.95 | 19.197 | 0.567 | 820.57 | 19.46 |
| 2 | 27.641 | 0.005 | 0.063 | 0.075 | 0.216 | 0.018 | 0.020 | 0.056 | 0.875 | 0.010 | 21.03 | 6.02 | 21.845 | 0.350 | 909.28 | 11.44 |
| 3 | 39.520 | 0.004 | 0.069 | 0.043 | 0.467 | 0.018 | 0.008 | 0.069 | 1.891 | 0.012 | 5.84 | 14.76 | 37.277 | 0.240 | 1354.19 | 6.13 |
| 4 | 42.220 | 0.005 | 0.019 | 0.050 | 0.004 | 0.113 | 0.001 | 0.395 | 0.017 | 0.001 | 0.50 | 14.25 | 42.057 | 0.249 | 1472.36 | 5.97 |
| 5 | 39.617 | 0.004 | 0.018 | 0.055 | 0.002 | 0.267 | 0.001 | 0.561 | 0.009 | 0.001 | 0.47 | 17.03 | 39.474 | 0.207 | 1409.47 | 5.14 |
| 6 | 43.683 | 0.006 | 0.013 | 0.098 | 0.002 | 0.489 | 0.000 | 0.741 | 0.006 | 0.000 | 0.32 | 15.75 | 43.593 | 0.285 | 1508.75 | 6.68 |
| 7 | 43.588 | 0.005 | 0.013 | 0.118 | 0.001 | 0.785 | 0.000 | 1.761 | 0.004 | 0.000 | 0.19 | 12.88 | 43.553 | 0.275 | 1507.81 | 6.45 |
| 8 | 44.105 | 0.005 | 0.011 | 0.201 | 0.001 | 2.321 | 0.000 | 2.832 | 0.002 | -0.001 | 0.20 | 7.36 | 44.070 | 0.347 | 1519.90 | 8.09 |
| 9 | 44.153 | 0.007 | 0.012 | 0.122 | 0.003 | 0.419 | 0.001 | 0.999 | 0.010 | 0.000 | 0.64 | 6.02 | 43.920 | 0.414 | 1516.40 | 9.68 |
| 10 | 44.791 | 0.010 | 0.016 | 0.252 | 0.007 | 0.709 | 0.006 | 0.657 | 0.030 | 0.000 | 3.99 | 1.98 | 43.052 | 1.268 | 1496.02 | 29.94 |
| Total/Avg | 40.954 | 0.001 | 0.029 | 0.012 | 0.187 | 0.004 | 0.005 | 0.021 |  | 0.004 |  | 100.00 | 43.682 | 0.052 |  |  |
|  | J = 0.030000 ± 0.000062, Volume 39ArK = 311.75 × 10-13 cm3 | | | | | | |  |  |  |  |  |  |  |  |  |
| Muscovite-B | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 10.793 | 0.009 | 0.060 | 0.026 | 0.009 | 0.082 | 0.023 | 0.040 | 0.286 | 0.010 | 63.18 | 13.23 | 3.937 | 0.280 | 201.43 | 13.55 |
| 2 | 55.429 | 0.006 | 0.056 | 0.025 | 0.113 | 0.037 | 0.047 | 0.022 | 3.691 | 0.008 | 24.93 | 4.88 | 41.568 | 0.393 | 1460.62 | 9.46 |
| 3 | 45.162 | 0.006 | 0.021 | 0.053 | 0.014 | 0.094 | 0.004 | 0.058 | 0.468 | 0.002 | 2.81 | 9.76 | 43.794 | 0.295 | 1513.46 | 6.91 |
| 4 | 43.847 | 0.008 | 0.013 | 0.046 | 0.000 | 1.104 | 0.001 | 0.411 | 0.010 | 0.000 | 0.53 | 18.74 | 43.511 | 0.344 | 1506.81 | 8.08 |
| 5 | 43.892 | 0.010 | 0.013 | 0.080 | 0.001 | 0.664 | 0.001 | 0.260 | 0.030 | 0.000 | 0.62 | 13.38 | 43.516 | 0.437 | 1506.94 | 10.26 |
| 6 | 43.660 | 0.008 | 0.013 | 0.092 | 0.000 | 2.164 | 0.001 | 0.559 | 0.011 | 0.000 | 0.41 | 15.62 | 43.376 | 0.356 | 1503.64 | 8.36 |
| 7 | 44.058 | 0.005 | 0.013 | 0.069 | 0.001 | 0.419 | 0.000 | 0.578 | 0.019 | 0.000 | 0.25 | 20.52 | 43.841 | 0.252 | 1514.55 | 5.88 |
| 8 | 46.009 | 0.014 | 0.014 | 0.369 | 0.004 | 0.847 | 0.003 | 0.978 | 0.136 | 0.000 | 1.79 | 1.76 | 45.082 | 1.028 | 1543.32 | 23.65 |
| 9 | 46.587 | 0.009 | 0.013 | 0.355 | 0.002 | 1.304 | 0.005 | 0.349 | 0.067 | -0.001 | 3.37 | 2.10 | 44.911 | 0.677 | 1539.39 | 15.60 |
| Total/Avg | 40.213 | 0.001 | 0.022 | 0.009 | 0.152 | 0.002 | 0.006 | 0.014 |  | 0.002 |  | 100.00 | 43.607 | 0.064 |  |  |
|  | J = 0.030000 ± 0.000062, Volume 39ArK = 198.62 × 10-13 cm3 | | | | | | |  |  |  |  |  |  |  |  |  |