**Tables**

**Table S1. Sample location and other pertinent information about the sample’s characteristics.**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample ID** | **Sample Set** | **Morphostratigraphic Age** | **Latitude** | **Longitude** | **Elevation (m asl)** | **Pressure Flag** | **Thickness (cm)** | **Density (g cm-3)** | **Shielding** |
| GH13-01 | 1 | Outer | 63.162842 | -135.777696 | 1407 | std | 2.5 | 2.67 | 0.98 |
| GH13-02 | 1 | Outer | 63.162761 | -135.777694 | 1409 | std | 2.5 | 2.67 | 0.98 |
| GH13-03 | 1 | Outer | 63.162715 | -135.777971 | 1408 | std | 2.5 | 2.67 | 0.98 |
| GH13-04 | 2 | Inner | 63.147674 | -135.762665 | 1619 | std | 2.5 | 2.67 | 0.99 |
| GH13-05 | 2 | Inner | 63.148734 | -135.762376 | 1609 | std | 2.5 | 2.67 | 0.99 |
| GH13-06 | 2 | Inner | 63.14887 | -135.76224 | 1607 | std | 2.5 | 2.67 | 0.99 |
| GH13-07 | 3 | Outer | 63.112283 | -135.793766 | 1408 | std | 2.5 | 2.67 | 1.00 |
| GH13-08 | 3 | Outer | 63.112368 | -135.794581 | 1404 | std | 2.5 | 2.67 | 1.00 |
| 15-GH01 | 4 | Inner | 63.12302 | -135.745 | 1645 | std | 2.5 | 2.67 | 0.98 |
| 15-GH02 | 4 | Inner | 63.12285 | -135.7451 | 1646 | std | 2.5 | 2.67 | 0.97 |
| 15-GH03 | 4 | Inner | 63.12203 | -135.745 | 1643 | std | 2.5 | 2.67 | 0.97 |
| 15-GH04 | 5 | Outer | 63.17107 | -135.57178 | 1376 | std | 2.5 | 2.67 | 0.99 |
| 15-GH05 | 5 | Outer | 63.17119 | -135.57236 | 1374 | std | 2.5 | 2.67 | 1.00 |
| 15-GH06 | 5 | Outer | 63.17102 | -135.57222 | 1375 | std | 2.5 | 2.67 | 1.00 |
| 15-GH07 | 6 | Inner | 63.14698 | -135.61467 | 1594 | std | 2.5 | 2.67 | 0.99 |
| 15-GH08 | 6 | Inner | 63.14693 | -135.61446 | 1593 | std | 2.5 | 2.67 | 0.99 |
| 15-GH09 | 6 | Inner | 63.14679 | -135.61427 | 1591 | std | 2.5 | 2.67 | 0.99 |
| 15-GH10 | 7 | Inner | 63.04108 | -135.53134 | 1655 | std | 2.5 | 2.67 | 0.99 |
| 15-GH11 | 7 | Inner | 63.041239 | -135.532868 | 1650 | std | 2.5 | 2.67 | 0.97 |
| 15-GH12 | 7 | Inner | 63.041239 | -135.532868 | 1650 | std | 2.5 | 2.67 | 1.00 |
| 15-GH13 | 8 | Outer | 63.178724 | -135.859939 | 1381 | std | 2.5 | 2.67 | 1.00 |
| 15-GH14 | 8 | Outer | 63.17901 | -135.8609 | 1376 | std | 2.5 | 2.67 | 1.00 |
| 15-GH15 | 8 | Outer | 63.17902 | -135.86104 | 1374 | std | 2.5 | 2.67 | 0.99 |

**Table S2. Be-10 geochemical information and resulting age. See text for scaling model and production rates used.**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Sample Set** | **Qtz Mass (g)** | **Be Carrier (mg Be)** | **10Be/9Be x 10‑15 ± 1s** | **Be-10 (atoms g-1)** | **±** | **Age (ka)** | **±** |
| GH13-01 | 1 | 21.1067 | 0.2157 | 521.39±6.73 | 3.56E+05 | 5.90E+03 | 24.10 | 0.40 |
| GH13-02 | 1 | 20.322 | 0.2163 | 527.77±6.00 | 3.75E+05 | 5.78E+03 | 25.28 | 0.39 |
| GH13-03 | 1 | 20.857 | 0.2144 | 575.78±11.64 | 3.95E+05 | 8.98E+03 | 26.67 | 0.61 |
| GH13-04 | 2 | 20.53 | 0.2148 | 464.58±9.74 | 3.25E+05 | 7.61E+03 | 18.26 | 0.43 |
| GH13-05 | 2 | 22.186 | 0.2137 | 513.40±9.72 | 3.30E+05 | 7.14E+03 | 18.69 | 0.41 |
| GH13-06 | 2 | 20.319 | 0.2138 | 499.20±4.68 | 3.51E+05 | 4.92E+03 | 19.91 | 0.28 |
| GH13-07 | 3 | 20.533 | 0.2155 | 1165.32±19.75 | 8.17E+05 | 1.61E+04 | 54.73 | 1.09 |
| GH13-08 | 3 | 20.891 | 0.2143 | 506.59±9.82 | 3.47E+05 | 7.64E+03 | 23.14 | 0.51 |
| **Process Blank** | |  |  |  | **10Be ± 1s (104 atoms)** |  |  |  |
| Blk11-11-14 |  |  | 0.214552 | 0.40±0.23 | 0.58±0.33 |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  | **Sample Set** | **Qtz Mass (g)** | **Be Carrier (mg Be)** | **10Be/9Be x 10‑15 ± 1s** | **Be-10 (atoms g-1)** | **±** | **Age (ka)** | **±** |
| 15-GH01 | 4 | 10.0089 | 0.2601 | 183.31±5.31 | 3.21E+05 | 1.00E+04 | 17.92 | 0.56 |
| 15-GH02 | 4 | 10.1416 | 0.2602 | 161.78±3.81 | 2.77E+05 | 7.20E+03 | 15.50 | 0.40 |
| 15-GH03 | 4 | 10.1399 | 0.2601 | 153.90±4.45 | 2.63E+05 | 8.18E+03 | 14.76 | 0.46 |
| 15-GH04 | 5 | 10.5538 | 0.2604 | 382.34±7.53 | 6.30E+05 | 1.42E+04 | 43.79 | 1.00 |
| 15-GH05 | 5 | 9.9875 | 0.2603 | 76.97±3.02 | 1.33E+05 | 5.48E+03 | 9.03 | 0.37 |
| 15-GH06 | 5 | 10.0526 | 0.2595 | 123.24±3.51 | 2.11E+05 | 6.65E+03 | 14.40 | 0.46 |
| 15-GH07 | 6 | 9.9952 | 0.2606 | 168.45±3.66 | 2.92E+05 | 7.43E+03 | 16.71 | 0.43 |
| 15-GH08 | 6 | 10.0271 | 0.2596 | 190.91±5.53 | 3.27E+05 | 1.03E+04 | 18.74 | 0.59 |
| 15-GH09 | 6 | 10.0578 | 0.26 | 137.46±4.06 | 2.39E+05 | 7.86E+03 | 13.80 | 0.46 |
| **Process Blank** | |  |  |  | **10Be ± 1s (104 atoms)** |  |  |  |
| Blk061116 |  |  | 0.260416 | 0.75±0.26 | 0.13±0.04 |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  | **Sample Set** | **Qtz Mass (g)** | **Be Carrier (mg Be)** | **10Be/9Be x 10‑15 ± 1s** | **Be-10 (atoms g-1)** | **±** | **Age (ka)** | **±** |
| 15-GH10 | 7 | 10.1069 | 0.2683 | 189.85±4.38 | 3.36E+05 | 8.46E+03 | 18.35 | 0.46 |
| 15-GH11 | 7 | 10.5828 | 0.268 | 258.92±4.82 | 4.03E+05 | 1.69E+04 | 22.54 | 0.95 |
| 15-GH12 | 7 | 10.2023 | 0.2662 | 170.03±3.90 | 3.00E+05 | 1.42E+04 | 16.32 | 0.78 |
| 15-GH13 | 8 | 10.383 | 0.2692 | 347.51±5.45 | 5.90E+05 | 1.99E+04 | 40.27 | 1.37 |
| 15-GH14 | 8 | 10.1136 | 0.2688 | 272.73±5.22 | 4.60E+05 | 1.84E+04 | 31.57 | 1.27 |
| 15-GH15 | 8 | 10.1185 | 0.2704 | 323.00±5.25 | 5.64E+05 | 1.93E+04 | 39.14 | 1.35 |
| **Process Blank** | |  |  |  | **10Be ± 1s (104 atoms)** |  |  |  |
| BAB111816 |  |  | 0.269048 | 0.28±0.14 | 0.05±0.03 |  |  |  |

**Table S3. C-14 geochemical information and resulting age. See text for scaling model and production rates used.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample ID** | **Sample**  **Set** | **Qtz Mass (g)** | **Carbon Yield**  **(mg)** | **±** | **Diluted**  **Mass**  **(mg)** | **±** | **14C/13C** | **±** | **14C/C** | **±** | **14C**  **(at g-1)** | **±** | **14C Age (a)** | **±** | **14C/10Be** | **±** |
| 15-GH(04) | 5 | 4.9977 | 26 | 0.3 | 126.6 | 1.6 | 3.34E-11 | 1.25E-13 | 3.63E-13 | 1.37E-15 | 3.98E+05 | 6.97E+03 | Sat. | -- | 0.63 | 0.02 |
| 15-GH(05) | 5 | 5.0124 | 31.2 | 0.4 | 103.3 | 1.3 | 3.45E-11 | 1.60E-13 | 3.77E-13 | 1.75E-15 | 2.78E+05 | 3.87E+03 | 9420 | 245 | 2.09 | 0.09 |
| 15-GH(06) | 5 | 5.0357 | 20.7 | 0.3 | 112.5 | 1.4 | 2.69E-11 | 1.12E-13 | 2.94E-13 | 1.23E-15 | 2.42E+05 | 3.46E+03 | 7401 | 172 | 1.15 | 0.04 |
| 15-GH(10) | 7 | 10.0102 | 23.6 | 0.3 | 106.9 | 1.4 | 6.57E-11 | 1.44E-13 | 7.17E-13 | 1.60E-15 | 3.78E+05 | 4.97E+03 | 11456 | 327 | 1.12 | 0.03 |
| 15-GH(11) | 7 | 10.0062 | 16 | 0.2 | 111.2 | 1.4 | 1.73E-11 | 7.54E-14 | 1.90E-13 | 8.33E-16 | 3.67E+05 | 4.83E+03 | 11241 | 316 | 0.91 | 0.04 |
| 15-GH(12) | 7 | 10.0177 | 21.4 | 0.3 | 95.7 | 1.2 | 7.23E-11 | 1.90E-13 | 7.91E-13 | 2.10E-15 | 3.72E+05 | 4.90E+03 | 11001 | 304 | 1.24 | 0.06 |
| 15-GH(13) | 8 | 7.5051 | 17.3 | 0.2 | 289.2 | 3.7 | 1.73E-11 | 7.54E-14 | 1.90E-13 | 8.33E-16 | 2.47E+05 | 5.70E+03 | 7567 | 287 | 0.42 | 0.02 |
| 15-GH(14) | 8 | 5.046 | 13.6 | 0.2 | 107.5 | 1.4 | 3.64E-11 | 1.23E-13 | 3.99E-13 | 1.35E-15 | 1.95E+05 | 5.31E+03 | 5398 | 208 | 0.42 | 0.02 |
| 15-GH(15) | 8 | 9.9939 | 30.7 | 0.4 | 98.7 | 1.3 | 7.32E-11 | 1.62E-13 | 7.99E-13 | 1.80E-15 | 2.18E+05 | 5.49E+03 | 6413 | 245 | 0.39 | 0.02 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Effective Blank**  **(atoms)** | **±** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6.47E+04 | 6.85E+03 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Table S4. Summary statistics for the moraine sample sets.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample Set** | **Morphostratigraphic Age** | **10Be Median Age** | **±** | **Std Error** | **14C Median Age** | **±** | **Std Error** |
| 2 | Inner | 18686 | 413 | 2.21% | -- | -- | -- |
| 4 | Inner | 15495 | 790 | 5.10% | -- | -- | -- |
| 6 | Inner | 16710 | 1234 | 7.38% | -- | -- | -- |
| 7 | Inner | 18349 | 1555 | 8.48% | 11241 | 114 | 1.01% |
|  | *Group Median* | *17530* | *1014* | 5.78% |  |  | -- |
|  |  |  |  |  |  |  |  |
| 1 | Outer | 25279 | 644 | 2.55% | -- | -- | -- |
| 3 | Outer | 38932 | 7897 | 20.28% | -- | -- | -- |
| 5 | Outer | 14403 | 8690 | 60.33% | 9420 | 7134 | 75.73% |
| 8 | Outer | 39140 | 2175 | 5.56% | 6413 | 542 | 8.46% |
|  | Group Median | *32105* | *8212* | 25.58% |  |  | -- |