**Supplementary Table 1.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Depth (mm)** | **Age (ka)** | **Error (+)** | **Error (-)** | **δ18O** | **δ13C** |
| |  | | --- | | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10 | | 11 | | 12 | | 13 | | 14 | | 15 | | 16 | | 17 | | 18 | | 19 | | 20 | | 21 | | 22 | | 23 | | 24 | | 25 | | 26 | | 27 | | 28 | | 29 | | 30 | | 31 | | 32 | | 33 | | 34 | | 35 | | 36 | | 37 | | 38 | | 39 | | 40 | | 41 | | 42 | | 43 | | 44 | | 45 | | 46 | | 47 | | 48 | | 49 | | 50 | | 51 | | 52 | | 53 | | 54 | | 55 | | 56 | | 57 | | 58 | | 59 | | 60 | | 61 | | 62 | | 63 | | 64 | | 65 | | 66 | | 67 | | 68 | | 69 | | 70 | | 71 | | 72 | | 73 | | 74 | | 75 | | 76 | | 77 | | 78 | | 79 | | 80 | | 81 | | 82 | | 83 | | 84 | | 85 | | 86 | | 87 | | 88 | | 89 | | 90 | | 91 | | 92 | | 93 | | 94 | | 95 | | 96 | | 97 | | 98 | | 99 | | 100 | | 101 | | 102 | | 103 | | 104 | | 105 | | 106 | | 107 | | 108 | | 109 | | 110 | | 111 | | 112 | | 113 | | 114 | | 115 | | 116 | | 117 | | 118 | | 119 | | 120 | | 121 | | 122 | | 123 | | 124 | | 125 | | 126 | | 127 | | |  | | --- | | 114.87 | | 114.89 | | 114.91 | | 114.94 | | 114.96 | | 114.98 | | 115.00 | | 115.03 | | 115.05 | | 115.08 | | 115.12 | | 115.15 | | 115.19 | | 115.23 | | 115.27 | | 115.31 | | 115.36 | | 115.39 | | 115.43 | | 115.49 | | 115.54 | | 115.58 | | 115.61 | | 115.64 | | 115.68 | | 115.71 | | 115.74 | | 115.77 | | 115.80 | | 115.83 | | 115.85 | | 115.87 | | 115.89 | | 115.91 | | 115.93 | | 115.95 | | 115.96 | | 115.98 | | 116.00 | | 116.01 | | 116.02 | | 116.04 | | 116.05 | | 116.07 | | 116.08 | | 116.10 | | 116.11 | | 116.13 | | 116.14 | | 116.16 | | 116.17 | | 116.19 | | 116.21 | | 116.22 | | 116.24 | | 116.26 | | 116.27 | | 116.29 | | 116.31 | | 116.33 | | 116.34 | | 116.36 | | 116.38 | | 116.39 | | 116.41 | | 116.43 | | 116.45 | | 116.46 | | 116.48 | | 116.50 | | 116.51 | | 116.53 | | 116.54 | | 116.56 | | 116.57 | | 116.59 | | 116.60 | | 116.61 | | 116.63 | | 116.64 | | 116.65 | | 116.67 | | 116.68 | | 116.69 | | 116.70 | | 116.71 | | 116.72 | | 116.73 | | 116.74 | | 116.75 | | 116.76 | | 116.77 | | 116.78 | | 116.79 | | 116.80 | | 116.81 | | 116.82 | | 116.83 | | 116.83 | | 116.84 | | 116.85 | | 116.86 | | 116.87 | | 116.87 | | 116.88 | | 116.89 | | 116.90 | | 116.90 | | 116.91 | | 116.92 | | 116.93 | | 116.94 | | 116.95 | | 116.96 | | 116.98 | | 116.99 | | 116.99 | | 117.00 | | 117.01 | | 117.02 | | 117.03 | | 117.04 | | 117.05 | | 117.06 | | 117.07 | | 117.08 | | 117.09 | | |  |  | | --- | --- | | 1.63 | | | 1.61 | | | 1.58 | | | 1.56 | | | 1.54 | | | 1.52 | | | 1.50 | | | 1.47 | | | 1.45 | | | 1.44 | | | 1.44 | | | 1.41 | | | 1.38 | | | 1.34 | | | 1.31 | | | 1.28 | | | 1.23 | | | 1.20 | | | 1.16 | | | 1.12 | | | 1.10 | | | 1.08 | | | 1.06 | | | 1.03 | | | 1.00 | | 0.97 | | 0.94 | | 0.92 | | 0.89 | | 0.87 | | 0.85 | | 0.83 | | 0.82 | | 0.81 | | 0.79 | | 0.77 | | 0.76 | | 0.74 | | 0.73 | | 0.72 | | 0.70 | | 0.69 | | 0.68 | | 0.67 | | 0.65 | | 0.64 | | 0.63 | | 0.62 | | 0.61 | | 0.60 | | 0.58 | | 0.57 | | 0.56 | | 0.54 | | 0.53 | | 0.52 | | 0.51 | | 0.50 | | 0.49 | | 0.48 | | 0.46 | | 0.44 | | 0.43 | | 0.43 | | 0.42 | | 0.41 | | 0.41 | | 0.40 | | 0.40 | | 0.39 | | 0.38 | | 0.38 | | 0.38 | | 0.38 | | 0.38 | | 0.40 | | 0.42 | | 0.44 | | 0.46 | | 0.48 | | 0.51 | | 0.54 | | 0.58 | | 0.61 | | 0.62 | | 0.61 | | 0.60 | | 0.60 | | 0.61 | | 0.61 | | 0.61 | | 0.60 | | 0.60 | | 0.59 | | 0.59 | | 0.59 | | 0.58 | | 0.58 | | 0.57 | | 0.56 | | 0.55 | | 0.55 | | 0.54 | | 0.53 | | 0.52 | | 0.52 | | 0.51 | | 0.50 | | 0.49 | | 0.49 | | 0.49 | | 0.49 | | 0.49 | | 0.50 | | 0.52 | | 0.52 | | 0.52 | | 0.52 | | 0.51 | | 0.50 | | 0.49 | | 0.48 | | 0.48 | | 0.49 | | 0.50 | | 0.51 | | 0.52 | | |  | | --- | | 2.89 | | 2.84 | | 2.80 | | 2.75 | | 2.70 | | 2.65 | | 2.61 | | 2.57 | | 2.53 | | 2.49 | | 2.45 | | 2.42 | | 2.39 | | 2.36 | | 2.32 | | 2.28 | | 2.25 | | 2.21 | | 2.17 | | 2.15 | | 2.12 | | 2.08 | | 2.03 | | 1.99 | | 1.96 | | 1.92 | | 1.88 | | 1.84 | | 1.81 | | 1.78 | | 1.74 | | 1.71 | | 1.66 | | 1.62 | | 1.58 | | 1.54 | | 1.50 | | 1.46 | | 1.43 | | 1.40 | | 1.36 | | 1.32 | | 1.28 | | 1.24 | | 1.20 | | 1.16 | | 1.12 | | 1.09 | | 1.06 | | 1.03 | | 1.00 | | 0.96 | | 0.92 | | 0.89 | | 0.86 | | 0.83 | | 0.80 | | 0.78 | | 0.76 | | 0.73 | | 0.69 | | 0.67 | | 0.64 | | 0.62 | | 0.59 | | 0.58 | | 0.56 | | 0.55 | | 0.53 | | 0.52 | | 0.50 | | 0.49 | | 0.47 | | 0.46 | | 0.45 | | 0.43 | | 0.42 | | 0.41 | | 0.40 | | 0.40 | | 0.39 | | 0.38 | | 0.37 | | 0.36 | | 0.35 | | 0.35 | | 0.35 | | 0.36 | | 0.36 | | 0.37 | | 0.38 | | 0.39 | | 0.40 | | 0.41 | | 0.42 | | 0.43 | | 0.43 | | 0.42 | | 0.41 | | 0.40 | | 0.39 | | 0.39 | | 0.38 | | 0.38 | | 0.37 | | 0.36 | | 0.36 | | 0.35 | | 0.35 | | 0.35 | | 0.35 | | 0.35 | | 0.35 | | 0.36 | | 0.36 | | 0.36 | | 0.36 | | 0.36 | | 0.37 | | 0.37 | | 0.38 | | 0.38 | | 0.38 | | 0.39 | | 0.40 | | 0.41 | | 0.41 | | |  | | --- | | -8.41 | | -11.36 | | -11.72 | | -11.72 | | -11.69 | | -11.78 | | -11.72 | | -11.79 | | -11.79 | | -11.58 | | -11.58 | | -11.42 | | -11.57 | | -11.58 | | -11.70 | | -11.55 | | -11.81 | | -12.25 | | -12.38 | | -11.92 | | -12.22 | | -12.20 | | -12.23 | | -11.78 | | -12.08 | | -12.69 | | -12.56 | | -12.2 | | -12.35 | | -12.38 | | -12.61 | | -12.82 | | -12.64 | | -12.28 | | -12.38 | | -12.13 | | -12.02 | | -11.9 | | -11.73 | | -11.81 | | -11.68 | | -12.04 | | -11.94 | | -11.51 | | -11.64 | | -11.37 | | -11.26 | | -11.59 | | -11.73 | | -11.47 | | -11.43 | | -11.03 | | -11.28 | | -10.97 | | -10.96 | | -11.62 | | -11.65 | | -11.62 | | -11.36 | | -11.91 | | -11.98 | | -11.87 | | -11.87 | | -11.92 | | -11.81 | | -11.81 | | -12.22 | | -12.4 | | -12.82 | | -12.78 | | -12.84 | | -12.52 | | -12.09 | | -11.66 | | -11.55 | | -11.52 | | -11.21 | | -11.22 | | -11.01 | | -11.43 | | -11.49 | | -11.78 | | -11.28 | | -11.72 | | -12.34 | | -11.79 | | -11.66 | | -11.75 | | -11.88 | | -12.27 | | -11.83 | | -11.5 | | -11.4 | | -11.16 | | -11,00 | | -11.06 | | -10.59 | | -10.56 | | -10.78 | | -11.29 | | -11.21 | | -11.83 | | -10.93 | | -10.72 | | -10.91 | | -10.74 | | -10.95 | | -11.17 | | -11.46 | | -11.04 | | -11,00 | | -11.03 | | -10.9 | | -11.29 | | -11.52 | | -11.4 | | -11.2 | | -11.3 | | -11.28 | | -11.06 | | -11.15 | | -11.54 | | -10.7 | | -10.9 | | -10.88 | | -11.08 | | -10.97 | | |  | | --- | | 0.74 | | -7.89 | | -8.61 | | -8.6 | | -8.65 | | -8.76 | | -8.78 | | -8.82 | | -8.79 | | -8.84 | | -8.75 | | -8.88 | | -9.02 | | -8.96 | | -8.94 | | -8.96 | | -8.99 | | -9.01 | | -9.15 | | -9.15 | | -9.10 | | -8.68 | | -8.82 | | -8.72 | | -8.96 | | -9.32 | | -9.43 | | -9.57 | | -9.63 | | -9.45 | | -9.4 | | -9.44 | | -9.48 | | -9.31 | | -9.24 | | -9.15 | | -9.51 | | -9.49 | | -9.48 | | -9.05 | | -8.87 | | -8.8 | | -8.7 | | -8.63 | | -8.66 | | -8.76 | | -8.74 | | -8.91 | | -8.97 | | -9.24 | | -9.09 | | -9.08 | | -9.05 | | -9.05 | | -9.04 | | -9.03 | | -8.72 | | -8.94 | | -8.81 | | -9.3 | | -9.27 | | -9.11 | | -9.1 | | -9.33 | | -9.31 | | -8.96 | | -8.81 | | -8.61 | | -8.94 | | -9.23 | | -9.42 | | -9.08 | | -8.81 | | -8.66 | | -8.55 | | -8.58 | | -8.42 | | -8.19 | | -8.1 | | -8.12 | | -8,00 | | -8.22 | | -8.06 | | -8.06 | | -8.41 | | -8.22 | | -8.89 | | -8.42 | | -8.43 | | -8.76 | | -8.97 | | -8.67 | | -8.89 | | -8.4 | | -8.37 | | -8.38 | | -8.98 | | -8.77 | | -8.44 | | -8.83 | | -8.49 | | -8.35 | | -8.28 | | -8.25 | | -9.15 | | -8.74 | | -8.71 | | -8.41 | | -8.61 | | -8.5 | | -8.59 | | -8.87 | | -8.53 | | -8.74 | | -8.4 | | -8.27 | | -8.27 | | -8.88 | | -9.01 | | -8.84 | | -8.19 | | -8.55 | | -7.9 | | -8.07 | | -8.09 | | -8.16 | | -7.98 | |
| Host marble sample |  |  |  | 2.27 | -0.79 |