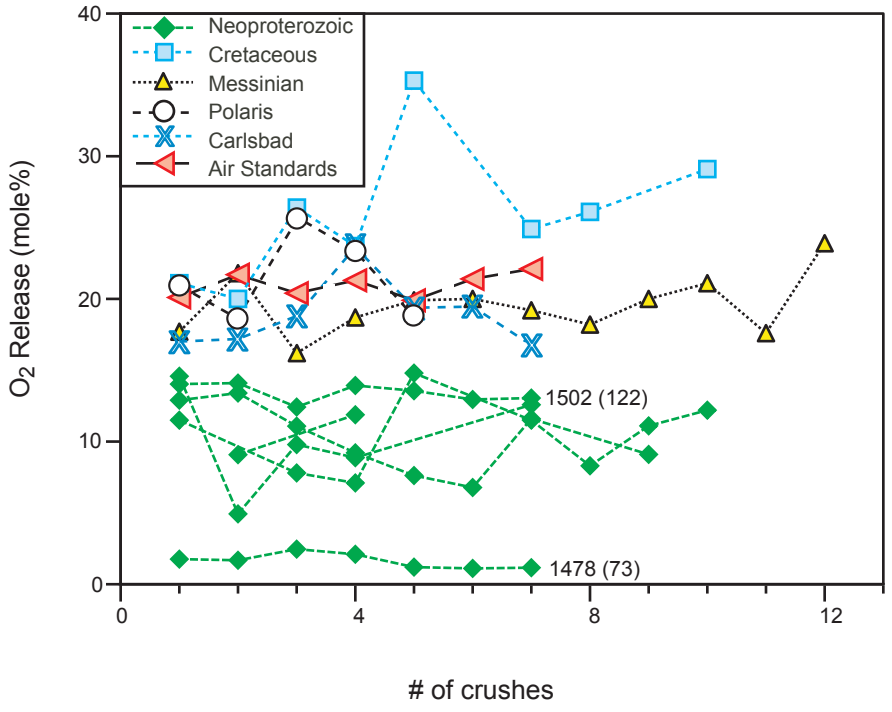
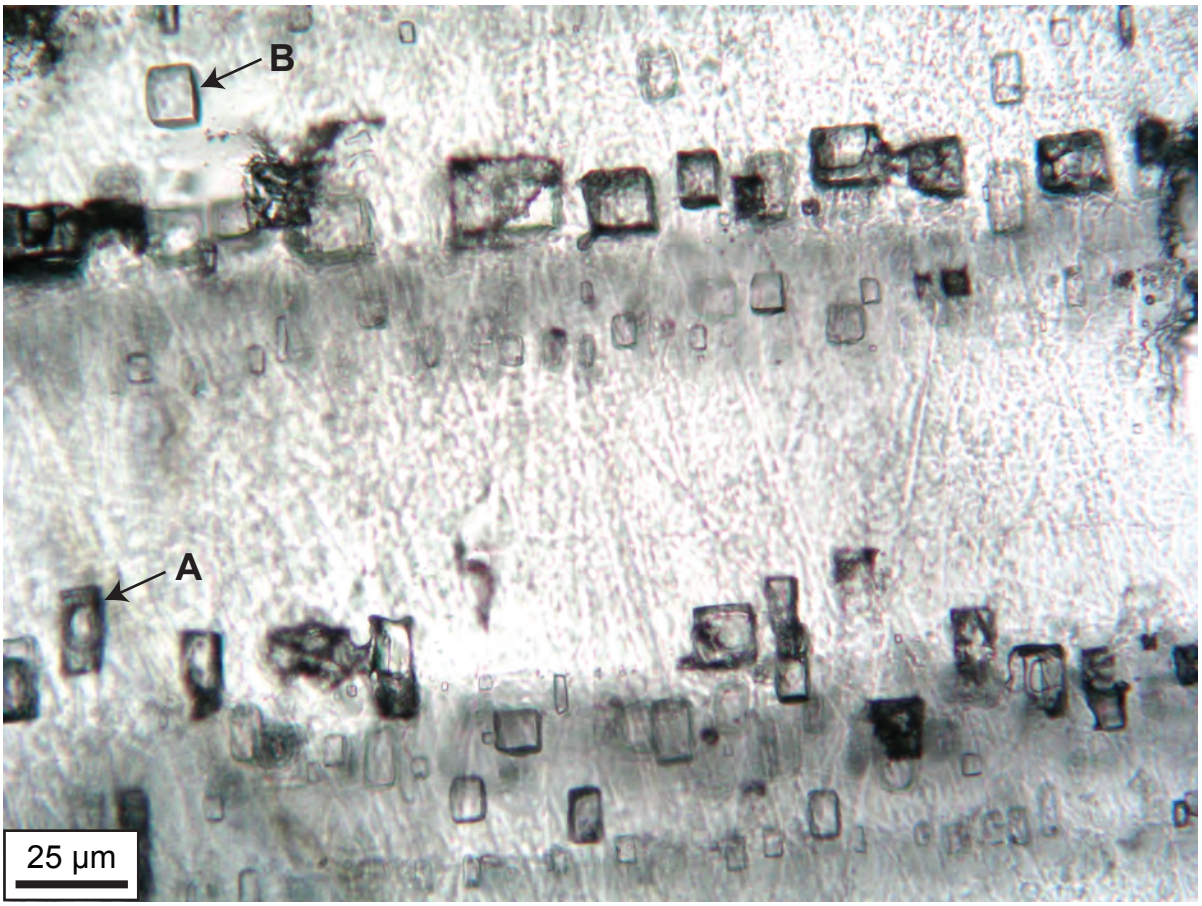
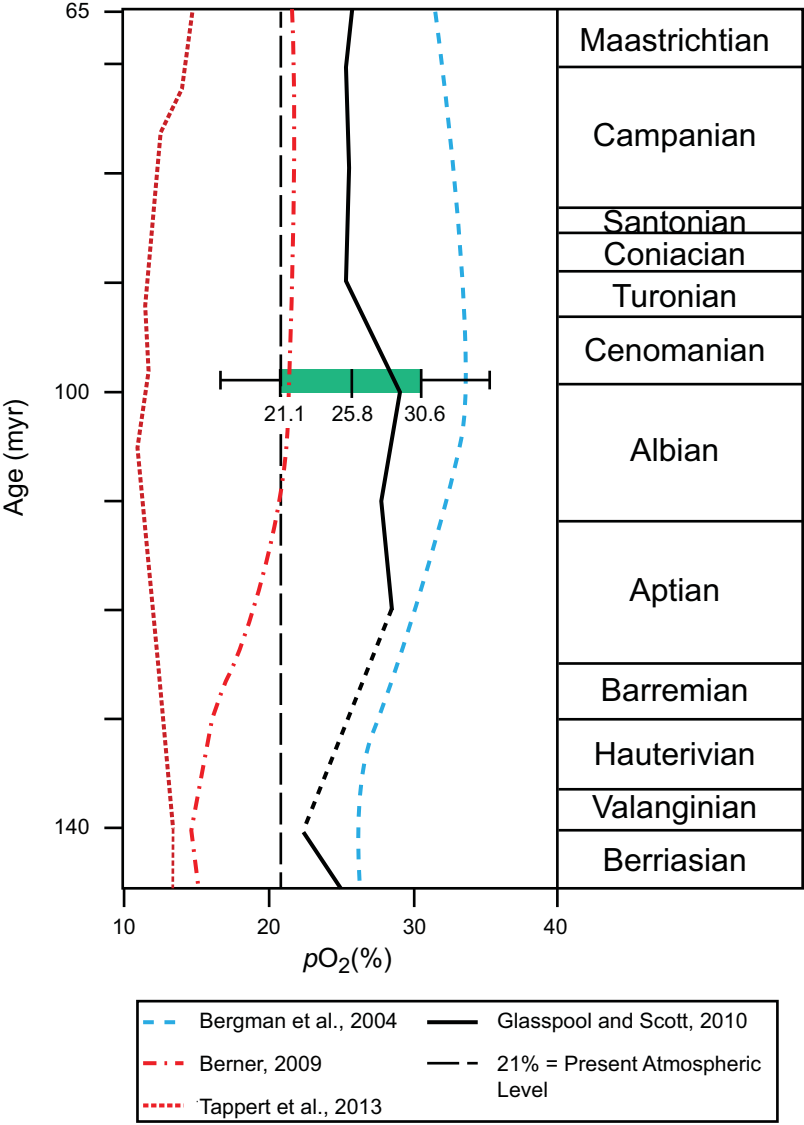


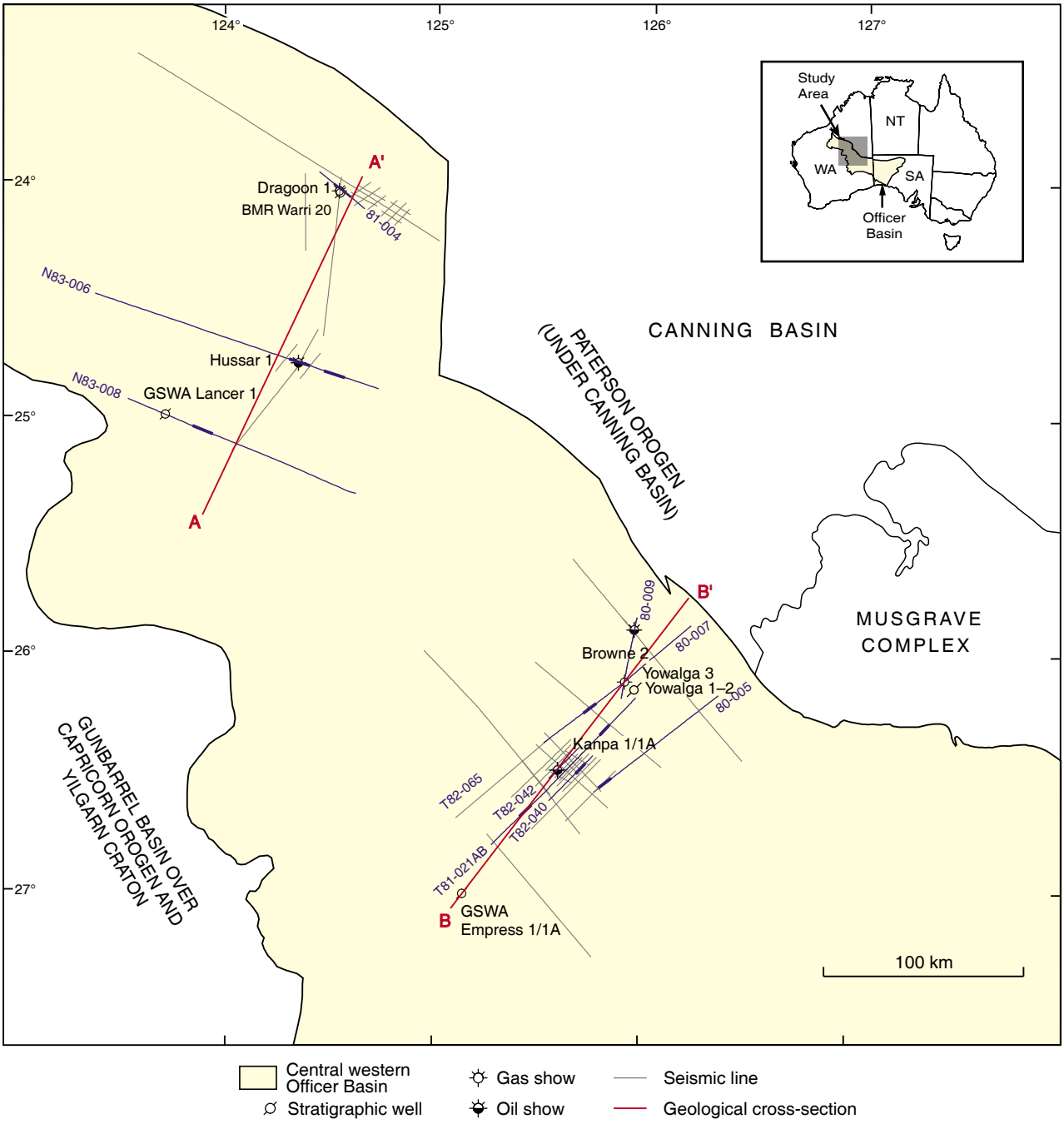

Neo-1
Sup Fig. DR1



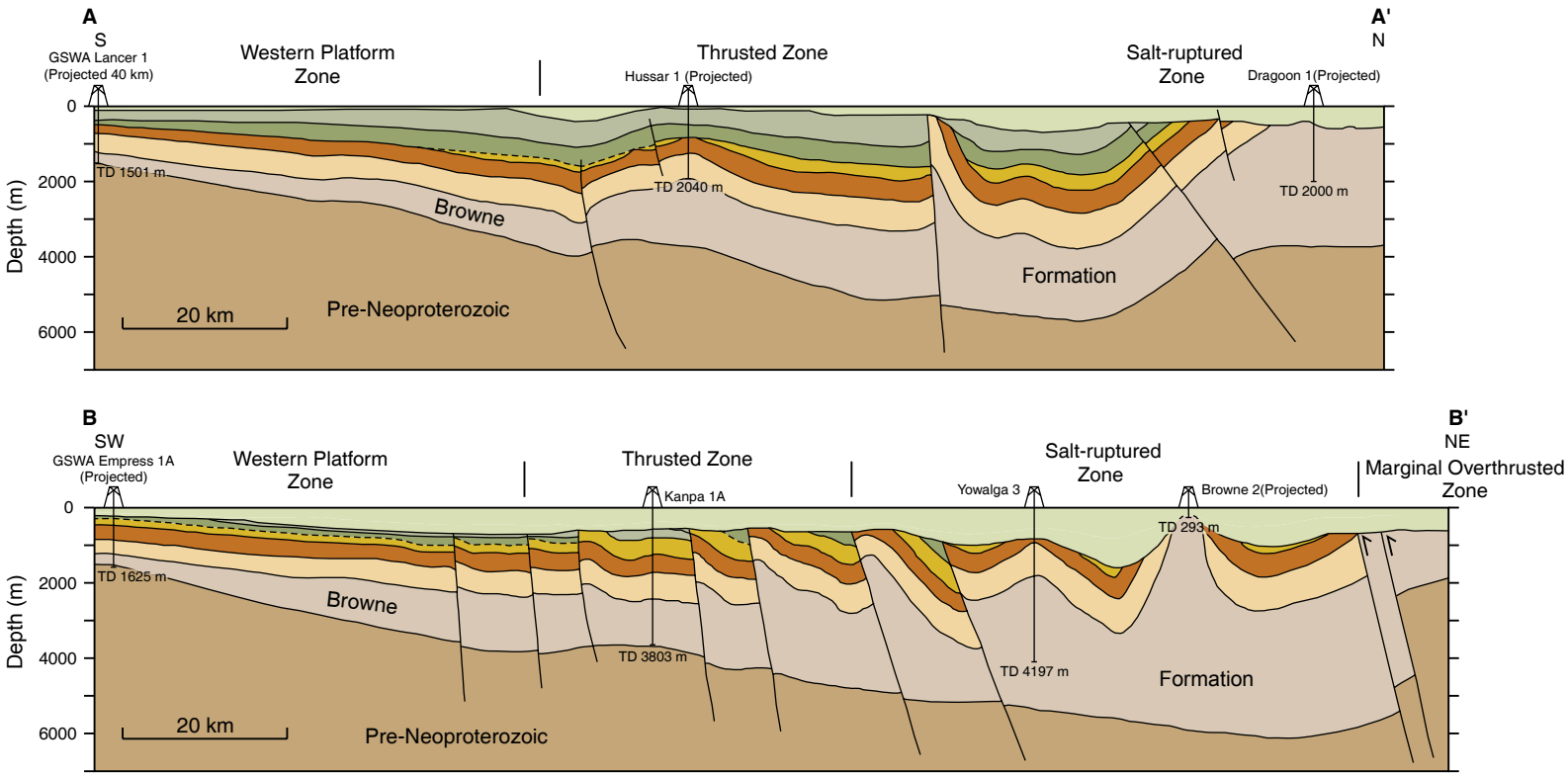

Neo-1
Sup Fig. DR2



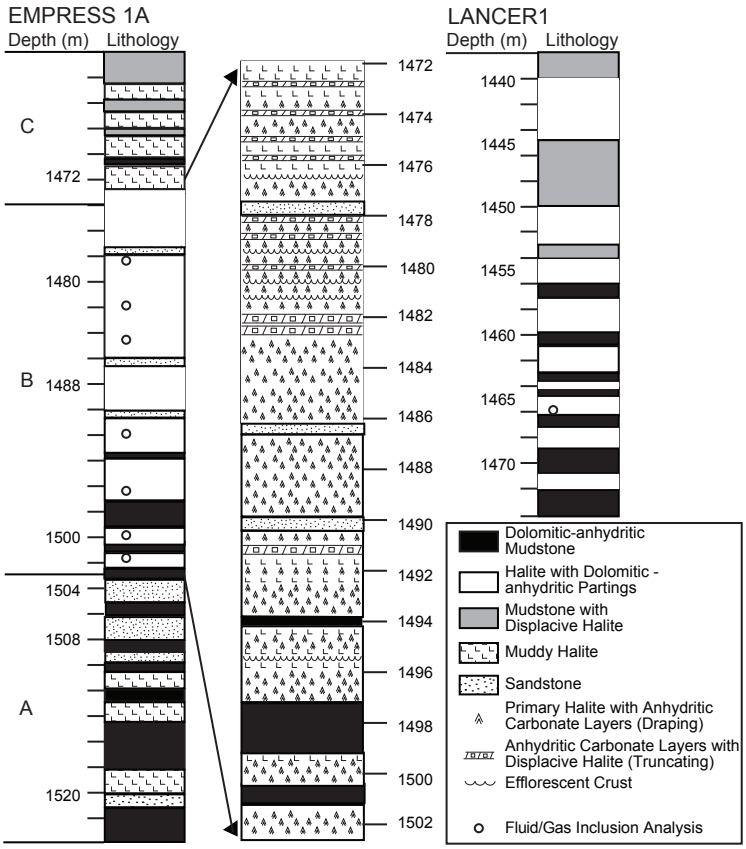

Neo-1
Sup Fig. DR3




Neo-1
Sup Fig. DR4




Neo-1
Sup Fig. DR5




Neo-1
Sup Fig. DR6

Appendix. Gas contents (mol %, water-free basis) of capillary tubes and halites (modern, Messinian, Cretaceous and Neoproterozoic)
Note: Mean-adj values reflect values without anomalous gas bursts and gas contents (results in red font)

| Sample | 7-1 microlitre air capillary tubes (New Mexico lab air) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Crush # | 9396a | 9396b | 9396c | 9404b | 9404c | 9404d | 9464a | Mean | stdev |
| N2 | 78.81 | 77.24 | 78.70 | 77.64 | 79.16 | 77.57 | 76.93 | 78.01 | 0.87 |
| O2 | 20.11 | 21.70 | 20.37 | 21.29 | 19.90 | 21.36 | 22.05 | 20.97 | 0.83 |
| Ar | 1.07 | 1.06 | 0.93 | 1.07 | 0.94 | 1.07 | 1.02 | 1.02 | 0.06 |
| Mols Gas | 1.59E-09 | 1.58E-09 | 1.75E-09 | 2.06E-09 | 2.11E-09 | 1.81E-09 | 1.52E-09 | 1.77E-09 | 2.35E-10 |

| Sample | Mosaic Mine, Carlsbad (modern, New Mexico, U.S.A.) GPS: 32°21'24" N, 103° 55' 21.75" W | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Crush # | 9255a | 9255b1 | 9255b2 | 9255c | 9255d | "9255e1 | "9255e2 | Mean | stdev |
| N2 | 81.89 | 81.65 | 80.00 | 75.36 | 79.71 | 79.56 | 82.32 | 80.07 | 2.36 |
| O2 | 17.01 | 17.19 | 18.80 | 23.62 | 19.38 | 19.46 | 16.76 | 18.89 | 2.38 |
| Ar | 1.10 | 1.15 | 1.20 | 1.02 | 0.91 | 0.98 | 0.92 | 1.04 | 0.11 |
| Mols Gas | 1.13E-12 | 4.44E-13 | 2.14E-12 | 1.53E-11 | 3.90E-12 | 3.61E-11 | 2.12E-12 | 8.74E-12 | 1.31E-11 |

| Sample | Lake Polaris (modern, north of Southern Cross, Western Australia) GPS: 31°14'11.01"S, 119°19'58.99"E | | | | | | |
|---|---|---|---|---|---|---|---|
| Crush # | 9413a | 9415a | 9415e | 9416b | 9416c | Mean | stdev |
| N2 | 78.15 | 80.58 | 72.48 | 74.50 | 78.52 | 76.85 | 3.28 |
| O2 | 20.89 | 18.60 | 26.14 | 23.76 | 19.54 | 21.79 | 3.11 |
| Ar | 0.84 | 0.85 | 0.81 | 1.52 | 1.91 | 1.19 | 0.50 |
| Mols Gas | 2.68E-11 | 5.7E-11 | 9.68E-12 | 4.6E-13 | 2.21E-13 | 1.88E-11 | 2.14E-11 |

| Sample | Racalmuto Mine (Messinian, ITALY) GPS: 37°15'N, 13°44'E | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Crush # | 9463b | 9463d | 9463e | 9463f | 9463h | 9465a | 9465b | 9465h | 9465j | 9465l | 9465m | 9465n | Mean | stdev |
| N2 | 81.41 | 77.46 | 83.03 | 80.43 | 79.23 | 79.28 | 79.94 | 81.15 | 79.22 | 77.98 | 81.50 | 75.24 | 79.66 | 2.10 |
| O2 | 17.74 | 21.76 | 16.19 | 18.72 | 19.86 | 19.95 | 19.17 | 18.15 | 20.00 | 21.09 | 17.61 | 23.88 | 19.51 | 2.08 |
| Ar | 0.85 | 0.78 | 0.78 | 0.85 | 0.91 | 0.77 | 0.90 | 0.71 | 0.78 | 0.93 | 0.89 | 0.88 | 0.84 | 0.07 |
| Mols Gas | 1.95E-12 | 2.81E-12 | 3.21E-12 | 7.07E-13 | 1.91E-12 | 1.09E-11 | 5.12E-12 | 1.84E-12 | 9.84E-12 | 6.80E-12 | 1.68E-12 | 7.03E-12 | 4.48E-12 | 3.42E-12 |

| Sample | Menyejing Formation (Cretaceous, CHINA) GPS: 22°42'01"N, 101°38'24"E | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Crush # | 9433a | 9433b | 9433c | 9433d | 9433e | 9433g | 9433j | 9433l | 9433m | 9433n | Mean | stdev | Mean-adj |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N2 | 77.82 | 79.10 | 72.76 | 75.42 | 63.82 | 82.37 | 74.21 | 73.00 | 82.15 | 69.90 | 75.05 | 5.69 | 73.25 |
| O2 | 21.09 | 19.98 | 26.37 | 23.72 | 35.33 | 16.79 | 24.90 | 26.08 | 16.94 | 29.08 | 24.03 | 5.69 | 25.82 |
| Ar | 1.09 | 0.92 | 0.87 | 0.85 | 0.84 | 0.85 | 0.89 | 0.92 | 0.91 | 1.03 | 0.92 | 0.08 | 0.93 |
| Mols Gas | 1.15E-11 | 1.10E-11 | 7.19E-12 | 5.85E-12 | 2.42E-11 | 1.97E-11 | 2.59E-11 | 1.63E-11 | 1.23E-10 | 3.39E-11 | 2.79E-11 | 3.46E-11 | |

| Sample | Empress | 1478m | (Neoproterozoic, AUSTRALIA) Empress 1A drillcore: 27°03'13" S, 125°09'24"E | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Crush # | 9231b | 9231c | 9231d | 9231e | 9231f | 9231g | 9231h | Mean | stdev |
| N2 | 97.64 | 97.78 | 97.11 | 97.19 | 98.22 | 98.43 | 98.47 | 97.83 | 0.6 |
| O2 | 1.76 | 1.68 | 2.46 | 2.10 | 1.20 | 1.11 | 1.16 | 1.64 | 0.5 |
| Ar | 0.61 | 0.54 | 0.44 | 0.71 | 0.58 | 0.45 | 0.37 | 0.53 | 0.1 |
| Mols Gas | 1.89E-12 | 1.63E-11 | 7.83E-12 | 7.76E-12 | 1.04E-11 | 5.09E-12 | 1.09E-11 | 8.60E-12 | 4.60E-12 |

| Sample | Empress | 1482m | (Neoproterozoic, AUSTRALIA) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Crush # | 9227a | 9227b | 9227e | 9227f | 9227g | 9227h | 9438a | 9438b | 9438c | 9438d | Mean | stdev | Mean-adj |
| N2 | 87.63 | 88.63 | 91.46 | 92.05 | 84.17 | 95.95 | 87.46 | 90.51 | 87.82 | 86.76 | 89.24 | 3.3 | 88.48 |
| O2 | 11.52 | 10.49 | 7.82 | 7.14 | 14.78 | 3.56 | 11.54 | 8.34 | 11.13 | 12.23 | 9.86 | 3.2 | 10.48 |
| Ar | 0.85 | 0.87 | 0.72 | 0.81 | 1.05 | 0.49 | 1.00 | 1.15 | 1.05 | 1.02 | 0.90 | 0.2 | 0.96 |
| Mols Gas | 6.88E-11 | 1.81E-10 | 2.27E-11 | 2.93E-11 | 3.52E-11 | 1.31E-10 | 5.10E-11 | 6.63E-12 | 7.50E-12 | 1.45E-11 | 5.48E-11 | 5.79E-11 | |

| Sample | Empress | 1492m | (Neoproterozoic, AUSTRALIA) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Crush # | 9232b | 9232c | 9232d | 9232e | 9232f | 9232g | 9435a | 9435b | 9435c | Mean | stdev | Mean-adj |
| N2 | 86.03 | 85.74 | 88.05 | 90.04 | 91.81 | 92.81 | 87.85 | 99.48 | 90.09 | 90.21 | 4.2 | 89.05 |
| O2 | 12.90 | 13.40 | 11.08 | 9.21 | 7.62 | 6.78 | 11.60 | 0.44 | 9.10 | 9.12 | 4.0 | 10.21 |
| Ar | 1.07 | 0.86 | 0.87 | 0.75 | 0.57 | 0.41 | 0.55 | 0.08 | 0.81 | 0.66 | 0.3 | 0.74 |
| Mols Gas | 1.59E-11 | 2.98E-11 | 2.22E-11 | 3.10E-11 | 2.43E-11 | 1.96E-11 | 1.40E-12 | 1.38E-10 | 4.82E-11 | 3.67E-11 | 4.00E-11 | |

| Sample | Empress | 1497m | (Neoproterozoic, AUSTRALIA) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Crush # | 9228a | 9228b | 9228c | 9228d | 9228e | 9228f | 9228h | Mean | stdev | Mean-adj |
| N2 | 84.58 | 94.45 | 89.38 | 90.29 | 93.98 | 94.24 | 86.84 | 90.54 | 3.9 | 89.11 |
| O2 | 14.58 | 4.93 | 9.79 | 8.87 | 5.24 | 4.69 | 12.58 | 8.67 | 3.9 | 10.15 |
| Ar | 0.84 | 0.63 | 0.84 | 0.84 | 0.79 | 1.07 | 0.58 | 0.80 | 0.2 | 0.74 |
| Mols Gas | 9.85E-12 | 3.03E-11 | 1.17E-11 | 3.05E-12 | 5.43E-12 | 3.33E-12 | 1.07E-11 | 1.06E-11 | 9.37E-12 | |

| Sample | Empress | 1502.2m | (Neoproterozoic, AUSTRALIA) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Crush # | 9230b | 9230c | 9230d | 9230e | 9230f | 9230g | 9230h | Mean | stdev |
| N2 | 84.87 | 84.59 | 86.20 | 84.81 | 85.33 | 85.91 | 85.87 | 85.37 | 0.6 |
| O2 | 14.03 | 14.10 | 12.42 | 13.93 | 13.56 | 12.95 | 13.05 | 13.43 | 0.6 |
| Ar | 1.11 | 1.31 | 1.38 | 1.26 | 1.11 | 1.14 | 1.08 | 1.20 | 0.1 |
| Mols Gas | 5.37E-11 | 1.39E-11 | 1.37E-11 | 2.66E-11 | 8.80E-12 | 5.38E-11 | 4.85E-11 | 3.13E-11 | 2.02E-11 |

| Sample | Lancer | 1466.3m | (Neoproterozoic, AUSTRALIA) Lancer 1 drill core: 25°02'44.5"S, 123°45'20.1"E | | | | | |
|---|---|---|---|---|---|---|---|---|
| Crush # | 9229a | 9229b | 9229c | 9229d | 9229g | Mean | stdev | Mean-adj |
| N2 | 95.57 | 90.17 | 95.24 | 87.47 | 89.65 | 91.6 | 3.6 | 89.09 |
| O2 | 4.00 | 9.08 | 4.36 | 11.88 | 9.71 | 7.81 | 3.5 | 10.23 |
| Ar | 0.42 | 0.75 | 0.40 | 0.65 | 0.65 | 0.57 | 0.2 | 0.68 |
| Mols Gas | 1.03E-10 | 2.31E-11 | 4.15E-11 | 1.19E-11 | 1.92E-10 | 7.42E-11 | 7.44E-11 | |