**Supplement:**

Note: Incubations for the beginning of the time series for the 20m and 39.5m were destroyed during transport, leaving us without initial rates for these depths. Therefore we used the first available point (T3) to determine the rate for these Incubations. It is difficult to ascertain if these incubations are any different from the one at 81.7 meters. Total consumption throughout the experiment and similar rates for later time intervals provides a baseline that initial rates also have been similar for these incubations as they were for the 81.7m incubations. However the small difference between the 20 and 39.5m incubations may provide evidence indicating that the rates are slowly increasing with depth.

**Figure Captions:**

Table S1. Variables related to $O_2$ diffusion calculation into the Syringes are listed. Many of the variables are changing with sampling interval (Time), when assessing the diffusive fluxes into the glass and plastic syringes during incubations.

Table S2. Values for diffusion coefficient and average values for the diffusive flux, average diffusion rate into the syringes and final accumulated concentration due to diffusion are given for the glass and plastic syringes used in the incubations.

Table S3. Data used with Eq. 2 and 3 to calculate metabolic activity and carbon assimilation during incubations, from which time series then the 1st order rates of Fig. 4 were determined.

Fig. S1. Rate at which $O_2$ leaks into the syringes vs. syringe volume, plastic syringes in (circles) and glass syringes in (triangles). Glass syringes have all identical rates since they all have the same initial concentration.

Fig. S2. Rate of concentration change in the syringes due to diffusion into them vs. syringe volume, plastic syringes in (circles) and glass syringes in (triangles). Glass syringes have all identical rates concentration change since they all have the same initial concentration.

| Sampling interval<br><br>Depth 20m for Plastic<br>Glass =all | Syringe type | Surface Area<br><br>($cm^2$) | Diffusion Path length dx<br>(mm) | Diffusion rate into syringe<br>($\mu mol\ s^{-1}$) | Diffusive flux<br><br>($\mu mol\ cm^{-2}\ s^{-1}$) |
|---|---|---|---|---|---|
| T1 | plastic | 99.7 | 1.0 | 1.82E-6 | 1.82E-8 |
| T2 | plastic | 85.4 | 1.0 | 1.56E-6 | 1.82E-8 |
| T3 | plastic | 71.2 | 1.0 | 1.30E-6 | 1.82E-8 |
| T4 | plastic | 57.0 | 1.0 | 1.04E-6 | 1.82E-8 |
| T1 | glass | 0.215 | 55.0 | 2.49E-7 | 1.16E-6 |
| T2 | glass | 0.215 | 65.9 | 2.08E-7 | 9.69E-7 |
| T3 | glass | 0.215 | 76.8 | 1.78E-7 | 8.32E-7 |
| T4 | glass | 0.215 | 87.6 | 1.57E-7 | 7.28E-7 |

Table S1

| Depth (m) | Syringe type | Ambient $O_2$ concentration ($\mu mol\ l^{-1}$) | $O_2$ concentration differential $d_o = (O_{2\ sat}-O_{2\ syr})/1000$ ($\mu mol\ cm^{-3}$) | Diffusive $O_2$ Flux at $T_0$ ($\mu mol\ cm^{-2}\ s^{-1}$) | Average Diffusion Rate into Syringe ($\mu mol\ l^{-1}\ d^{-1}$) | Maximum reachable $O_2$ concentration ($\mu mol\ l^{-1}$) |
|---|---|---|---|---|---|---|
| 20 | plastic | 210.5 | 0.0396 | 1.82E-8 | 2.7 | 250 |
| 39.5 | plastic | 137.8 | 0.1128 | 5.19E-8 | 7.8 | 250 |
| 81.7 | plastic | 58.4 | 0.1916 | 8.81E-8 | 13.4 | 72 |
| 105 | plastic | 4.9 | 0.2456 | 1.13E-7 | 16.7 | 9.4 |
| 110 | glass | <2.5 | 0.250 | 1.1E-4 | 0.2 | 2.2E-2 |
| 115 | glass | anoxic | 0.250 | 1.1E-4 | 0.2 | 2.4E-2 |
| 120 | glass | anoxic | 0.250 | 1.1E-4 | 0.2 | 1.4E-2 |
| 130 | glass | anoxic | 0.250 | 1.1E-4 | 0.2 | 1.4E-2 |

Table S2

| Depth | Incubation Time (days) | [$CH_4$] µmol $l^{-1}$ | Initial DPM $CH_4$ | Assimilation DPM | $CO^2$ DPM | Carbon Assimilated (nmol $l^{-1}$) | $CO_2$ Produced (nmol $l^{-1}$) | Total Methane consumed (nmol $l^{-1}$) |
|---|---|---|---|---|---|---|---|---|
| 20m | 0 | - | 4523 | 0 | 0 | 0.00 | 0.00 | 0.00 |
| | 2.96 | 0.22 | 4523 | -3.56 | -2.03 | -0.17 | -0.10 | -0.27 |
| | 10.65 | 0.43 | 4523 | 18.42 | 18.34 | 1.74 | 1.73 | 3.47 |
| 39m | 0 | - | 4339 | 0 | 0 | 0.00 | 0.00 | 0.00 |
| | 2.98 | 0.16 | 4339 | 38.37 | 53.28 | 1.38 | 0.00 | 1.38 |
| | 10.68 | 0.22 | 4339 | 32.50 | 94.66 | 1.63 | 4.75 | 6.38 |
| 81.7m | 0 | - | 10189 | 0 | 0 | 0.00 | 0.00 | 0.00 |
| | 0.01 | 0.16 | 10189 | 38.65 | -3.19 | 0.62 | -0.05 | 0.57 |
| | 0.30 | 0.22 | 10189 | 42.96 | 0.07 | 0.94 | 0.00 | 0.94 |
| | 1.02 | 0.21 | 10189 | 44.22 | 17.11 | 0.90 | 0.35 | 1.25 |
| 105m | 0 | 4.61 | 12680 | 0 | 0 | 0.00 | 0.00 | 0.00 |
| | 0.01 | 4.23 | 12680 | 67.80 | 6.62 | 22.63 | 2.21 | 24.83 |
| | 0.30 | 4.06 | 12680 | 165.05 | 75.49 | 52.85 | 24.17 | 77.03 |
| 110m | 0 | 21.48 | 6090 | 0 | 0 | 0.00 | 0.00 | 0.00 |
| | 0.03 | 20.32 | 6090 | 45.53 | 5.95 | 151.93 | 19.87 | 171.80 |
| | 0.11 | 24.32 | 6090 | 99.77 | 14.34 | 398.36 | 57.25 | 455.61 |
| 115m | 0 | 53.68 | 5310 | 0 | 0 | 0.00 | 0.00 | 0.00 |
| | 0.05 | 57.72 | 5310 | 32.20 | 7.08 | 350.01 | 76.93 | 426.94 |
| | 0.12 | 75.62 | 5310 | 52.80 | 45.12 | 751.88 | 642.44 | 1394.32 |
| 120m | 0 | 125.27 | 5466 | 0 | 0 | 0.00 | 0.00 | 0.00 |
| | 0.02 | 144.16 | 5466 | 21.21 | 2.29 | 559.45 | 60.31 | 619.76 |
| | 0.07 | 134.73 | 5466 | 29.63 | 2.74 | 730.26 | 67.60 | 797.86 |
| 130m | 0 | 432.36 | 5938 | 0 | 0 | 0.00 | 0.00 | 0.00 |
| | 0.02 | 369.35 | 5938 | 27.95 | 45.48 | 1738.48 | 2828.86 | 4567.34 |
| | 0.06 | 1405.75 | 5938 | 17.43 | 14.21 | 4125.75 | 3364.46 | 7490.20 |

Table S3

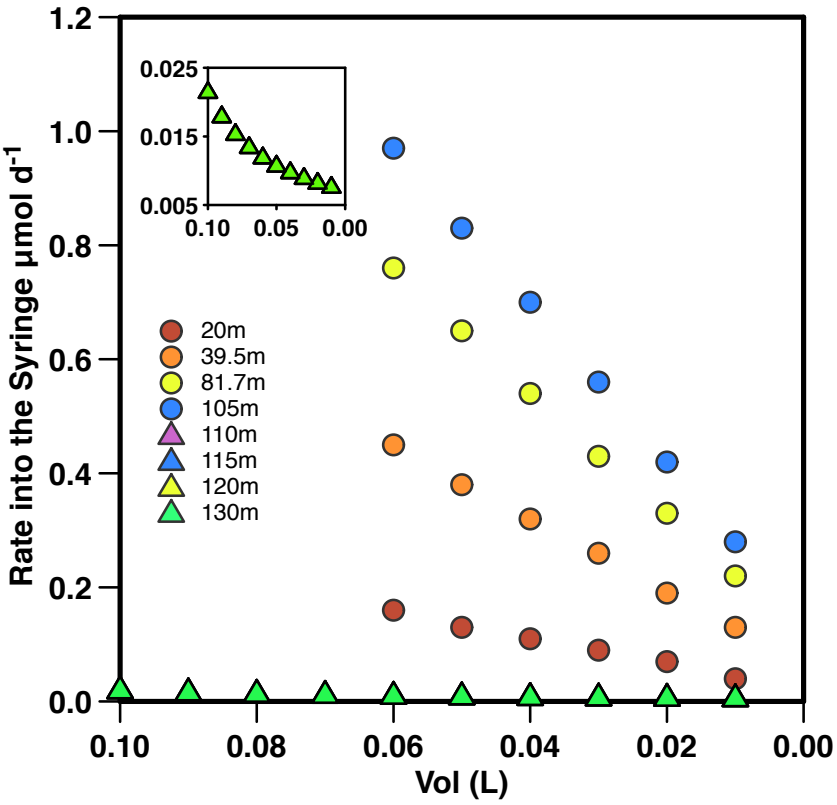
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Rate into the Syringe µmol d-1
0.10
0.08
0.06
0.04
0.02
0.00
Vol (L)
0.025
0.015
0.005
0.10
0.05
0.00
20m
39.5m
81.7m
105m
110m
115m
120m
130m

Fig. S1

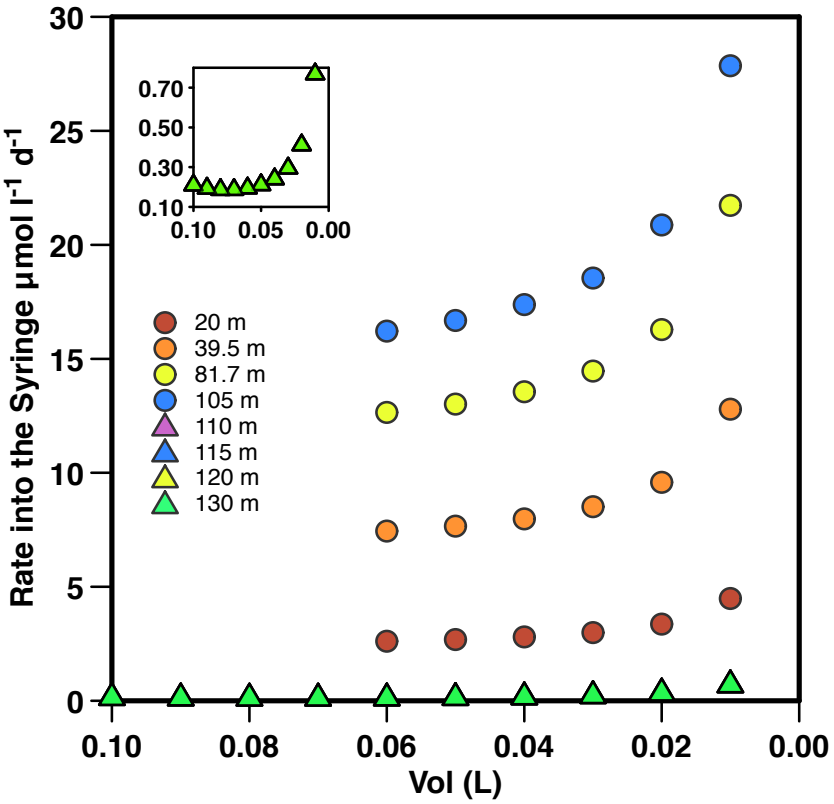
Rate into the Syringe µmol l-1 d-1
Vol (L)
20 m
39.5 m
81.7 m
105 m
110 m
115 m
120 m
130 m

Fig. S2