*Supplementary material*

# The Effect of the 2013-2016 High Temperature Anomaly in the Northeast Subarctic Pacific (The "Blob") on Net Community Production

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**Table S1** Confidence intervals for oxygen measurements and the gas exchange mass transfer coefficients used in the Monte Carlo estimate for ANCP uncertainty from the oxygen mass balance model (see also Yang et al., 2017). We considered the four most serious uncertainties (column 1) to be the degree of oxygen supersaturation $\Delta[O_2]$; gas exchange mass transfer coefficients for: air-sea diffusive exchange, $k_s$; small bubble collapse, $k_c$; large bubble exchange $k_p$; and the eddy diffusion coefficient at the base of winter mixed layer, $K_z$.

| Parameter | Confidence intervals (%) |
|---|---|
| $\Delta[O_2]$ | ± 0.1 |
| $k_s$ | ± 10 |
| $k_c$ & $k_p$ | ± 25 |
| $K_z$ | ± 50 |

**Text S1**

Residence time (τ) with respect to gas exchange can be calculated as the examples shown by Emerson and Hedges, 2008. Initial conditions for these calculations are: t = 20°C, TA= 2300 μ mol kg$^{-1}$, DIC = 2000 μ mol kg$^{-1}$, $[CO_2]$ = 11.3 μ mol kg$^{-1}$, Revelle Factor R = 9.6.

For $O_2$, since its solubility is very low, we can use a one-way gas exchange flux in Equation 1:

$$\tau = \frac{h \cdot [C]}{F_{air-water}} = \frac{h \cdot [C]}{G \cdot [C]} = \frac{h}{G} \qquad (1)$$

Where [C] is the gas concentration, h is the mixed layer depth, $F_{air-water}$ is the one-way gas change flux, and G is the gas exchange mass transfer coefficient.

With the mean gas exchange mass transfer coefficient of 5 m d$^{-1}$ and a mixed layer depth of 100 m, the residence time for $O_2$ is 20 d.

Due to the carbonate system reactions, the true reservoir size for $CO_2$ is larger than its concentration, $[CO_2]$. The ratio of the DIC reservoir that exchange C with the $CO_2$ reservoir is $\frac{\Delta DIC}{\Delta CO_2}$. Therefore the residence time for $CO_2$ can be calculated with Equation 2:

$$\tau = \frac{h \cdot [CO_2]}{G \cdot [CO_2]} \times \frac{\Delta DIC}{\Delta CO_2} = \frac{h}{G}\left(\frac{DIC}{R[CO_2]}\right) \quad (2)$$

With the DIC, R, and $[CO_2]$ values provided above, and the h/G value from Equation 1, the residence time for $CO_2$ is 368 d.

**Reference**

Emerson, S., and J. Hedges. 2008. Chemical oceanography and the marine carbon cycle,.