



## Supplement of

## Decoupling of $\Delta O_2$ / Ar and particulate organic carbon dynamics in nearshore surface ocean waters

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**Figure S1**: Relationship between particulate organic carbon (POC) concentration measured in 5 m CTD cast samples and underway beam attenuation ( $c_{p660}$ ) at 660 nm, measured within 5 minutes of the cast time. The five higher values were collected during drifter period 1, while the two lowest values were collected during the first day of drifter period 2. The best-fit linear regression of [POC] against  $c_{p660}$  (thick black line) is plotted relative to the linear regression (thin line) reported in Graff et al. (2015).



**Figure S2**: Vertical profiles of (left to right) dissolved nitrous oxide (N<sub>2</sub>O) concentration, dissolved oxygen (O<sub>2</sub>) concentration, [N<sub>2</sub>O]<sub>bio</sub> (Sect. 2.6.1, Eq. 7), [O<sub>2</sub>]<sub>bio</sub> (Sect. 2.6.1, Eq. 3), and the ratio of [O<sub>2</sub>]<sub>bio</sub> to [N<sub>2</sub>O]<sub>bio</sub> during (top) drifter period 1 and (bottom) drifter period 2. Gas samples were taken during CTD deployments from 12:00 to 14:00 of each day. The horizontal lines on each panel represent the average depths of the mixed layer (solid line) and base of the euphotic zone (dashed line). All concentration units are mmol m-3. The uncertainty in [O<sub>2</sub>]<sub>bio</sub>/[N<sub>2</sub>O]<sub>bio</sub> is 14.1% (Izett et al., 2018).



**Figure S3:** (a-c) Underway measurements of sea surface PAR, temperature, and salinity. Anomalous values, likely from intrusion of external water masses into the sampled drifter patch, are shaded. Underway observations from these periods were omitted from the data set. The brief decrease in PAR during the morning of 21 August was caused by a total solar eclipse. (d) The spectral slope of particulate backscatter (b<sub>bp</sub>). (e) Bulk refractive index ( $\eta_p$ ) at 470 nm, 532 nm and 650 nm.



**Figure S4**: Nutrient concentration time series during both drifter periods. The gray point indicates an anomalously high value measured during an erratic CTD cast during the third night of drifter period 1. This data point was omitted from analysis. The dashed line is the best fit linear regression of each nutrient concentration against time. All regressions indicated significant changes (p<0.05), except for [NO3-+NO2-] concentrations during drifter survey 2.



**Figure S5**: The difference between NCP<sub>02/Ar</sub> and NCP<sub>POC</sub> values calculated in three-hour increments over both drifter periods (Eq. 11; Sect. 2.6.3). Shaded segments in this panel roughly correspond to night time periods. The vertical dashed line indicates the break between drifter periods 1 and 2.