Supplementary Material

Figure S1. Residual preNO$_3$ [μM] on the neutral density $\gamma^n = 26.5$ surface in the North Atlantic. Residual preNO$_3$ is calculated using the values of f_{DOM} and r_{DOM} determined from the BATS station in Table 1 with a value of $r_{POM} = 10.6$. The dissolved O$_2$ and nitrate + nitrite for this calculation are from the World Ocean Atlas 2013 annual climatology. The bottom plots show residual preNO$_3$ [μM] versus CFC-11 and CFC-12 age [years] with depth [m] in color. The BATS station and its data point are highlighted on each plot. The bottom plots including CFC data are from the GLODAP v2 dataset plotted in the domain of the North Atlantic map (top plot).
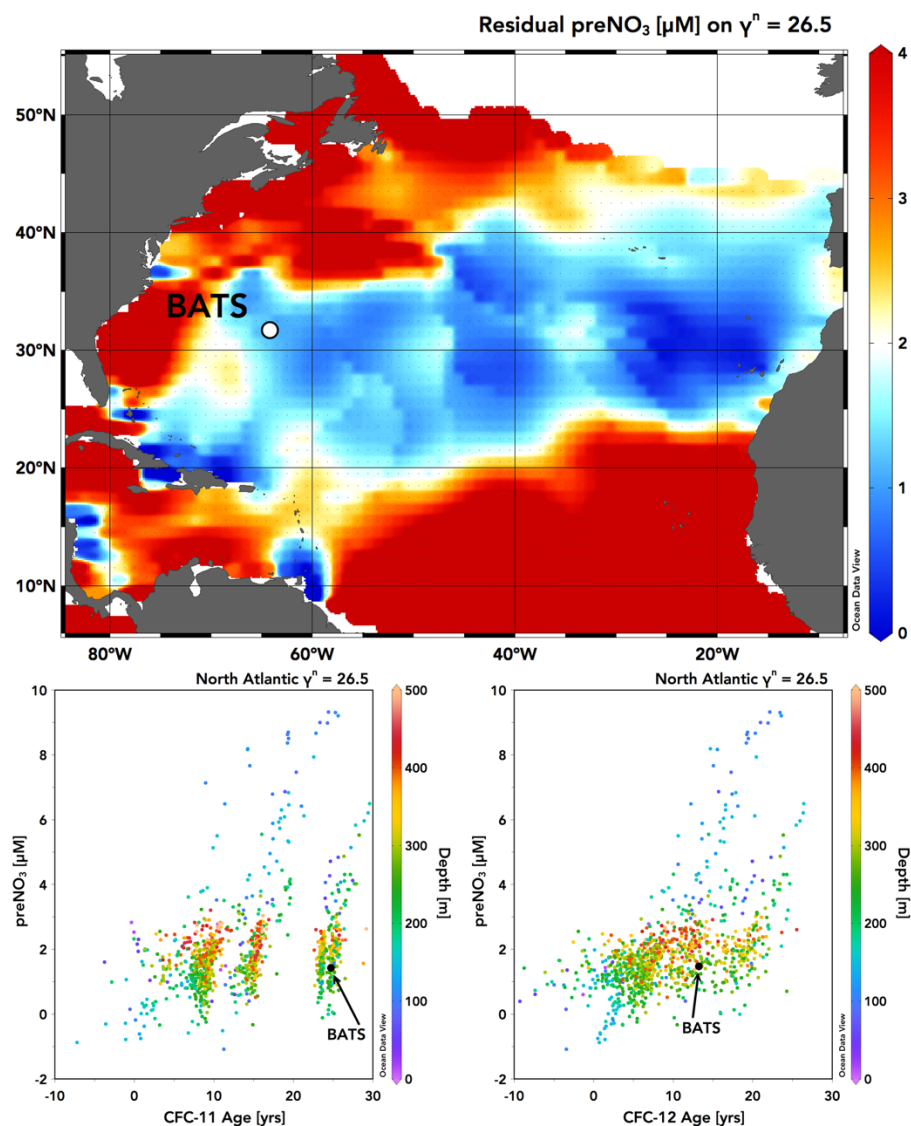
Figure S2. Residual preNO$_3$ [µM] on the neutral density $\gamma^n = 26.0$ surface in the North Atlantic.

All datasets and calculations are performed analogous to those detailed for Figure S1.
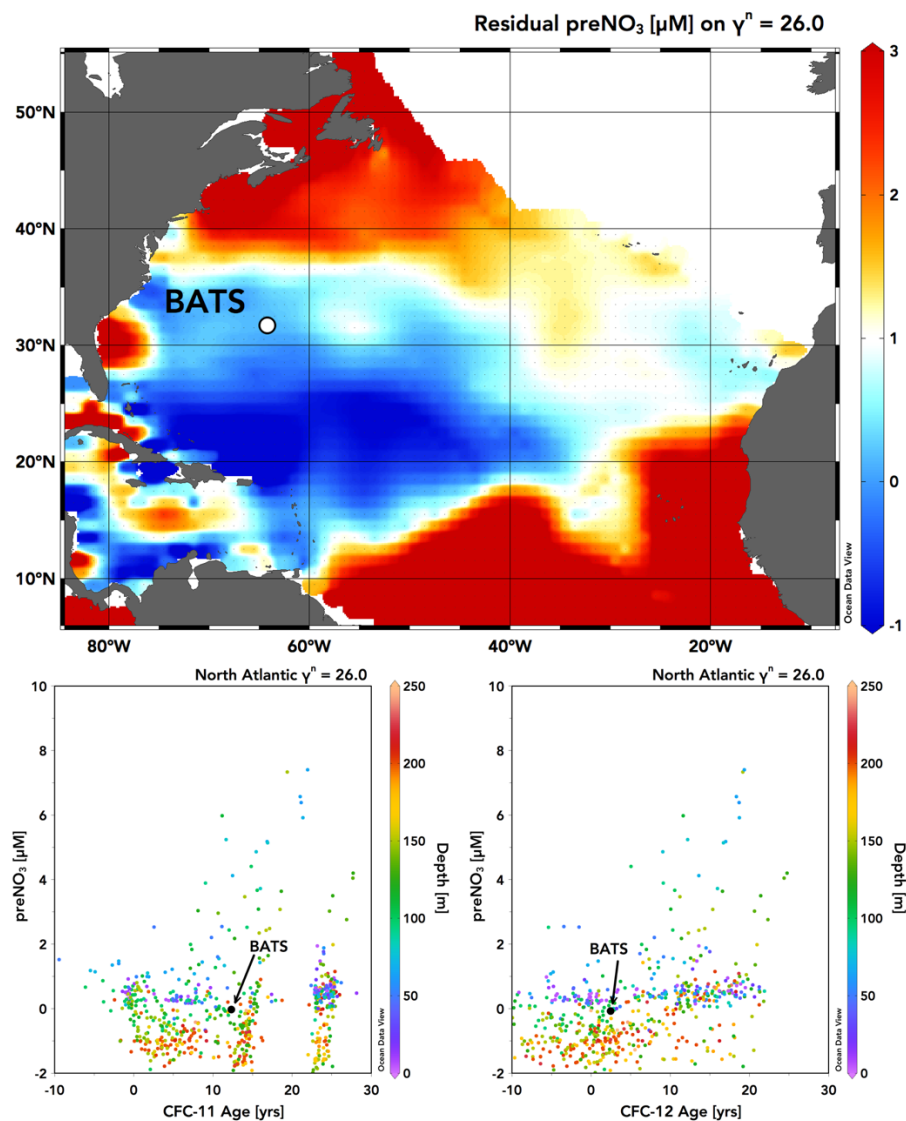
Figure S3. Residual preNO$_3$ [μM] on the neutral density $\gamma^n = 25.4$ surface in the North Pacific. Residual preNO$_3$ is calculated using the values of f_{DOM} and r_{DOM} determined from station ALOHA in Table 1 with a value of $r_{POM} = 10.6$. The dissolved O$_2$ and nitrate + nitrite for this calculation are from the World Ocean Atlas 2013 annual climatology. The bottom plots show residual preNO$_3$ [μM] versus CFC-11 and CFC-12 age [years] with depth [m] in color. Station ALOHA and its data point are highlighted on each plot. The bottom plots including CFC data are from the GLODAP v2 dataset plotted in the domain of the North Pacific map (top plot).
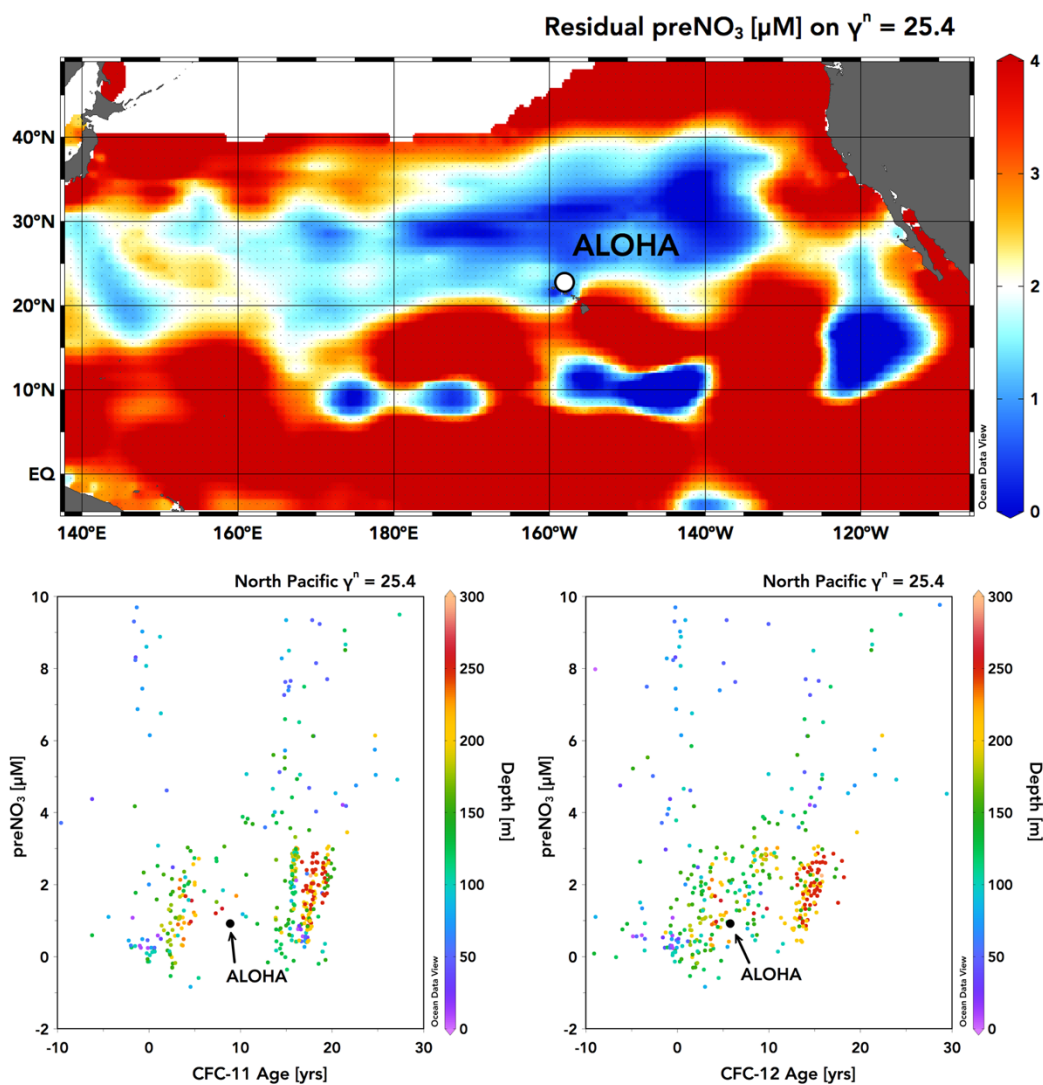
Figure S4. Residual preNO$_3$ [μM] on the neutral density $\gamma^n = 24.7$ surface in the North Pacific. All datasets and calculations are performed analogous to those detailed for Figure S3.
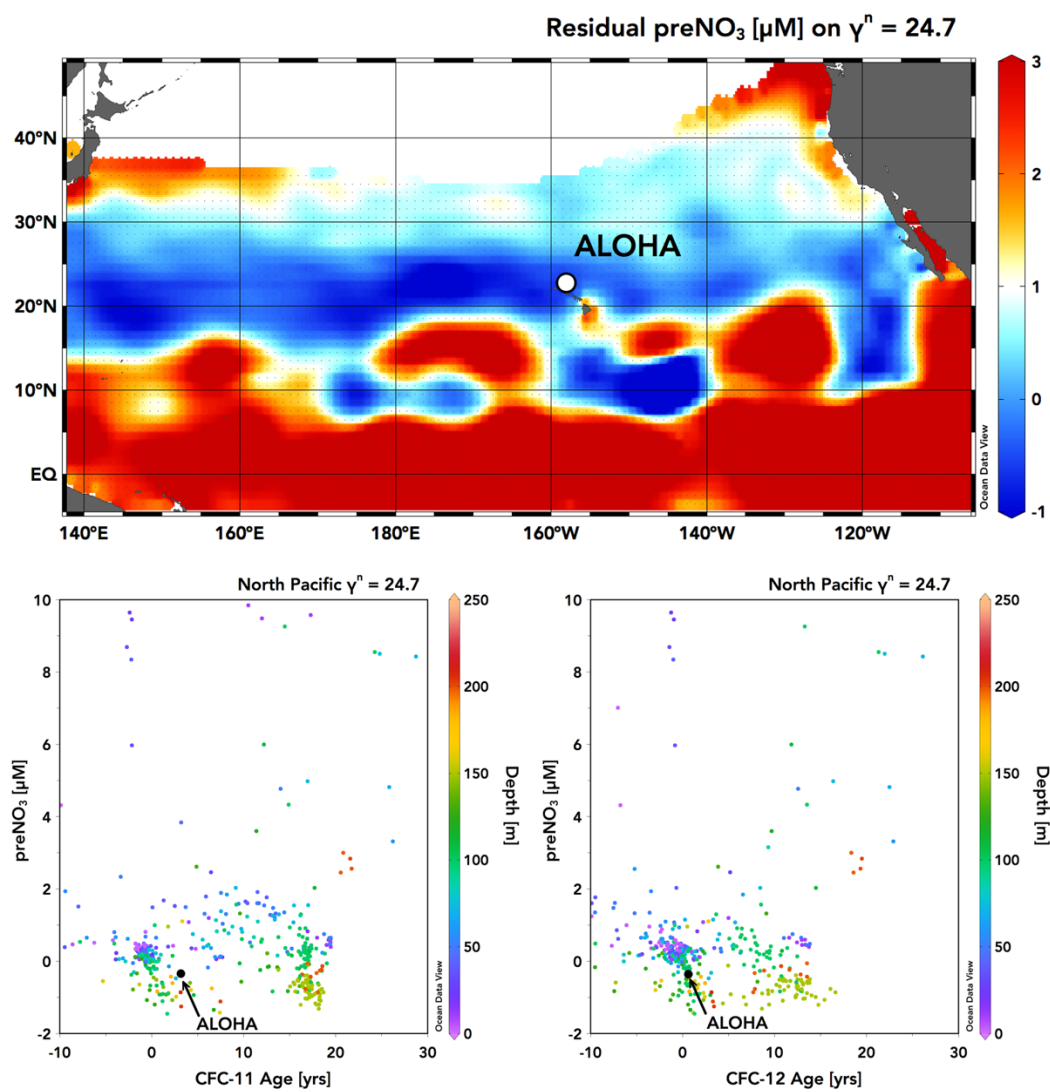
Figure S5. Climatology of the residual prePO$_4$ tracer [μM] in the upper 250 m at station

ALOHA (22.75 °N 158 °W). Black contour lines show neutral density γ^n = 24.2, 24.7, and 25.2.

Residual prePO$_4$ is calculated using the values of f_{DOM} and r_{DOM} determined from regressions of

AOU versus DON (converted to –O$_2$:P using N:P = 16) from station ALOHA in Table 1 with a

value of r_{POM} = 10.6.
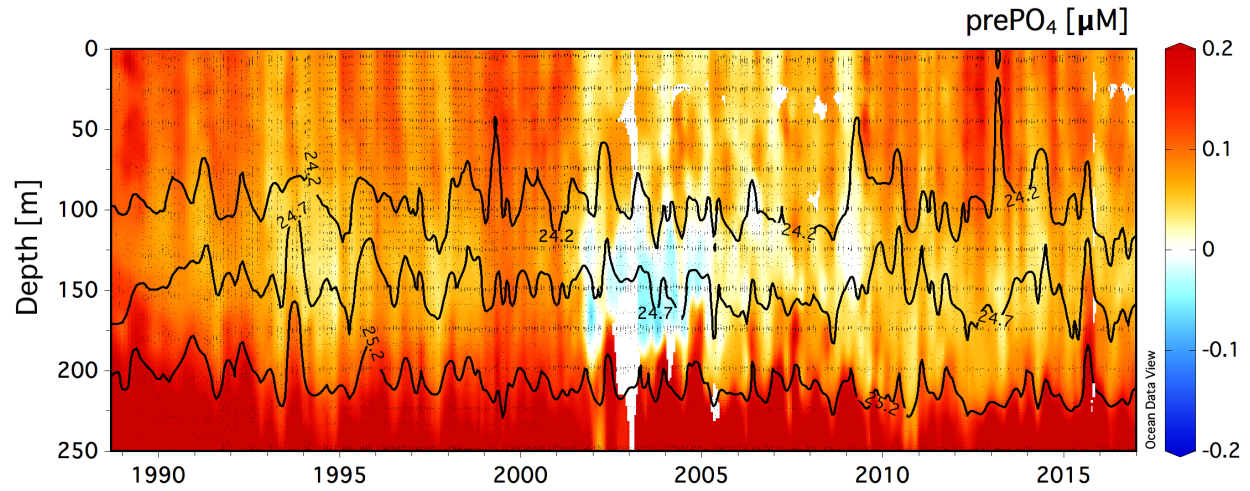
Figure S6. Climatology of the residual prePO$_4$ tracer [µM] in the upper 200 m at the BATS station (31.67 ºN 64.17 ºW). Black contour lines show neutral density γ^n = 25.8 and 26.3. Residual prePO$_4$ is calculated using the values of f_{DOM} and r_{DOM} determined from regressions of AOU versus DON (converted to $-O_2$:P using N:P = 16) from the BATS station in Table 1 with a value of r_{POM} = 10.6.
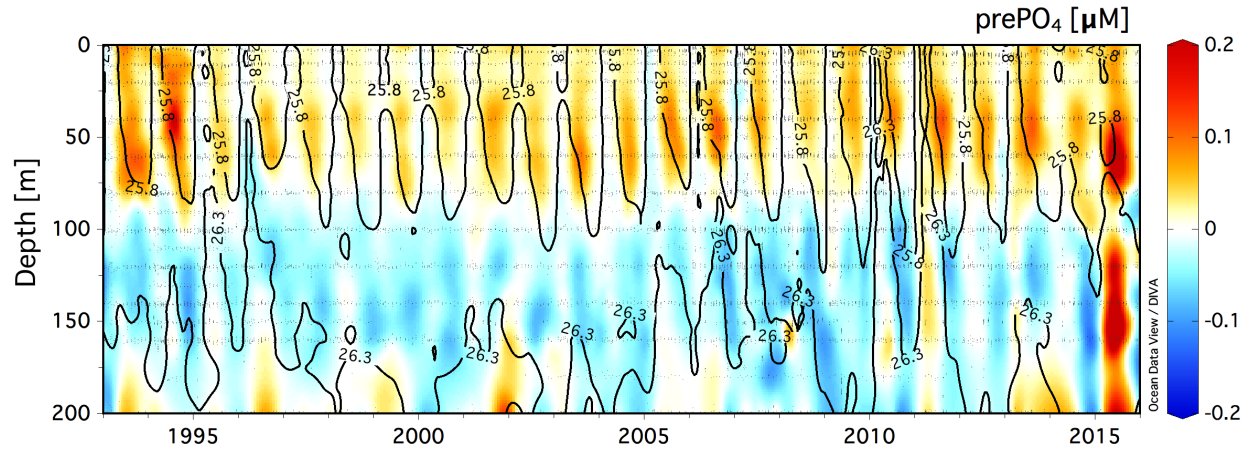
Figure S7. Climatology of a theoretical prePO$_4$ tracer [µM] in the upper 200 m at the BATS station (31.67 ºN 64.17 ºW). Black contour lines show neutral density $\gamma^n = 25.8$ and 26.3. The theoretical prePO$_4$ is calculated by finding the value of R$_{-O2:P}$, the stoichiometric ratio of O$_2$ consumed to PO$_4$ released for organic matter remineralization, that eliminates the negative prePO$_4$ anomaly present in the subsurface of the time series presented in Figure S6. The value of R$_{-O2:P}$ that eliminates the negative prePO$_4$ anomaly is ~1000:1 (plotted).