

Reviewer #1

This is categorically an FRRf paper and yet the authors ‘muddy the water’ by effectively integrating PAM- (multiple turnover, MT) and FRRf- (single turnover, ST) based concepts and publications (e.g. LN63 references). I have no issue with one or other approach in their own rights and it is understandable to cover as wider ground as possible BUT data from ST and MT cannot be easily reconciled; in the case of MT, the protocol itself introduces light-dependent artifacts that mean it is difficult to prescribe how light is potentially influencing Kc/RCII versus variable plastoquinone pool redox states. As such, I’d simply remove all references to MT-based studies (at least upfront when introducing the topics) unless the authors have good reason to maintain them. The article already has ca. 90 references so perhaps some streamlining would make sense and in no way affect the quality of the work.

While we do believe that the results and interpretation presented in the studies by Napoleon et al. and Goto et al. are relevant to our findings, we did remove them in the revised manuscript to reduce the length of our reference list, as suggested by the reviewer.

Reviewer #2

Minor Revisions:

Introduction, Line 58. Change responds to responses.

Corrected.

Introduction, Line 70. This sentence is a bit confusing. I suggest ‘... pathways’ divert absorbed energy away from the Calvin cycle, thus increasing ‘the conversion factor...’

We thank the reviewer for this suggestion which has been incorporated into the revised manuscript.

Introduction Line 111: Add a space after the word ‘and’.

Corrected.

Methods, Line 234: Two concentrations of activity are stated, I assume 1.9425 GBq mL⁻¹ is incorrect.

The original sentence reads:

Briefly, 300 mL water samples were spiked with 5.55 MBq NaH¹⁴CO₃ (final concentration 18.5 kBq mL⁻¹, 1.9425 GBq mL⁻¹ specific activity) (Perkin-Elmer).

The two activities reported correspond to how much activity was added per mL (final concentration of ¹⁴C in the spiked sample), and the specific activity of the ¹⁴C stock used to spike the sample. To clarify the sentence we removed the absolute activity of the spike added to the seawater sample and consistently use units of MBq. The sentence now reads:

Briefly, 300 mL water samples were spiked with $\text{NaH}^{14}\text{CO}_3$ (final concentration $0.0185 \text{ MBq mL}^{-1}$, $1942.5 \text{ MBq mL}^{-1}$ specific activity) (Perkin-Elmer).

Results, Line 327: Add a space between quanta and m.

Corrected.

Results, Section 3.1: Please state the mixed layer depth.

The mixed layer depth during the time of sampling was $33 \pm 2 \text{ m}$. This is stated in Results, Section 3.1, LN 318-319.

Results, Section 3.4: The use of % to explain magnitude is a bit confusing. Better to simply state that, for example, K_c/n_{PSII} ranged by a factor of 2.45...

Corrected.

Discussion, Line 587: Switch tau to τ

Corrected.