

Dear Reviewer,

Thank you for your constructive comments and suggestions. Below, we outline our planned revisions in response to your recommendations.

In the revised manuscript, we will refine the text for greater clarity and conciseness, and sharpen our methodological framework by adding a comprehensive sensitivity analysis that traces how uncertainties (standard deviations) propagate through the analysis, as also requested by Reviewer 1. We will ensure consistent nomenclature and notation throughout and explicitly state all underlying assumptions to enhance transparency.

Regarding your remark—“*They are estimating the POC and PON flux based on particle size spectra without any recourse to measuring POC or PON. Anywhere that it is stated that these are observations, I think requires re-writing*”—we wish to clarify that, as explicitly mentioned in the manuscript (see lines 290–293 and 310–313 of the preprint), our model parameters used to estimate fluxes from in-situ camera system (ICS)–based particle size spectra (i.e.,  $A_{\text{car.}}$  and  $B_{\text{car.}}$  for POC, and  $A_{\text{nit.}}$  and  $B_{\text{nit.}}$  for PON) were optimized against corresponding POC and PON fluxes measured using drifting sediment trap (DST) samples. In the manuscript, we used the term “observation” to refer specifically to DST-based flux measurements or to the particle size spectra acquired by the ICS, not to fluxes estimated from those spectra. However, we will carefully review the text and correct any instances where this wording might cause confusion.

We believe these revisions will strengthen the manuscript and welcome any further feedback you may have.

Best regards,

Corresponding author