

Interactive comment on “Particles size distribution and carbon flux across the Arabian Sea Oxygen Minimum Zone” by F. Roullier et al.

Anonymous Referee #2

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General Comments

This paper integrates numerous different oceanographic observations from a unique cruise in the Arabian Sea. The observations of particle size distribution throughout the oxygen minimum zone provide new insights into the dynamics of particles in this biogeochemically important and poorly understood zone.

It was unclear if the model used to assess the statistical funnels of sinking particles was applied in a true hindcast manner for the period of interest. It says 3 years of model data were used, so was data from these three years averaged together? Why was 2009 and 2011 model data used for a backward Lagrangian analysis for the interpretation of 2010 observational data? Further explanation is necessary as well as a discussion of the uncertainties that these approaches (eg. averaging) would introduce.

C9102

The fluxes computed from the PSD data utilize a global parameterization that assumes particles of a certain size are sinking at a given velocity. If some of the features in the particle abundance profiles are a result of laterally transported slowly sinking or neutrally buoyant particles common in intermediate nephloid layers, then this flux estimation approach could overestimate the actual vertical flux in those layers. A discussion of the potential limitations of this approach in this particular application is needed.

Not all figures are referenced in the text, and the ordering could be improved to reflect the sequence discussed in the text.

Specific comments:

P 19274, L9: Include dates of cruise here

P 19275, L13 replace “was” with “were”; and “than” with “as”

P 19275, L19 How was sensor drift assessed and evaluated?

Definition of OMZ: By using oxygen_max to calculate DI_z, and a threshold of 0.975, this would create a changing OMZ criteria for each profile, if I understand the explanations correctly. This is in contrast to picking a fixed limit of say < 20 μmol . If drift was indeed verified to be negligible between profiles, it would seem appropriate to use a fixed raw oxygen estimate from the sensor, rather than the method used here. If not, please provide further justification as to why the method described is the most appropriate.

P19278, L5. “particle” not “particles”

What is meant by particles cloud on P19279 L12 and how is this related to the location of the lat/long CTD locations?

P19283, L7 subsurface what?

Section 3.7. Include references to the appropriate figure. The figure refers to 0.53 mm, while the text refers to 500 μm size limits. Are these meant to be the same?

C9103

Section 3.8. Figure reference?

19284 Add figure reference

P19286 L24. Your test of this hypothesis relies on the assumption that these particles are sinking at least 1m/day. What if they were even more slowly sinking or neutrally buoyant? Do the isopycnal surfaces that these nephroid layers occur on intersect with the continental shelf or slope? Does the nephroid layer lie on the same isopycnal surface at the different stations? If so, this might support the idea of neutrally buoyant particles that can be sourced from long distances.

P19287 L7 Is there any evidence from the UVP or transmissometer that the concentration of smaller particles is being reduced as the zooplankton package it into larger particles? If so, please discuss and refer to the PSD plots

P19287 L9-12. I can't decipher what you mean in this sentence. Please clarify.

P19287 L28. This needs to be linked better with the data. See comment above.

Interactive comment on Biogeosciences Discuss., 10, 19271, 2013.