Biogeosciences Discuss., 10, C8141–C8143, 2014
www.biogeosciences-discuss.net/10/C8141/2014/

Biogeosciences Discussions
Open Access

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

Anonymous Referee #1

Received and published: 21 January 2014

General comments: This is an interesting paper examining particle distributions and modeled carbon fluxes across the Arabian Sea Oxygen Minimum Zone (OMZ). The primary data collected are particle size distributions and concentrations obtained with a transmissometer and the UVP imaging instrument, plus some zooplankton net tows and CTD and satellite data. The fluxes are calculated from a model (not measured by direct collections such as sediment traps); therefore, I suggest that the title be modified to "modeled carbon flux" to make that clear. (Note that "Particle" should be singular in the title also.) The combination of new technology leading to unique observations, sophisticated modeling, and an interesting discussion make this a valuable contribution to science and the increased focus on OMZs in the context of climate change.

Scientific questions and issues: In my opinion, the effect of OMZs on particle fluxes

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

to the deep sea (below the OMZ) remains an open question, and these uncertainties could be more fully highlighted in the discussion. This paper models overall fluxes (Martin curve) only into the OMZ core (Fig. 11). What happens to the Martin curve when you include the particle layer at the lower oxycline? When examined in detail, previous papers are also not clear about this. The comprehensive summaries of Berelson, Lee, and Honjo about sediment trap results (direct flux measurements) during JGOFS (including the Arabian Sea program) could not define (with statistical significance) a clear difference between OMZ and non-OMZ regions, especially when lateral advection and technical differences likely played a role. The Van Mooy et al. (2002) paper deals with degradation experiments and does not include the lower oxycline as a feature. Of course, most earlier flux papers do not address the lower oxycline particle increase since it was not recognized. A more comprehensive discussion including analyses of the various methodologies and their uncertainties would be scientifically beneficial for this unresolved issue.

The lower oxycline biology section 4.3 should refer to the recent paper by Wishner et al. (2013, DSR I 79:122-140), which includes a comprehensive discussion of the biology of the lower oxycline boundary layer (Eastern Tropical North Pacific). It is especially pertinent that the zooplankton increase below the OMZ in that region represents an abrupt order of magnitude biomass peak and that zooplankton stable isotopes indicate active trophic processing (feeding), possibly on particles similar to those observed with the UVP in the Arabian Sea.

However, it is interesting that the UVP results from the present paper do not record a similar abrupt particle layer at the lower oxycline (Fig. 8, 9). In fact, at some stations, there is really no clear difference (and in some cases a decrease) between particle abundance within and below the OMZ. Although the Fig. 8 caption refers to a peak at 900 m, it is not obvious in most of the profiles. The zooplankton profiles do not show the lower oxycline layer either, probably because of the large depth interval of the nets. The “zooplankton activity” referred to in the abstract is confusing wording since only

BGD
10, C8141–C8143, 2014

distributions were obtained. The authors should be more specific in their description and include more about these world comparisons and spatial variability issues in their discussion.

Technical corrections: Oxygen axis labels are missing from Figs. 2, 5, 7, 8, and 11. Figs. 10 and 11 are not referenced in the text. I assume Fig. 11 should be noted in section 3.8, in which case it is out of order. Pg 19272 line 1: impact (not retroactions) Line 16 trap Line 26 particle Pg 19273 line 15 day Pg 19274 line 13 as (not than) Line 14 other Pg 19276 Line 20 delete “a” Pg 19278 Line 13 chose Pg 19281 Line 2 zooplankton were, Line 13 particle Pg 19282 Line 7 subsurface maximum Pg 19284 Line 17 Cariaco

---

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