

## ***Interactive comment on* “Distribution of mesozooplankton biomass in the global ocean” by R. Moriarty and T. D. O’Brien**

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We would like to thank Anonymous Referee #1 for taking the time to review our manuscript. We are very grateful for their all their suggestions on how to improve the manuscript.

All corrections regarding small alterations to the text of the manuscript have been carried out in the manner suggested by the referee. There are a few instances where clarification was required and these changes are outlined and discussed below.

Referee #1: Page 894. In Lines 4-5. “They (mesozooplankton) are also the primary contributor to vertical particle flux in the oceans.” I think this may be a bit of an over-statement, since in temperate and sub-Arctic regions, where spring blooms are intense,

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senescent un-grazed phytoplankton can contribute significantly to vertical particle flux. So, I would suggest changing the text to something like: “In many regions they are also the primary contributors etc.” [and] Referee #1: Page 895. In Lines 8-9. “(Mesozooplankton) are the largest contributor to the vertical particle flux in the oceans (Buitenhuis et al., 2006).” I read the paper by Buitenhuis et al. and I could not find a definitive statement saying that mesozooplankton were the largest contributors to vertical particle flux on a global basis. As I have stated above, in areas where there are intense spring blooms un-grazed dying phytoplankton also contribute significantly to the vertical particle flux. Nevertheless, I recognize that on a “global” basis this statement might be true. So, could the authors please explain what they meant by this statement, probably by re-writing it.

Author response: We would like to reply to both comments above at the same time as they refer to related text in both the Abstract and Introduction of the manuscript. In both instances we have changed the text of the manuscript. In the first instance we have amended the text in the Abstract as the referee has suggested. In the second instance this sentence in the Introduction has been broken into two and now reads “They feed directly on phytoplankton, microzooplankton, other mesozooplankton and detritus, and have a significant feedback to primary production (Buitenhuis et al., 2006). In the global ocean they are one of the primary contributors to vertical particle flux in the oceans.” We hope this is to the satisfaction of the referee.

Referee #1: Page 901. “Quality control” I had some difficulty following the “flagging” procedure, so I went to the COPEPOD website, and did not do much better! I understand the main idea (i.e. the flagging of data beyond certain limits), but the details are less clear. For example, are the  $\pm 99\%$ ,  $\pm 99.9\%$ ,  $\pm 99.99\%$  range limits calculated using the actual numbers, or the log transformed numbers? As well, it is stated on the COPEPOD website that “If 1,000 or more values are available, the tighter 99.9% ranging check can be assigned, etc.” I don’t see how 99.9% provides “tighter” ranging check than 99%, since the acceptable range of values is larger. Maybe this is just a question

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of semantics, however, I also have questions about the way in which the global ocean was divided.

Author response: It is a question of semantics. COPEPOD considers the 99.9% test itself to be a “tighter” test than the 99% test (as in it has stricter requirements to flag data). The reviewer’s viewpoint is also correct in that the 99% test is “tighter” with respect to the fact that it excludes many more values than the 99.9% test will exclude. We have modified the text to hopefully clarify this point more clearly to the reader.

The data values are all log<sub>10</sub> transformed to create a normal distribution. The exact value ranges were determined by counting equally outward from the mean until 99% (or 99.9% or 99.99%) of the values were counted. We could have used a simple “mean  $\pm$   $X\sigma$ ” method, but we wanted to enforce a stronger minimum “n” requirement while also making the different flagging level differences more logical. For example, a “99.99% outlier” is ten times “worse” than a “99.9% outlier”, which is ten times “worse” than “99% outlier”. Because this method is “n” based, the 99% flagging requires at least 100 values, and the 99.9% flagging requires at least 1000 values.

Referee #1: Page 901 (continued). . .[Maybe this is just a question of semantics], however, I also have questions about the way in which the global ocean was divided. I am assuming that the authors used the scheme shown on the COPEPOD website (Fig. 6, COPEPOD-2007) to implement their QC (i.e. flagging procedure). I am not sure that these divisions are the most appropriate, since (for example) the North Atlantic region includes both the sub-tropical and sub-polar gyres, which I do not think are comparable in terms of seasonality or average magnitude of mesozooplankton biomass. Thus, one would expect a very large range of values spatially and among months. Assuming that most of the other regions (Fig. 6, COPEPOD-2007) were equally heterogeneous, it was hardly surprising that virtually no data points were excluded (Page 902, Results of quality control)! One might argue that a better scheme would be one which divides the ocean according to Longhurst (1998), but perhaps I should understand (and perhaps be told!) that this level of QC is only designed to flag “really crazy” outliers.

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Author response: The reviewer is correct that the intent of the existing QC is to detect extreme outliers. In terms of any quality control based on geographic regions, COPEPOD's multiple-region method is theoretically better than examining the data using a single "global" region or by using a handful of "large latitudinal bands". Compared to these other options (in use by other papers in the ESSD project), COPEPOD's quality control goes a step beyond the basic ESSD quality control requirement. We also agree that things can be improved.

With regards to the "Longhurst 1998" suggestion, we agree and thank the reviewer for this advice. The next generation of COPEPOD's QC was originally going to generically divide its already existing 15 categories into "east/west" and "near-shore/open-ocean" sub-regions (nearly 60 regions). After considering the reviewer's suggestion, going with the Longhurst Provinces seems a more sound approach as the regions are biologically-based (versus geographic basin or hydrographic-only considerations), they are well-established (in-use by the community), and they are fully citable. Again, this is an excellent idea!

We hope the reviewer understands that the time and effort required to install these new geographic regions into the COPEPOD QC system is beyond the reasonable time limits for completing the review and publication of this paper. (We accept the suggestion, COPEPOD is pursuing it, but the results will not be added to this paper.)

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Interactive comment on Earth Syst. Sci. Data Discuss., 5, 893, 2012.

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