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Biogeosciences Discussions

Interactive comment on "Regional and temporal variability of sinking organic matter in the subtropical northeast Atlantic Ocean: a biomarker diagnosis" *by* I. J. Alonso-González et al.

Anonymous Referee #1

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The authors investigate the regional and temporal variability of sinking organic matter in a region south of the Canary Islands. Both chlorophyll degradation products and amino acid analyses are applied to infer the origin and degradation state of the organic matter. This is in principle an important study, designed to test the influence of eddies on particle flux during both a summer and winter season in this eddy and filament influenced region. The paper is well written, but I have serious concerns mainly with regard to the interpretation of the presented data:

1. It is not clear in the context of this study why the stations to the very south (20N) are included in the analysis. If the main objective is to compare particle flux originating

from different eddy types, then these 'S' stations appear a bit out of context, especially since the far-field stations already provide a non-eddy control.

2. It is hard to believe that there were no zooplankton present in the trap material. Anyone who has conducted any kind of shallow sediment trap work knows that swimmers are a regular occurrence in traps, usually dominating particles on the filters. The standard JGOFS trap protocol recommends a thorough analysis of the trap material, not just a cursory check. A non-quantitative removal of swimmers would seriously compromise the sample analysis.

3. The authors measure GPP and respiration at each station, but never report NCP, which as it turns out, is negative during the summer months at most stations, even in the higher productivity zones. How is it then that any particle flux is occurring at all? Is it all due to advection of particulate material from the upwelling zone? If yes, then any inference to the productivity of the eddy is difficult to support.

4. Amino acids are very liberally used to infer degradation state and origin of the particles. No theoretical background is provided, despite this not being a common application in particle flux studies. For example, if culture experiments indicate the presence of an amino acid associated with an organism group or species, then its occurrence in the field cannot be taken as an unequivocal evidence that exactly this group or species is present. In the current study, however, this is done: the relative distribution of diatoms and coccolithophorids is inferred solely based certain amino acids, without any parallel evidence such as microscopy, lipid analysis, genetic markers, carbonate and biogenic opal analysis etc. Also, amino acids certainly cannot distinguish coccolithophorids from the group of haptophytes. In comparison to the entire population of haptophytes, coccolithophorids are only a small component (see e.g., Haidar and Theirstein's work at BATS). There is a lot of hand waving on this subject, especially on p. 11106, lower paragraph.

5. The literature on chlorophyll degradation products as proxies of microzooplankton or

mesozoopalnkton grazing is fairly old, and has to my knowledge not been corroborated in more recent literature. Much is interpreted into the occurrence of pheophytin-a, pheophorbide-a and pyropheophorbide a. For example, if mesozooplankton feed on microzoopankton, their preferred food source, what is the result in the pigment signature? Pigment would be likely degraded to not show a signal at all. Inferring from the absence of degradation pigment low grazing pressure by mesozooplankton would thus not be warranted.

6. 11104, top: The authors do not carefully distinguish results obtained in their study region with those obtained in flux studies conducted at the oligotrophic ESTOC station to the north of the islands. In the same context (p. 11109): The work cited on flux results obtained at ESTOC did indeed present multi-year and mulitseasonal flux data, thus was misrepresented.

7. The authors need to look into Mc Gillicuddy's observations (2007) of wind interaction with anticyclonic and cyclonic eddies causing upwelling and downwelling. This can give an alternative explanation to the observed difference in standing stocks between both eddy types.

In summary, the results presented in this study have good potential and are valuable, as they offer a comparison of flux characteristics between different eddy types. But the authors need to revisit the focus of their study and interpretation and conclusions drawn from of their data.

Interactive comment on Biogeosciences Discuss., 6, 11089, 2009.