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Biogeosciences Discussions

Interactive comment on "Quantifying the structure of the mesopelagic microbial loop from observed depth profiles of bacteria and protozoa" *by* T. Tanaka et al.

Anonymous Referee #1

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This paper presents the results of applying a simple steady state food chain model to quantify carbon fluxes in the mesopelagic microbial loop. Published data from separate studies of a well-studied spot are used to produce a general picture of the relative importance of each compartment in the microbial loop and the fluxes between those compartments. By integrating the data obtained from the different compartments of the microbial loop, the authors try to challenge our current vision of the microbial loop. The results of such an exercise often raise new questions that would not be apparent in the separate studies. Thus, these analyses are necessary and I would like to encourage the authors to continue with this approach. However, I find very unfortunate that after engaging in an inspiring discussion the authors jump into wrong conclusions that are not justified by their own data.

Their second main conclusion is unfortunately wrong, the authors state at the end of the abstract "that heterotrophic nanoflagellates are **the** important remineralizers" and

more specifically on lines 23-24 on page 419 that " This may challenge the current view of ocean biogeochemistry with bacteria as the principal remineralizers...". Since remineralization of organic carbon (OC) means conversion into CO2, or respiration, it is obvious that bacteria are the principal remineralizers in this study. As stated on page 418, line 15 bacterial growth efficiency is 19-39% which means bacteria respire (or remineralize) 60-80% of the OC entering the food chain. In this food chain the growth of HNFs is supported exclusively by bacteria, thus only 20-40% of the OC entering the food chain is left for HNFs. This alone refutes their conclusion. Moreover, the model assumes that HNFs use efficiently all the bacterial production, either respiring it or incorporating it into new biomass, however it is known that HNFs egest a significant part of their prey back into the OC pool, rather than respiring it. Since one of the authors (F. Rassoulzadegan) is an expert on this, it is probably easy to refine the model to include a more accurate estimate of HNF respiration (remineralization).

I will leave these calculations up to the authors, however it is clear that with the low growth efficiency of HNFs on bacteria, the role of HNFs as remineralizers will be quite significant. The second conclusion could be rephrased expressing the importance of HNFs as remineralizers and stressing the importance of measuring HNF and other rate processes in mesopelagic waters. It would be probably good to stress a bit more the little transfer of bacterial carbon to higher trophic levels.

I recommend therefore, that the paper should be rewritten to address these issues before it can be accepted for publication.

Minor comments

Page 417, line 23 "...between **the** three..."

Page 421, line 7 , Deep-Sea? Missing I or II

Interactive comment on Biogeosciences Discussions, 1, 413, 2004.