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Interactive comment on "Presence of *Prochlorococcus* in the aphotic waters of the western Pacific Ocean" *by* N. Jiao et al.

Anonymous Referee #3

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General comments:

In this manuscript Jiao et al report on the discovery of Prochlorococcus populations far below the euphotic zone and discuss possible mechanisms for their transport and implications to C cycling. Overall I think this is an important observation and the oceanographic community needs to hear about it. However, the present form of this paper has shortcomings that need to be addressed. For example, the evidence for metabolic activity or viability of deep Prochlorococcus is sparse and not particularly convincing. There was only one set of measurements of rRNA content and they only went down to 300m. It would be interesting if Prochlorococcus cells were still active in mesopelagic waters, but without supporting data the discovery of deep Prochlorococcus tells use more about physical processes and C transport than ecology and

physiology of Prochlorococcus. In fact, the transport of Prochlorococcus cells seems less important in terms of C than the transport of DOC and other microbes from the bottom of the euphotic zone, which is not dominated by Prochlorococcus in terms of biomass. Prochlorococcus cells serve as tracers for physical transport, and I believe the paper would be stronger if it deemphasized issues of Prochlorococcus viability and Prochlorococcus C, and focused more on estimating total C transport from the bottom of the euphotic zone.

Specific comments and questions:

Does the model of transport by solitons explain transport to and from the mesopelagic? The paper mentions transporting a certain fraction of cells back to the euphotic. More background on solitons would be helpful to understand if it is a bidirectional process.

Why do deep Prochlorococcus maintain high pigment concentrations? Pigments are expensive but useless in the mesopelagic. Does high pigment concentration indicate the cells were recently transported?

Are there flow cytometry counts for total bacteria from the bottom of the euphotic zone? What about counts from the mesopelagic? I know Prochlorococcus was not "supposed' to be down deep, but were they a larger or small fraction of total deep populations compared to the bottom of the euphotic zone? It's hard to believe that Prochlorococcus were preferentially transported, so how many cells might have gone down to the mesopelagic with them?

Is it really important to emphasize picoplankton-derived C when discussing the importance of the microbial carbon pump? Why would it matter if refractory C was produced from Prochlorococcus instead of heterotrophic bacteria?

I am confused why the authors suggest deep Prochlorococcus populations emphasize the importance of the microbial carbon pump in subtropical waters. This observation really supports a greater role for the biological pump since the observation is of POC

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transported in the deep ocean. There were no measurements in this study regarding the production or refractory C.

Can Figure 4 be more quantitative? Perhaps a table with counts of ITS sequences from each ecotype would provide strong support.

Interactive comment on Biogeosciences Discuss., 10, 9345, 2013.