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Comment

Interactive comment on “Increased ocean carbon export in the Sargasso Sea is countered by its enhanced mesopelagic attenuation” by M. W. Lomas et al.

Anonymous Referee #3

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The authors present a decade of biogeochemical time-series observations at time-series station BATS. They find both an increase of phytoplankton biomass and shallow export, coupled with a doubling of the mesopelagic flux attenuation. This is an important contribution, providing insight into the long-term coupling of climate, biogeochemistry, and plankton community composition at an oligotrophic time series station. The manuscript is well written and merits publication in BG after some revision.

1. The authors link the observed changes in the biogeochemistry with a shift from a predominantly positive NAO to a more variable NAO. But rather than tying the NAO index to mixing depth alone, there is also the aspect of varying mode water formation

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and delivery of nutrients to the subtropical gyre as elaborated by Palter et al (Nature 2005). This aspect should be explored further.

2. The authors state that (9563/4) “If aggregation were a significant process in the Sargasso Sea biological carbon pump, it would explain both the increase in POC flux with smaller phytoplankton and enhanced remineralization.” I do not quite follow the link of aggregation to enhanced remineralisation. Tightly packed fecal pellets might have the same density as loosely packed, but mineral ballasted pellets or aggregates. What would make the aggregates more labile and more susceptible to degradation? For example, is there a change in the POC/PON ratio of the sinking material that might give an indication of greater susceptibility to bacterial utilization?

3. 9557, 28 and following: Haptophyte biomass is not dominated by *Emiliana* at BATS, but coccolithophorids are. The Durand et al. 2001 study as well as Haidar and Thierstein’s study show that coccos are in the 10s of cells/ml, whereas the total haptophyte abundance may be 1-2 orders of magnitude higher. Recent reports of extreme diversity of non-calcifying haptophytes (Liu et al., PNAS, 2009) support this notion. That haptophytes are equated with coccolithophorids is pervasive but incorrect.

4. In contrast to *Synechococcus*, *Prochlorococcus* does not show a change in abundance over the time-period (Table 2). Any explanation?

5. Fig 2. Why not include the same graph for silicate, as that nutrient is implicated in the changed diatom abundances?

Minor comments:

9552, 22 and following: bandpass filters need a plus/minus wavelength range

9553, 18: explain QC/QA

9553, 20: inorganic carbon does not get incorporated into particulate organic matter, but into photosynthesizers

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9556, 6: in this study

9556, 23: Statement that seasonality is strong in the Sargasso Sea is relative: certainly it is minor compared to higher latitude NA. Best to reword.

9557, 15: assimilation number is chl a normalized, not biomass normalized

9557, 19/20: revise sentence

9559, 5: why would changes in collection efficiency of the 300 m traps occur? Was the design not the same throughout the observation period?

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