Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2017-370-RC2, 2017

Biogeosciences Discussions
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Interactive comment on "Hurricane Arthur and its effect on the short-term variability of pCO_2 on the Scotian Shelf, NW Atlantic" *by* Jonathan Lemay et al.

Anonymous Referee #2

Received and published: 9 November 2017

The authors present high-resolution biogeochemical data from the Scotian Shelf (Northwestern Atlantic) before, during, and after a hurricane event. Hourly pCO2 data re used to assess the short-term impact of the storm on the surface and subsurface properties of the water column, and the resulting impact on the air-sea CO2 exchange. The paper reports that there is a layer of cold water depleted in inorganic carbon (DIC) just above the thermocline, which is attributed to a population of phytoplankton that grows under reduced light conditions, assuming sufficient nutrients are available. The presence of the phytoplankton is confirmed by chlorophyll data, which the authors treat qualitatively having shown some disagreement between measured and sensor observations of fluorescence. With a storm event, the layer of high-biomass (and reduced

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DIC) is entrained into the surface layer and results in an undersaturation in pCO2 that drives a flux of CO2 from the atmosphere to the ocean (uptake). This short-term event is found to be comparable to the spring bloom in terms of contribution to the uptake of CO2, and thus short-term wind events may have a large impact on the annual CO2 exchange in this region.

The paper is well written and structured, and most assumptions are satisfactorily justified. I believe the paper is suitable for publication in Biogeosciences following some minor revisions based on my comments below:

Line 151: was the pCO2 really measured using the VINDTA 3C – I was not aware this was possible. I thought pCO2 was computed on the basis of the DIC and TA analyses? Please clarify.

Line 288: While I understand that the SeaHorse profile data was not available for the hurricane observations, it does seem odd to rely so heavily on subsurface data from a short period several years earlier. I think the text would benefit from more information/validation about these data and how representative they are of the conditions preceding the 2014 storm event. Is there other climatological data that could be used to provide greater context for these short term observations below the surface?

Conclusions: I found the description of the schematic to be oddly placed in the conclusion – please consider relocating to the discussion. I also found Figure 11 to be a somewhat confusing representation of the more clearly described mechanistic understanding of the system in the text.

I believe the other reviewer suggested that Fig. 11 was not necessary, and I'm inclined to agree. If you do want to include a schematic, I would suggest coming up with something that has multiple panels contrasting the situation where there is a short-term wind event with when there isn't – or a time evolution of the 2 to 3 layer system. As shown it does not convey the arguments the author's are trying to make.

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Caption for Fig. 7: I don't see how these are "climatologies"?

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