

Interactive comment on “From sea ice to seals: A moored marine ecosystem observatory in the Arctic” by Claudine Hauri et al.

Claudine Hauri et al.

chauri@alaska.edu

Received and published: 20 October 2018

(1) Comments from Referee 1

Anonymous Referee #2 Received and published: 9 October 2018

The authors present a blueprint for a complete observing system, capable of capturing relevant physical, chemical and biological parameters for monitoring and understanding the progress of change in a vulnerable Arctic system. While the paper doesn't really focus on new scientific results, the manuscript is a useful way to share the challenges and early successes of working with an automated observing platform in a remote region. I hope that papers with a deeper focus on the science are forthcoming. The description of the physical environment and the well-studied physical seasonal-

C1

ity provides a nice background for the description of the observing platform and the presentation of preliminary results.

The freeze up detection method sounds great – was the 'expendable float' recovered? Would be a tough sell to leave gear like that behind by design in the Antarctic.

Minor Comments: It would have been nice to see the CO₂ system data that was collected once the SeapHOx sensor was added since these provide the data required to address questions relevant to the progress of acidification which the authors outline as a key research goal. It was reassuring to see the correspondence in temperature at 34 and 43 meters depth since measurements are restricted to the subsurface – any ideas about seasonality of mixed layer depth? The pCO₂ supersaturations observed in Canadian waters in winter were more shallow than 34 meters (see also Shadwick et al., 2011 L&O).

(2) Author's response

Dear Referee, We are grateful to you for taking the time to review our manuscript, thank you. We are currently working on a series of papers describing our data in more detail and are hoping to be able to submit these papers soon. The reason we did not include pH and pCO₂ data in this current paper is that the timeseries of pH and pCO₂ only starts in the summer of 2016. We chose to show the data return of our 2015/2016 deployment because it contained the most complete record of post-processed data to date. Similar to drifting buoys, the top float of our ice freeze up buoy is left behind. It contains the satellite communications modem, and some very basic electronics to trigger the release and a battery, which make up about 1/3 of the price. The vast majority of the cost of the mooring is recovered, including all scientific sensors and acoustic releases. We have put effort into trying to make them more biodegradable by using fewer plastics and this is an ongoing process.

We unfortunately do not have seasonal data for the mixed layer depth at the mooring location. The ice detection buoy is a first try to get a better understanding of the mixed

C2

layer depth from the time it is deployed (late July or August) until freeze up. Peralta-Ferriz and Woodgate, 2015 (Progress in Oceanography, now referenced in MS) compiled available salinity and temperature profiles from 1979-2012 and estimated a mixed layer depth minimum of 12 m in July/August and maximum of 36 m in March. Please keep in mind that these estimates are based on available data from the entire Chukchi Sea, and may not precisely reflect the seasonality of the mixed layer depth at the observatory location. Current methods, such as using benthic landers to collect seasonal mixed layer depth data are outside the scope of our project, but we are looking into other options. While analyzing our biogeochemical data, we will keep in mind that the mixed layer depth may at times be deeper than the location of our sensors.

(3) Author's changes in manuscript

Any ideas about seasonality of mixed layer depth? -> We added available information about the mixed layer depth to the text. These estimates are based on available data from the entire Chukchi Sea. We changed the text accordingly: p. 3 L.1: Through heat loss, sea ice formation, and brine rejection (Fig. 3B) in late fall and winter, the water column over the Chukchi shelf becomes more saline and vertically homogenized (Weingartner et al., 2005), deepening the mixed layer depth to a maximum of ~36 m in March (Peralta-Ferriz and Woodgate, 2015).

P. 3 L. 9: During this time, the water column stratifies with inputs of fresh meltwater and heat at the surface (Fig. 3G), leading to a shoaling of the mixed layer depth to a minimum of ~12 m (Peralta-Ferriz and Woodgate, 2015). This is the time when extraordinary phytoplankton blooms occur in the nutrient rich surface waters (Fig. 3F; Hill et al., 2018).

Please also note the supplement to this comment:

<https://www.ocean-sci-discuss.net/os-2018-82/os-2018-82-AC2-supplement.pdf>

Interactive comment on Ocean Sci. Discuss., <https://doi.org/10.5194/os-2018-82>, 2018.