Ocean Sci. Discuss.,
https://doi.org/10.5194/os-2018-52-RC1, 2018

Interactive comment on "An Evaluation of the Performance of Sea-Bird Scientific's Autonomous SeaFET™: Considerations for the Broader Oceanographic Community" *by* Cale A. Miller et al.

Anonymous Referee #1

Received and published: 29 May 2018

The research presented by Miller et al. is an evaluation of the SeaFET, a seawater pH sensor with fairly common usage within the ocean carbon community. The evaluation included both tank and field testing paired with independent, high-quality pH validation measurements. Miller et al. find that for the three coastal locations utilized in this study, a multi-point calibration results in the highest accuracy for SeaFET pH. This is counter to the more commonly used procedure of keeping the factory calibration as presented by Bresnahan et al. 2014.

This paper is an important contribution to understanding how this sensor performs in the environments in which it is deployed. I recommend publication in Ocean Sciences

after the authors consider some comments below that may make the paper more relevant to other sensor users and may reduce environmental error in the sensor uncertainty estimates.

Major comments:

1) Assess uncertainty if following today's existing SOP: While this study clearly shows the utility of single- and multi-point calibrations in these three coastal systems, it would be useful to discuss the uncertainty observed when following the existing SeaFET standard operating procedure (SOP). I believe the SOP described by Bresnahan et al. 2014 is to use the factory calibration, but correct the dataset to some independent measure of "true" pH (e.g., discrete bottle samples, pH derived from other biogeochemical sensors combined with locally-constrained carbon system algorithm or TA-S relationship) once the SeaFET has conditioned to the environment in which it is deployed. This, along with an explanation of why the Miller et al. results differ from Bresnahan et al., would be a useful analysis for the existing users of SeaFETs.

2) Characterize environmental variability: While the authors include a thorough explanation of how they minimized the impact of time/space sampling mismatch between the SeaFETs and the various independent validation measurements, it would be useful to develop an estimate of the environmental variability within these time/space constraints. This should be subtracted from (or considered somehow in) the sensor uncertainty estimates. An example of this type of assessment of how environmental variability impacts sensor field evaluations is summarized in the following and its associated ACT pCO_2 sensor reports: Tamburri et al., 2011: Alliance for Coastal Technologies: Advancing Moored pCO_2 Instruments in Coastal Waters. Marine Technology Society Journal, 45, 43-51.

Minor comments/edits:

Line 124: Elaborate; what does non-controlled source water conditions mean?

Line 437: State the impact of 0.21oC discrepancy on pH.

Lines 472-474: Improved accuracy for the unconditioned vs conditioned calibration based on what? The inter-sensor anomaly seems to be less in Fig 5 (conditioned) compared to Fig 4 (unconditioned), which is also shown in Fig 6.

Lines 680-683: While spectral analysis is a powerful tool for identifying drivers that are periodic or regular in nature, it will not characterize many phenomenon in the coastal environment such as storms or biological productivity/respiration. These types of events may impact the range over which a multi-point calibration should be made. This caveat should be included when suggesting spectral analysis as a tool for developing a multi-point calibration scheme in an environment with stochastic events.

Line 687: Define M2.

Figure 3: The temperature difference here could be misleading to the reader. It is important to be transparent by stating in the caption that the SeaFET was not fully submerged in the tank, making it susceptible to air temperature fluctuations unlike the BoL, which was measuring only tank water temperature.

Interactive comment on Ocean Sci. Discuss., https://doi.org/10.5194/os-2018-52, 2018.