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Ocean Science
Discussions

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.

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Specific comments Several methods of assessing data quality have been used – variability, accuracy (= integrated uncertainty), uncertainty, "true pHt", variance, RMSE, Standard deviation of duplicate samples, mean anomaly . . .Although Section 2.5.1 and 3.5 describes some of these terms in some detail, I found it difficult to assess the performance of the instruments and was distracted by the variety of terms. The sentence starting line 576 is a good example of this ". . . can provide and accurate measurement of pHt. . .. executed with high precision."

I suggest a table defining how and in what circumstance each term is used.

Response

We thank the reviewer for the comment and have added a table defining some of the terminology used.

Line 257 specify austral winter

Response

We have amended this line to indicate winter in the northern hemisphere: boreal winter.

Lines 343, 400 why are the calibration coefficients on the header file and the CD-ROM different? If they are different how can the correct one be verified?

Response

After speaking with the engineers at Sea-Bird, I was instructed that the calibration coefficient on the CD-ROM was correct and the one written to the header file was not. After this conversation, I do not know their actions to resolve this issue, but they are aware of the problem. While I was instructed that the CD-ROM calibration coefficient is correct, we are hesitant to fully trust this response until they provide a more detailed response regarding this issue.

Line 410 SeaFET397 emerged from the tank for 24 hours. Did the pH sensor dry out? And if so, how was it reconditioned.

Response

It is not clear whether or not the electrodes dried out as the tank refilled before proper examination. Given the humidity in the room and in the tank, as well as a robust performance throughout the deployment, we do not believe the sensor was damaged. Since this failure occurred on April 8th and calibration did not occur until April 25th, any reconditioning required would have taken place within that 16 day window once the tank was refilled.

Line 467, the absolute difference of 2.83 C is large in this context. How did you decide what temperature to use. Do you have a recommendation around calibration of the SeaFET temperature sensor?

Response

We agree with the reviewer that this is a large temperature difference; however, we had more confidence in the Thermosalinograph readings given the history of reliability of this sensor in the community and at this specific location coupled to the BoL. In addition, there were multiple temperature probes monitoring incoming water throughout the hatchery that we cross-referenced. Suggestions as to accurately monitor temperature when calibrating the SeaFETTM are suggested in the manuscript. Please see lines 693 – 699.

Line 497 How was duration of the conditioning period determined, ie the width of the blue box in Figure 6. The 14 days indicated in Figure 6 is a long time

Response

Given that Bresnahan et al. (2014) indicate an approximate conditioning period of around 10 days, we were able to use this as a baseline to see when measurements stabilized over a several day period. This is how we were able to determine the conditioning period.

Line 512 the sentence starting "There was no clear distinction in greater accuracy.." does not make sense to me. Please rewrite this.

Response

This sentence has been rewritten for clarity based on the reviewer's comment.

Line 632 The sentence starting "For instances of . . ." makes no sense, please reword.

Response

We have rewritten the sentence to be clearer. Specifically, this sentence refers to the variance within discrete reference sample collection. That is, when collecting calibration samples, replicates will display a certain degree of variance for a "true pH" value, and this should be considered when calibrating the sensor. For example, we found a higher than desired discrepancy in our triplicate calibration samples taken for Kasitsna bay, so one replicate was thrown out, and duplicate calibration samples were used rather than triplicate for calculation of a "true pH."

Line 648 You state that ". . .the potential uncertainties calculated in this study represent the upper limit of an average uncertainty. . ..." How are you able to ascertain that this is an upper limit?

Response

We suggest that these are upper limits since our ranges of uncertainty fall within and, are, greater than what previous published results have found.

Line 654 You begin to discuss the effects of errors in the temperature measurement, but stop short of making any recommendations. This section should be tightened up, to go beyond a description of your own deployments.

Response

We appreciate the reviewer's concern, but believe that there is a clear recommendation regarding temperature. We state that it would be preferable to record temperature with a more robust instrument, or track temperature before deployment and apply an offset to the thermistor value.

Line 667 ". . .expanding the scope of pH variability. . ." this does not make sense

Response

This sentence has been rewritten based on the reviewer's comment.

It would be useful to include a bullet pointed list of recommendations in the Conclusion

Response

While we agree that this may be beneficial, we feel the main objective of this manuscript is to serve as an evaluation rather than a suggested best practices as this has already been done: Bresnahan et al. 2014 and Rivest et al. 2016.

Was there any evidence of biofouling affecting the pH measurement during any of the deployments? Would you be able to determine the effect of this with your calibration strategy, and do you have any recommendations on how to identify this problem?

Response

There was no evidence of biofouling affecting any of the SeaFETs. There was no evidence of biofouling at all for the Alaska SeaFETs, and the one at sentry shoal underwent maintenance during its deployment. In addition, this senor appeared to provide the most accurate measurements.

As far as identifying biofouling as interference, we do not offer suggestions, but this should be identifiable when you start to see a consistent drift in readings. This can be compared against other oceanographic data and the other electrode to verify biofouling, as well as a close physical inspection upon recovery. At the time biofouling is identified, calibration will need to be redone once the sensor is cleaned.

References – These are complete and up to date.

Response

No reply needed.

Figures – In general these are clear and helpful. I do not understand, however, the difference between Figure 4 and Figure 5. They are the same data sets, but Figure 4 is for “before they were conditioned”, and “Figure 5 is for ‘conditioned”. Does this refer to the way they were calibrated? Please clarify in the Figure caption.

Response

The reviewer is correct, this does refer to how they were calibrated. We have amended the caption in figure 5 to make this clear.

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