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Discussions

Interactive comment on "Technical note: Interpreting pH changes" *by* Andrea J. Fassbender et al.

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Thank you for your interest in the manuscript and for providing constructive feedback.

Below we address each comment from your review in order of appearance.

We agree that challenges associated with merging ocean pH observations remain a barrier to creating accurate, long-term pH records. The difficulties result from the problems inherent in clarifying the likely uncertainties in pH measurements made by different individuals at different times or places and are exacerbated by changes in measurement technique and/or calibration approach (pH scale) between research groups. However, we do not think this short Technical Note is the ideal place in which to address such complex challenges. On Line 43 we note that pH is presented on the total hydro-

gen ion scale throughout the article and thereafter focus on issues associated with the presentation and interpretation of pH change data that are already on a common pH scale.

Thank you for bringing the Carstensen and Duarte, 2019 publication to our attention. We have elected not to add a fourth, coastal example to the manuscript, as pH changes will always represent relative changes in [H+] no matter the location. We also feel that lengthening the manuscript and providing more than one example for any of the three cases presented would make it less accessible. Finally, on the Biogeosciences page that describes manuscript types, it states that Technical Notes "should be short (a few pages only)". However, we agree that the difference in open ocean and coastal pH trend magnitudes is interesting and worth pointing out in the context of the article. Thus, we have added a sentence near Line 114:

Line 114: Yet, at another Equatorial Pacific site (0 °N, 155 °W; Sutton et al., 2014), there is a similar [H+] trend to that of the Irminger Sea site because the initial pH differs. While we focus here on pH changes in the open ocean, pH changes also occur in coastal waters where they tend to be larger (Carstensen and Duarte, 2019). Recognizing that a change in pH represents a relative change in [H+], regardless of location, and examining long-term trends in both parameters should improve interpretation of chemical changes across ocean domains.

While pH is a useful notation for displaying wide ranges in [H+], hydrogen is the chemical element that organisms interact with in the environment. We think this is self-evident and haven't provided further comment on the matter as it would distract from the main point.

We agree that the comparison of proton concentration and saturation state changes with depth is useful in practice, but in this case would distract from the key point of the article.

We agree that proton budgets are useful for quantifying process contributions to local

acidification. However, this topic lies outside the scope of the article and would distract from the main point.

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