Earth Syst. Sci. Data Discuss.,
https://doi.org/10.5194/essd-2018-114-RC1, 2018

Earth System Science Data Discussions

Interactive comment on "Autonomous seawater pCO_2 and pH time series from 40 surface buoys and the emergence of anthropogenic trends" *by* Adrienne J. Sutton et al.

Anonymous Referee #1

Received and published: 12 November 2018

Review of
Autonomous seawater pCO_2 and pH time series from 40 surface buoys and the emergence of anthropogenic trends
by Sutton et al.

November 2018

Recommendation: Acceptable for publication after minor revisions

1 Summary

Sutton et al. release a comprehensive data product for pCO_2 and pH (among other variables) from 40 surface ocean buoys around the globe. Further, this paper briefly analyzes the time series data to compute Time of Emergence (ToE) of the anthropogenic emissions signal. They propose conservative estimates of ToE, since their relatively short time series do no capture the influence of decadal variability. The data product is extremely accessible and the website is well put together. One can acquire plots of near real-time pH and pCO_2 via the web server as well as select a buoy of interest from a map to retrieve well-labeled and quality-controlled data. I suggest that this manuscript

be published in $ESSD$ following minor revisions. I only have a few very minor comments/clarifications.

2 Major Comments

1. I appreciate the attention to detail on limitations to ToE with such short time series (*i.e.*, taking an estimate of decadal variability on the TAO buoys and applying that to all other stations). However, I'd be curious to see what the influence of the differing IAV estimates does to the ToE estimate. *I.e.*, what is the difference in the ToE when using the detrended vs. not detrended estimate of anomalies in Equation 1? I imagine that the 12% change in IAV from this tactic might propagate a decent bit of uncertainty into ToE (that is separate from the decadal variability uncertainty).

3 Minor Comments

2. Lines 31–33 (pg. 3): "... magnification of the seasonal amplitude of pCO_2 due to warming, ... resulting in increased detection time." You could cite Kwiatkowski and Orr (2018) and Landschützer et al. (2018) here, which cover this topic.
3. Lines 1–3 (pg. 6): Perhaps expand here on what future efforts will be done to improve IAV estimates. What can be done other than waiting for longer time series to develop?
4. Lines 10–11 (pg. 9): "Since ToE is dependent on the variability ... tend to have longer ToE estimates." I would suggest more clear wording for this

sentence. In the case of this application, ToE is mainly variability-induced, since all stations share a commonly imposed trend of 2$\mu atm\ yr^{-1}$. However, in many cases, long ToE estimates can be also driven by a weak signal, and short ToE estimates by a very strong signal, etc.

5. Figures 1 and 2: When using a discrete color bar, it is generally advised that the tick marks align with discrete color boundaries. In their current format, both color bars have tick marks placed arbitrarily within color bounds, which makes these color divisions useless. E.g., in Figure 1, setting 10 color boundaries with colorbrewer would align the ticks/color boundaries in 25μatm increments.
6. Figure 3: I suggest changing the color scheme for (b) and (c) to be mindful of those that are red-green color blind.

References

Lester Kwiatkowski and James C. Orr. Diverging seasonal extremes for ocean acidification during the twenty-first century. *Nature Climate Change*, 8(2):141–145, 2018. doi: 10.1038/s41558-017-0054-0.

Peter Landschützer, Nicolas Gruber, Dorothee C. E. Bakker, Irene Stemmler, and Katharina D. Six. Strengthening seasonal marine CO2 variations due to increasing atmospheric CO2. *Nature Climate Change*, January 2018. ISSN 1758-678X, 1758-6798. doi: 10.1038/s41558-017-0057-x.