Earth Syst. Sci. Data Discuss.,
https://doi.org/10.5194/essd-2018-114-AC2, 2019

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.

Adrienne J. Sutton et al.

adrienne.sutton@noaa.gov

Received and published: 15 February 2019

We thank all referees for their thoughtful and constructive comments and suggestions on our manuscript "Autonomous seawater pCO2 and pH time series from 40 surface buoys and the emergence of anthropogenic trends." The revised manuscript will be much improved as a result of the careful critiques. Below we discuss the comments from Referee #2 point by point including original referee comments and our responses bulleted (–) underneath.

Major comment Dr. Sutton and colleagues presented a readily accessible data product of autonomous pCO2 and pH time series from 40 surface buoys from 2004 in open

ocean, coastal and coral reef sites, that exhibit extensive daily and interannual variability. Using a time of trend emergence methodology, they estimated the length of time for an anthropogenic trends in oceanic pCO2 and pH to emerge from natural variability in the 40 time series. Only at two time series datasets (WHOTS and Stratus), surface oceanic pCO2 significantly increased. However, pH time series data are too short to estimate long-term anthropogenic trends. In addition, description of pH sensor isn't detailed, compared from pCO2 sensor [Sutton et al., 2014b]. I cannot confirm postcalibrated and quality-controlled pH data (at NCEI data archive) through comparison with in-situ calibration, discrete samples and so on, because pH sensor performance was often limited by biofouling [Bresnahan Jr et al., 2014]. After revising the manuscript to address this comment and the specific comments below, I would support publication of the author's submission.

– We agree that thorough sensor evaluation and data quality control is critical to confirming pH data quality. Entire publications are dedicated to this topic, like Bresnahan et al. 2014 cited by the reviewer. Similar to the pCO2 sensor evaluation of Sutton et al. 2014b, the 2016 paper describes in detail the moored pH sensor evaluation and data quality control, which are primarily through comparison to discrete data and independently calculated pH. That analysis determined these sensors (once calibrated and adjusted in the case of the SeaFET) have a total uncertainty of <0.02 in this particular surface buoy application. We agree with the reviewer that this point needed clarification, and we've added the following statement to that section: "Data quality control of these pH time series, including calibration, comparison with discrete samples, and assessment of drift due to sensor performance and biofouling, are described in detail by Sutton et al. (2016)."

Figure 1 I think that only locations and names of 40 fixed moored time series station map is convenient for readers.

– Very good point that we failed to link Figure 1 with the detailed site information in Table 1. We've added the following to the Figure 1 caption: "Moored time series locations

and names are detailed in Table 1." Also of note, while Figure 1 focuses on illustrating surface seawater pCO2 mean, seasonal amplitude, and IAV, the data product at NCEI (https://www.nodc.noaa.gov/ocads/oceans/Moorings/ndp097.html) includes a figure solely focused on buoy location and names for data users ease.

Line 22, Page 7 How long is it necessary for pH time series to determine a robust estimate of IAV?

– In this manuscript, we are using the pCO2 estimate of 3 years of continuous measurements (page 19 line 4; page 21 line 7) as the cutoff for presenting IAV, and as of the assessment described in this manuscript, no pH time series meet that length. Included in the IAV methodology section (page 5 line 34 – page 6 line 4) is a discussion of the uncertainty in these IAV estimates.

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