

Review of *CO₂ and hydrography acquired by Autonomous Surface Vehicles from the Atlantic Ocean to the Mediterranean Sea: data correction and validation* by Martellucci et al. (essd-2023-457)

Overview

Martellucci and coauthors describe data collected by two Saildrone (SD) autonomous surface vehicles (ASVs) in the Atlantic Ocean and Mediterranean Sea during the ATL2MED experiment in 2019 and 2020. In particular, they discuss strategies to correct salinity, dissolved oxygen, and $p\text{CO}_2$ data from the ASVs, and compare their corrected datasets to a variety of validation datasets from cruises, fixed moorings, Argo floats, and gliders.

This manuscript represents an important contribution to the field, as measurements from autonomous systems are becoming a critical way to fill observational gaps in hydrographic and biogeochemical ocean observations. The demonstration of creative and effective methods to ensure data delivered by these autonomous systems are scientifically credible is therefore an essential step in filling those gaps. The importance of this work is particularly underscored by its context within the timeline of the COVID-19 pandemic. The difficulty conducting regular maintenance and collecting validation measurements experienced during the ATL2MED experiment due to pandemic restrictions might serve as a good analogue for the future of autonomous observations, when many more autonomous platforms may be deployed throughout the global ocean and cost considerations could limit comprehensive maintenance plans and the number of independent measurements available for comparison.

The manuscript is generally well written and contains sufficient information describing data collection, adjustment, and analysis. I'll detail a few minor comments below that could help make this a stronger contribution.

General comments

In the discussion section, analysis of the corrected salinity and dissolved oxygen datasets in their oceanographic contexts is provided, but this analysis is conspicuously absent from the $p\text{CO}_2$ section. Instead only apparent differences between SD $p\text{CO}_2$ and $p\text{CO}_2$ from fixed stations is discussed. I'd suggest augmenting this section with some brief analysis; for example, what causes the increase in sea surface $p\text{CO}_2$ toward the end of the experiment?

The 'Experiences and recommendations' section feels rather hastily written to me. The suggestions provided are good ones, but are sometimes repetitive and delivered in a way that is somewhat difficult to follow. I'd suggest revising this section for clarity.

Line-by-line comments

52-53: Remove 'the' before biofouling: '...one of the most important is biofouling...'

Figure 1 caption: should this be 'glider sections'? Also, section is spelled incorrectly within the figure

102: Perhaps also cite Sabine et al. (<https://doi.org/10.1175/JTECH-D-20-0010.1>) when discussing the ASVCO₂ system

111, 121: Not sure what is meant by 'open fixed station'. Should this be 'open-ocean'?

127: Define OGS here (this is the first mention in the text, besides the author affiliations). Also, in the next line, the authors have 'the OGS'. I'd recommend consistency: either 'the OGS' or just 'OGS'.

201-202: Grammar. Change 'allowing to' to 'allowing for the correction of'

275: Grammar. Change 'less' to 'fewer'

300: Can it be specified what level of uncertainty would have been assumed in the absence of these issues with the ASVCO₂ instrument?

Figure 8d: x-axis label should be 'Latitude'

Figure 9b: y-axis label should be ' $\Delta p\text{CO}_2$ '

Figure 10b: Can a line be added through the W1M3A values, like for the other datasets?

430-439: No mention of the $p\text{CO}_2$ results in this paragraph?

436: Could this be better stated as 'consistency in the corrected salinity values between both SDs'?

437: Could this be better stated as '...to correct the erroneous trend in O₂ saturation %'?

455: Typo. 'substantial' amount of effort

474: This is the first mention of RBR. Are these the optical sensors?

497: Author contribution section is incomplete