



Comment on **essd-2021-16**

Rik Wanninkhof (Referee)

Referee comment on "SeaFlux: harmonization of air-sea CO₂ fluxes from surface pCO₂ data products using a standardised approach" by Amanda R. Fay et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-16-RC1>, 2021

Reviewer Rik Wanninkhof NOAA/AOML

This is a well written manuscript thoughtfully describes and rectifies inconsistencies between several global ocean air-sea CO₂ flux products. Notably, differences in ocean surface area depending if marginal and coastal seas are included; and providing an adjustment to quadratic gas transfer parameterizations to match the global bomb 14C constraint. This "harmonization" leads to a better agreement between the different products. As a last step the authors use an ensemble approach to determine a global mean air sea CO₂ flux of 1.92 ± 0.35 Pg C/yr where the uncertainty is a 2 sigma (95 %) confidence interval and is based on agreement of the 18-member ensemble using on 6 interpolated and area normalized surface water pCO₂ products and three different windspeed products with normalized gas transfer velocities. The uncertainty (± 0.17) (1-sigma) basically reflects the differences in interpolation techniques of the same dataset (SOCAT). Using this uncertainty for purposes as stated "help to identify missing fluxes as we strive to close the global carbon budget" is not appropriate. While beyond the scope of ESSD, it looks like the authors are trying "to sneak a number" into the peer reviewed literature.

The manuscript appears a mixture of a data description as expected for ESSD and commentary/interpretation which is beyond the scope of this journal. As listed on the home page of ESSD: "for the publication of articles on original research data (sets),. The editors encourage submissions on original data or data collections which are of sufficient quality and have the potential to contribute to these aims. Any interpretation of data is outside the scope of regular articles."

A few things are not clear:

-Why isn't the "Landschützer, P., Laruelle, G., Roobaert, A., and Regnier, P.: A combined global ocean pCO₂ climatology combining open ocean and coastal areas (NCEI Accession 0209633)," included as one of the interpolated products? This seems to be one of the most complete sets wrt area. Also, citing the paper in ESSD rather than the data product might be more appropriate.

-The authors refer to the "Seaflux product and "Seaflux package" but the full description

of either is lacking in this paper. The Gregor and Fay, 2021 referenced is the dataset without a complete description. What exactly is the Seaflux package? I would encourage the authors to focus on describing this product and tools in this manuscript.

-It is mentioned that the area normalization has been previously applied in models and products in a rudimentary fashion. How different are the global fluxes using simple extrapolation methods compared to the approach used here? Eyeballing the results it appears that scaling global fluxes to a consistent area, and has been done in the past seems to work reasonably well.

- Figure 1A is not clear. Is "the changing fraction of area covered by observations" essentially seasonal changes in ice coverage? If so, perhaps include the different expressions for gas exchange in partial ice coverage (e.g. Takahashi 2009), and different ice products in the analysis.

Minor issues:

-The gas transfer velocity is listed as piston velocity and exchange coefficient: be consistent

- I don't think that "improved" in the title is appropriate. The title for the SeaFlux product seem better as title for this paper: "SeaFlux data set: Air-sea CO₂ fluxes for surface pCO₂ data products using a standardised approach"

- Tables and figures are good but lines are difficult to read (for those with color impaired eyesight)