

## ***Interactive comment on “Air–sea carbon flux from high-temporal-resolution data of in situ CO<sub>2</sub> measurements in the southern North Sea” by Steven Pint et al.***

**Steven Pint et al.**

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We appreciate and welcome the referee's comments and we will address them in a revised manuscript. In general, the referee mentions the lack of novelty, the correction applied to the original data, and the single buoy origin of the data as most important remarks.

To better highlight the novelty of the study in the revised version of the manuscript, we emphasize and highlight the strengths and weaknesses of the proposed setup. We are not aware of any other station or platform in the Southern Bight of the North Sea or nearby regional seas with similar setup. Despite few setbacks (mainly related to

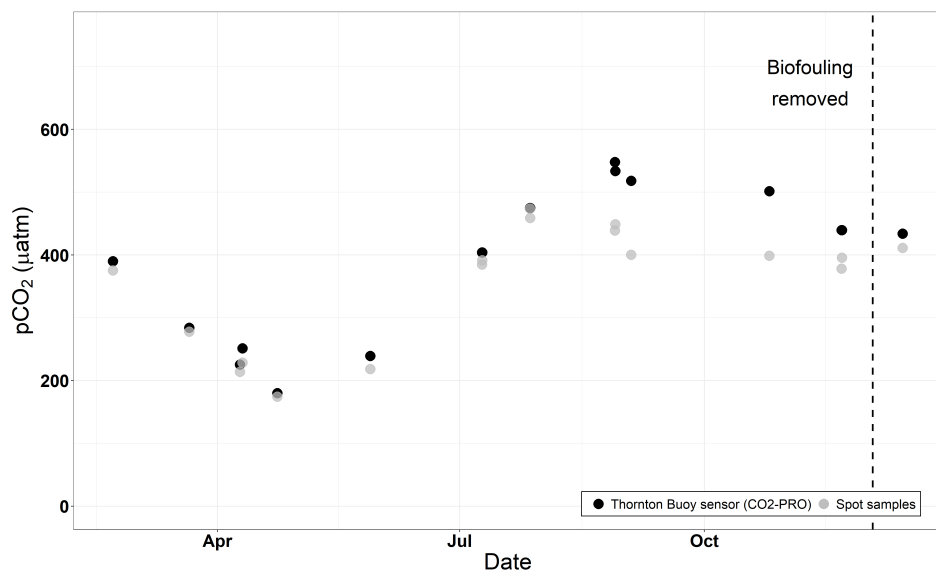
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hardware failures, e.g. failure of the batteries and solar panels) the class 1 labelled ocean station is operational and with capacity to continue to provide quality assured and quality controlled data within the ICOS network.

We acknowledge that the area was well studied, however we have not come up with datasets from recent years (i.e. 2015 onwards) and with similar sampling frequency. Especially in the past decade, the ocean abiotic conditions are changing at unprecedented rates.

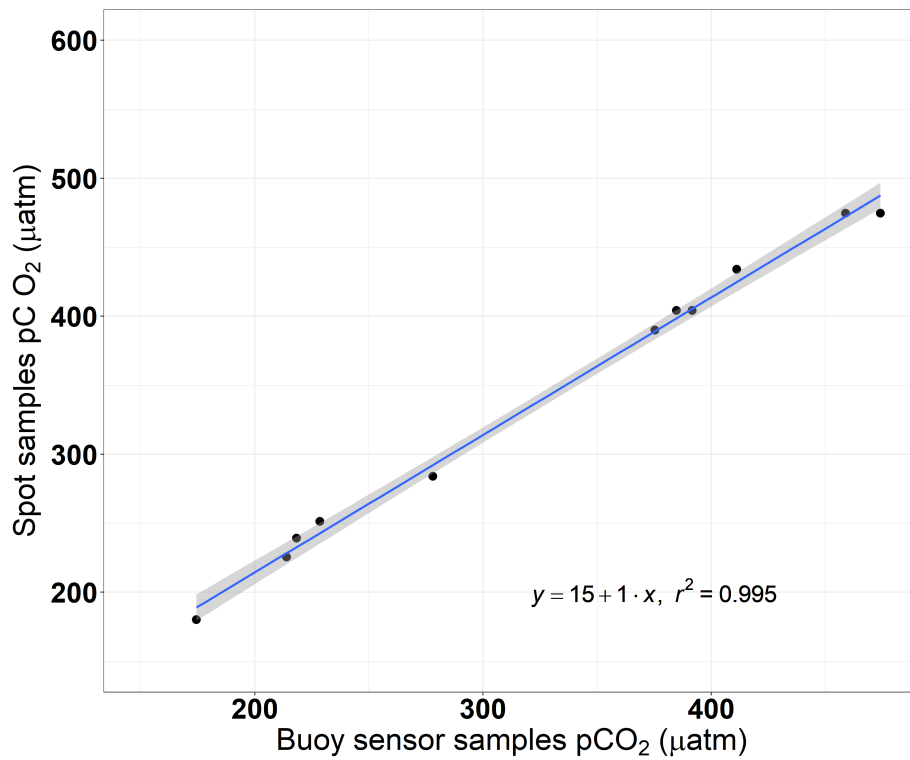
We will include in the revised manuscripts air-sea carbon flux information from different continental shelves and global estimates.

The reported correction of pCO<sub>2</sub>, sea measurements is based on a simple linear regression between in situ measurements and spot samples collected when the station was visited with our research vessel RV Simon Stevin. We have identified that the sensor values were closer to the spot samples from February 2018 until July 2018 and then there is a larger deviation from August 2018 until November 2018. This is because of increased biofouling after a prolonged deployment. Once this was identified and conditions allowed, we resolved this during our maintenance visits, by cleaning the sensor. The latter clearly improved the performance as can be seen in December 2018 (Fig. 1). In that respect, we have decided to use 2 linear regression periods. To make the corrections, we applied one regression curve for the period February 2018 – July 2018 and December 2018 (Fig. 2) and another regression curve for the period August 2018 – November 2018 (Fig. 3). We are also confident that the erroneous sensor values for the seawater CO<sub>2</sub> are because of biofouling, pre and post deployment calibrations of the sensor's NDIR detector, performed by the manufacturer suggest minimum or no drift of the detector's signal. We will include the details of our corrections in the supplementary material of this paper.



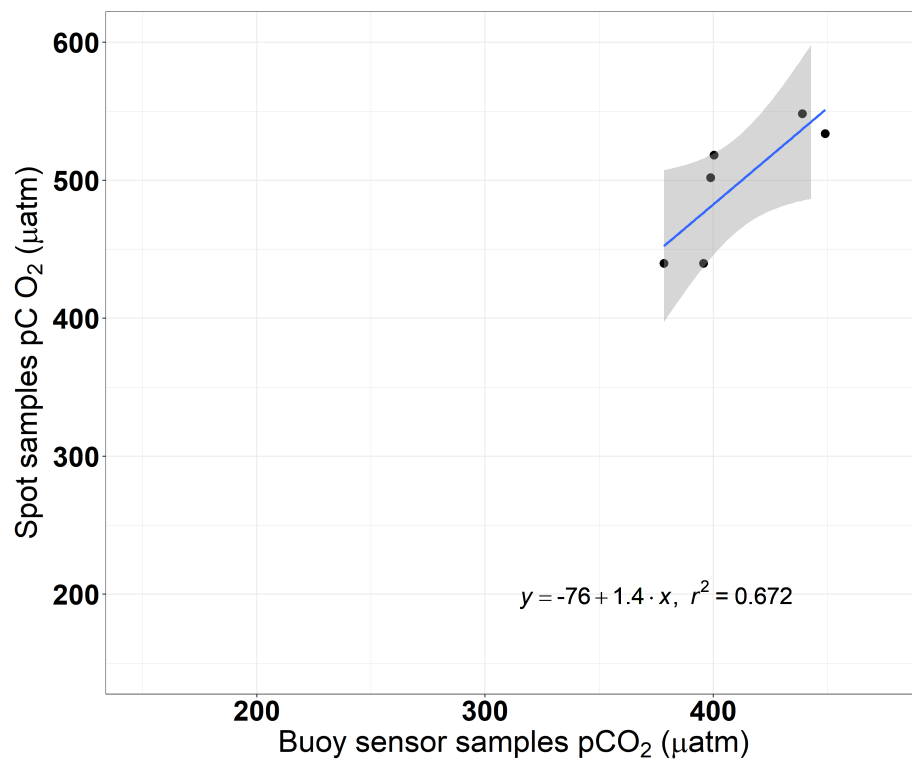
**Fig. 1.** pCO<sub>2</sub> from the Thornton Buoy sensor and spot samples. The removal of biofouling on the buoy's sensor (CO<sub>2</sub>-PRO) is indicated with the vertical dashed line.

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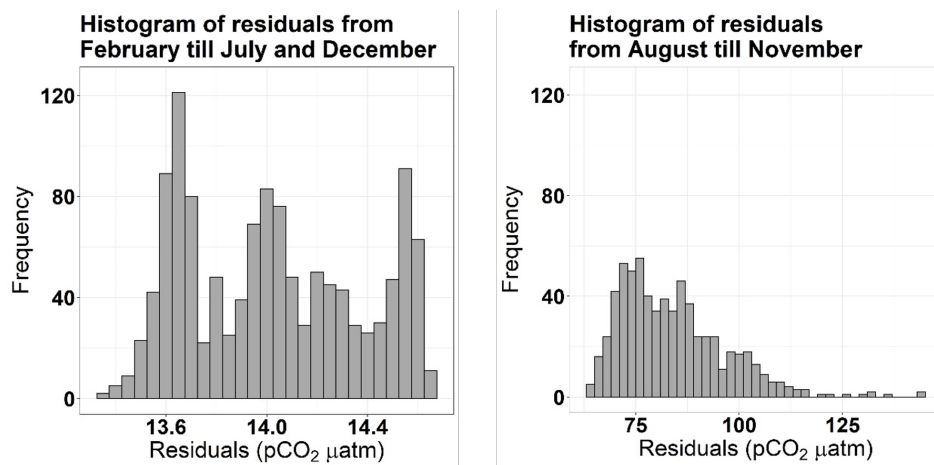
**Fig. 2.** Regression 1st period Feb-Jul 2018 and Dec 2018

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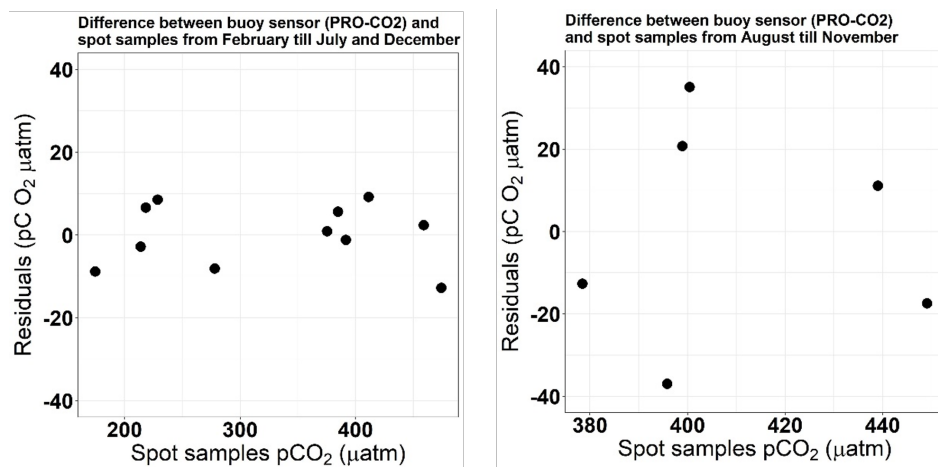
**Fig. 3.** Regression 2nd period Aug - Nov 2018

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**Fig. 4.** Histogram of the absolute residuals for each period of correction

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**Fig. 5.** The difference between the buoy's sensor and the spot samples. Negative values indicate a difference where the buoy's value is smaller than the spot sample value and vice versa