

## Response to editors suggested changes:

*You have chosen the “result and discussion” structure for your paper*

*Chapter numbers and title must follow this format.*

*In addition, I believe your paper be easier to read if you combine actual 3.1+3.3 and 3.2+3.4, without altering the text.*

This is a good suggestion and we have revised the structure of the paper as follows:

- 1 Introduction
- 2 Experimental
  - 2.1 Eddy covariance fluxes
  - 2.2 Flux footprints
  - 2.3 Seawater measurements
- 3 Results and discussion
  - 3.1 CH<sub>4</sub> fluxes and implied seawater concentrations
  - 3.2 CO<sub>2</sub> fluxes and implied seawater concentrations
  - 3.3 Spatial homogeneity of the study region
    - 3.3.1 Variability in salinity
    - 3.3.2 Variability in seawater pCO<sub>2</sub>
    - 3.3.3 Variability in dissolved CH<sub>4</sub>
  - 3.4 CO<sub>2</sub> gas transfer velocity
    - 3.4.1 Dependence of K<sub>CO<sub>2</sub>,660</sub> on wind speed and friction velocity
    - 3.4.2 Seasonal variability in K<sub>CO<sub>2</sub>,660</sub>
    - 3.4.3 Dependence of K<sub>CO<sub>2</sub>,660</sub> on bottom-driven turbulence
  - 3.5 Effects of rain on air-sea CO<sub>2</sub> exchange
- 4 Conclusions

*L39 : change “terrestrial aquatic systems” to “continental aquatic systems” or “inland aquatic systems”*

Changed to “Inland aquatic systems”

*L50 “Due to both the ‘solubility pump’ and the ‘biological pump’, the surface ocean can be a net source or sink of CO<sub>2</sub>, depending on location and time of the year” The term “pump” clearly applies for the case of a sink of atmospheric CO<sub>2</sub>, but not for a source. Please rephrase*

Revised to:

“Seawater CO<sub>2</sub> levels are primarily determined by solubility (temperature-dependent) and the balance between primary production and respiration by the biological community. Seasonal and geographical differences in seawater temperature and biological activity mean that the surface ocean can act as a net source or sink of CO<sub>2</sub>, depending on location and time of the year (Khatriwala et al. 2013; Houghton 2003).”

*L52 “The global open ocean is modelled to absorb”, not sure this is the appropriate formulation*

Revised to:

“Models estimate that  $2.4 \pm 0.5$  GtC yr<sup>-1</sup> of CO<sub>2</sub> (a quarter of anthropogenic emissions) have been absorbed by the global ocean over the last decade (Le Quéré et al. 2018).

*L83 not sure if mentioning such details on surfactants effect on  $K$  is relevant in the introduction of the present study, which does not deal with surfactants.*

The section on seasonal variability in  $K_{CO_2,660}$  (now Section 3.4.2) discusses this briefly and refers to Figure 13 ( $K_{CO_2,660}$  colour-coded by Chl  $a$ , which is often used as an indicator of likely surfactant levels). We feel that this is a relevant-enough topic to be retained in the introduction.