

Interactive comment on “Air-sea exchange of CO₂ at a Northern California coastal site along the California Current upwelling system” by H. Ikawa et al.

Anonymous Referee #2

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In this paper the authors estimate air-sea exchange of CO₂ in an upwelling zone off the coast of California. They conclude that this coastal area represents a strong source of CO₂ during upwelling events and a moderate source during relaxation of upwelling. They also report that sea surface temperature and salinity are good predictors of CO₂ flux in this area. Clarifying the role of the coastal ocean in the uptake or release of atmospheric CO₂ is of fundamental importance to understanding and predicting current and future states of the global carbon cycle. This study aims to increase that understanding.

General comments I think that these results might be quite useful to a broad community,

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but as written the paper does not make the application clear. The English grammar is fine, but the paper is hard to follow, because the structure is confusing. In particular, the authors state in the abstract that they have found a strong relationship between the temperature and salinity of surface water and the CO₂ flux. Such a relationship could be compared with results obtained by researchers in other locations, possibly leading to some sort of general, empirical prediction of CO₂ flux from more easily measured values. Although this is one of the main conclusions of the paper, I think that I have found it in the Methods section (equations 9 and 10). In addition, it would be useful if the authors discussed why their results indicate that this upwelling zone is a source of CO₂, while previous studies have found that it is a net sink. I am not familiar with the eddy covariance technique myself; it would be useful to have someone else review it who is. The work reported in this paper appears useful and could be novel. The authors mainly need to strengthen the Discussion and Summary to clarify the novelty and significance of their research and to put this study into a broader context.

Detailed comments There are too many abbreviations and symbols sprinkled throughout the paper which require that the reader search back a couple of pages for a definition. A table of symbols would help, but it would be better if the authors could simply reduce the number of abbreviations by writing out more terms in full.

Figure 2 requires more explanation.

Figures 3 and 4. Abbreviations are OK on the plot, but avoid them in the caption, except for the universal abbreviations, such as S for salinity and T for temperature.

Figure 7. Plot the regressions used to determine the predictive relationships among S, T and CO₂ flux.

Figure 7. Salinity is dimensionless; avoid “psu” as a unit.

Figure 7. Discuss the two clusters of data that appear above and below S ~33.