

Interactive comment on “Measuring turbulent CO₂ fluxes with a closed-path gas analyzer in marine environment” by Martti Honkanen et al.

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The manuscript provides a very technical assessment of the effects of a drier and a compactor on removing the spectral cross contamination of water vapor in CO₂ flux measurements. It is relevant, and reports interesting findings with direct implications to observation techniques of ocean CO₂ fluxes. Given the topic, I found the narrative diverging to describing other unrelated findings (turbulence, gap filling, roughness length). These sections should be removed, or, the direct relevance of these findings to understanding the differences between the measurement setups should be described.

otherwise, I only have a few minor comments: p3L15-20, I think sea breeze is worth mentioning here. Also, you should mention specifically

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that sea-land gradient is almost always present and violates the horizontal homogeneity assumption. please reference Rey Sanchez et al 2017 <https://www.tandfonline.com/doi/abs/10.1080/20964129.2017.1392830> which evaluated the relative effect of horizontal advection.

Fig 1- please say explicitly where is the EC flux station. I assume it is A, but a bit confused about what B is.

the location of the tower at the edge of a cliff is problematic. The sharp change of roughness and the physical disturbance to the flow probably generate increased turbulence and a vertical ejection flow that violate a few of the EC assumptions (0 mean vertical flow, ergodicity of turbulence). There are many papers discussing the effects of forward facing step on vertical flow. See for example our paper <https://link.springer.com/article/10.1007/s10546-014-9923-5> and references within. Roughness and surface heat flux transition create circulations patterns that are particularly problematic for edge-of-shore flux measurements. See Higgins et al 2013 <https://journals.ametsoc.org/doi/full/10.1175/JHM-D-12-0166.1> and Kenny et al 2017 <https://link.springer.com/article/10.1007/s10546-017-0268-8>. these will be a problem even when the footprint is all water. Please at least discuss this issue, around where you discuss other difficulties of measuring carbon flux in the ocean. P7L15 in the same issue of vertical flow - how did you rotate your wind coordinates? Most rotations assume 0 vertical wind. That will affect your momentum flux. In your case with the cliff facing the wind, you should filter out cases where the unrotated mean w was large. P7L26 you cannot remove more than half of the observations based on a subjective eyeball analysis for “distortion”. Please provide an objective definition for which observations should be removed and remove only and all of those that fit these criteria. P12 L5 The stationarity is an environmental property and should not vary between instruments. I do not understand why you have different stationary cases for each of your setups which are at the same location. That can only be the outcome of different observation errors in each of the setups. I suggest adopting a common criterion, when both

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sensors observe stationary conditions. P13L19 "co2 flux station" seems odd. maybe "co2 flux exchange at the station". This paper is not about carbon budgets. I suggest removing this section. if you insist to keep it, please provide more information on the gap filling approach you used, how you estimated uncertainty, and the resulting co2 flux budget.

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