

Interactive comment on “Current estimates of K_1^* and K_2^* appear inconsistent with measured CO_2 system parameters in cold oceanic regions” by Olivier Sulpis et al.

Anonymous Referee #1

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General comments:

The manuscript is interesting, important and well written. The work is well described and well put into context.

Specific comments:

The short results section followed by a long discussion with new material and figures feels unusual, but after consideration I think it works very well. I also like the short and concise conclusion.

I do not have any major scientific comments or objections, I genuinely think the work is

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well done, as far as I can tell.

Technical corrections:

line 47-48: "... activities or effective concentrations of the reaction products to the product of reactant activities... ". This is hard to follow, please rephrase.

line 98: "Barring" is an unusual choice of words. I personally like it, but suggest using something else for better accessibility of the text. I also suggest rewriting/inverting the sentence so that the main point comes first, and then the exception.

line 161: "WOCE flag of 2" please explain what this entails. There is an explanation much later in the MS, I suggest moving that to here.

line 272: "model fits" or "models fit" ?

line 288: Why the small changes in a_2 in the table 1 ? Is it a typo?

line 298-303: I think this introduction-like text should come before lines 293-298. Possibly also before table 1.

line 376: Do the measurements face an issue? I think this is the wrong forum for that formulation. Do you mean to write that users of the data may face this issue?

line 409: Here is the explanation of the quality flag, please move it to earlier in the text.

line 488-494: A bit hard to follow. Especially "Gray et al. (2018) showed that the Southern Ocean CO_2 uptake is considerably smaller than previously estimate" and then "Using the new constants in Table 1, Southern Ocean pCO_2 is significantly higher than the values used by Gray et al. (2018), meaning that the air-sea CO_2 fluxes are much smaller, in agreement with the conclusions of Bailey et al. (2018)".

Figure 8: It would be much better if the a, b and c panels could be placed directly below one another and be of equal size.