Interactive comment on “Current estimates of \( K_1^* \) and \( K_2^* \) appear inconsistent with measured \( \text{CO}_2 \) system parameters in cold oceanic regions” by Olivier Sulpis et al.

Anonymous Referee #1

Received and published: 18 May 2020

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...
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/inversing 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 a2 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 CO2 uptake is considerably smaller than previously estimate" and then "Using the new constants in Table 1, Southern Ocean pCO2 is significantly higher than the values used by Gray et al. (2018), meaning that the air-sea CO2 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.

C2