

Authors' Response to Reviews of

Inferring the vertical distribution of CO and CO₂ from TCCON total column values using the TARDISS algorithm

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We appreciate the work of the referees and their helpful comments and would like to, again, thank the referees for their help in improving this manuscript. Responses to the comments are below.

- Anonymous reviewer #1:

Specific Comments:

Reviewer: L81: "They report errors near 2%" ... which is actually not so much worse than the errors reported here implying that the retrievals from the MIR might be useful for flux inversions after all.

Authors: We have changed the phrase "to limit their use for carbon cycle studies" to "to encourage the exploration of other methods for use for carbon cycle studies" to focus on the motivation for TARDISS.

Reviewer: L231-L234: Is this obsolete? Equation (2) defines all this.

Authors: L231 – L 234 has elements defined elsewhere, however we feel it is necessary to be explicit with the steps that deal with grouping so that there is less ambiguity about the main terms in the TARDISS algorithm.

Reviewer: L272: K boldface

Authors: We have bolded the character.

Reviewer: L286: y boldface

Authors: We have bolded the character.

Reviewer: L294, equ (15): Shouldn't it be " $x_{L2}-x_a$ " on lhs, or " $x_{a+...}$ " on the rhs?

Authors: We have changed the equation.

Reviewer: L312: "forward mapping matrix" previously introduced as "Jacobian matrix"

Authors: We changed the terminology to be consistent.

Reviewer: L366: G boldface

Authors: We have bolded the character.

Reviewer: L395, L400, L404: The "errors" are probably the "square roots" of the variances in the matrices, not the variances per se.

Authors: We have corrected the description of the errors as they are the square roots of the variances.

Reviewer: L713: the -> they

Authors: We have corrected the term.

Reviewer: Fig.8: Why not using pressure as vertical axis as in Fig. 1?

Authors: We have changed the vertical axis to match Fig. 1.

Reviewer: L870: "While scaling the a priori matrix by a higher value increases the smoothing error ..." Isn't it the other way around: loose prior constraint implies less smoothing error.

Authors: We have clarified the statement to "using a more constrained a priori covariance matrix increases the smoothing error".