

Response to Reviewer:

We thank the reviewer for a careful review of our manuscript. Please see our responses below:

Responses to minor comments:

2.1. We have clarified the text as follows:

“ $\Delta_{CO_2}^{flux}$ is computed at discrete levels from the surface to 14 [km], whereas $\chi_{CO_2}^{bkg}$ is computed at 3 additional levels. These additional levels represent the upper troposphere and the stratosphere, where influence of recent surface flux is assumed to be zero. If there are cases where recent surface fluxes influence upper tropospheric and stratospheric air, those are accounted for as part of background estimation. This is because models used to estimate background are also constrained by *in-situ* measurements. Note that there may still be rare cases, e.g., in the proximity of large fires (Hooghiem et al., 2020), where surface flux influence in the upper troposphere and lower stratosphere may not be captured by this approach.”

2.2. We have now included these regressions as supplementary material S1.

Responses to technical corrections:

3.1. ppm acronym has been spelled out as per the reviewer’s suggestion.

3.2. We have added the ACOS retrieval version (v10).

3.3. NOAA’s CarbonTracker-Lagrange model is not versioned currently, as there is only one version (<https://gml.noaa.gov/ccgg/carbontracker-lagrange/>). This is a regional Lagrangian model that is different from the global Eulerian version (NOAA’s CarbonTracker; <https://gml.noaa.gov/ccgg/carbontracker/>) that is released quasi-annually.

3.4. We have corrected ‘systemic’ to ‘systematic’.

3.5. a.s.l. has now been changed to a.s.l. (above sea level).

3.6. We have amended this error as per the reviewer’s suggestion.

3.7. Considering the other reviewer’s comments, we have now removed this section of the manuscript.

3.8. This has been corrected.