

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2021-793

Anonymous Referee #2

Referee comment on "Continental-scale contributions to the global CFC-11 emission increase between 2012 and 2017" by Lei Hu et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-793-RC2>, 2021

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Title: Continental-scale contributions to the global CFC-11 emission increase between 2012 and 2017 (Hu et al.)

This study analyzed the atmospheric CFC-11 measurements from two global aircraft surveys - the HIPPO (2009-2011) and Atom (2016-2018) campaigns, to estimate regional scale CFC-11 emissions and the emission changes between two campaign periods. The manuscript demonstrates how a well-designed aircraft measurement can be used to constrain regional emissions estimates.

Overall, the writing and figures are clear, and the methodology maximizes the functionality of high-quality datasets. I encourage the publication of this important work, with only a few minor considerations suggested below.

General comments

- Global emissions: authors provided their estimates of global CFC-11 emissions for 2009-2011 and 2016-2018 periods in table 1. They were very briefly mentioned in lines 351-355. Authors need to describe more in details how they were determined, which datasets were used for the analysis, and how well consistent they were with the estimates from other studies.
- Data selection: authors stated that the data included most of the aircraft profiling sampling below 8km. Then does it mean that the HYSPLIT model used to simulate footprint for inversion was also run from the surface boundary layer up to the 8-km

altitude? How were the uncertainties associated with the HYSPLIT model analysis analyzed?

- Prior emissions: since CFC-11 is an anthropogenic compound, it is reasonable to take population density-based distributions of the global CFC-11 emissions of 67 Gg/yr as prior emissions. But as a base case, authors may need to consider including area-based distributions.
- 6-8: it was stated that the error bars for the emissions changes between the HIPPO and ATom periods were calculated from the sum of 2 δ errors derived for the HIPPO and ATom inversions. But propagated errors from a subtraction can be determined by the square root of the sum of the squares of each error. So, the errors shown in the lowest panels of Figs. 6-8 might be overestimated.