

Atmos. Chem. Phys. Discuss., referee comment RC2
<https://doi.org/10.5194/acp-2021-115-RC2>, 2021
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Comment on acp-2021-115

Anonymous Referee #3

Referee comment on "Origins and characterization of CO and O₃ in the African upper troposphere" by Victor Lannuque et al., Atmos. Chem. Phys. Discuss.,
<https://doi.org/10.5194/acp-2021-115-RC2>, 2021

This paper presents an analysis of the CO and O₃ distributions in the African upper troposphere on the period 2005-2013.

The study is based on the IAGOS program (sensors on board airliners), IASI observations (Infrared Interferometer on board satellite) and models (SOFT_IO, FLEXPART) for the transport.

The article is clear and well written. It is a nice investigation of the influence of large-scale circulation patterns on the transport of biomass burning gases and I recommend accepting the publication after the following points are addressed.

1) Period data coverage.

The data used in this paper stop in 2013. Did the measurements stop in 2013, or were they continued but not used for this work?

In the first case, it must be clearly indicated in the text. In the second case, why more recent data were not used?

2) Life-time of CO/O₃ vs SOFT-IO time backtrajectory

The Soft-IO time backtrajectory is 20 days (line 144). The lifetime of CO in the troposphere is larger than 20 days, then the analysis takes into account only recent

contributions of CO. Can the authors assess whether this approximation significantly influences the results or not?

3) differences between IASI and IAGOS.

Figure 5 presents seasonal IASI maps of CO and O₃, with IAGOS points superimposed. This highlights that IAGOS CO and O₃ values are systematically largely over IASI values, for the two gazes and the two seasons. The authors mention that these discrepancies and biases are due to very different natures of observations (line 391). Why not but I think that this point is important and the text has to be clear and precise. IAGOS overestimates O₃ and CO or IASI underestimates ? Why exactly ? I have read the two following papers :

Maya George, Cathy Clerbaux, Idir Bouarar, Pierre-François Coheur, Merritt N. Deeter, et al.. An examination of the long-term CO records from MOPITT and IASI: comparison of retrieval methodology. *Atmospheric Measurement Techniques*, European Geosciences Union, 2015, 8 (10), pp.4313-4328.

And

Safieddine, S., Boynard, A., Hao, N., Huang, F., Wang, L., Ji, D., Barret, B., Ghude, S. D., Coheur, P.-F., Hurtmans, D., and Clerbaux, C.: Tropospheric ozone variability during the East Asian summer monsoon as observed by satellite (IASI), aircraft (MOZAIC) and ground stations, *Atmos. Chem. Phys.*, 16, 10489–10500, <https://doi.org/10.5194/acp-16-10489-2016>, 2016.

But I could not find evident reason for the discrepancies of the present study.

Could it be a problem of difference of altitude of observation between the two ?

4) Minor point

Line 386 : The text mention four seasons but the analysis is based on a 2 seasons separation