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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Tropospheric CO vertical profiles measured by IAGOS aircraft in 2002–2017 and the role of biomass burning" *by* Hervé Petetin et al.

Anonymous Referee #1

Received and published: 27 August 2018

General:
The paper presents a very comprehensive analysis of long-term CO observations performed within the IAGOS project. In particular the observed profiles, mainly in the vicinity of the airports, are extensively discussed. The observed (positive) anomalies from the climatological CO profiles are traced back to their sources by using the backward trajectories technique (FLEXPART) and by including emission inventories containing anthropogenic and biomass burning data. The results show, in a very impressive way, the importance of the biomass burning for the understanding of the observed CO profiles. Because the data set is so large, statistical approach is necessary which was excellently performed in this paper. Consequently, a very robust picture is drown show-

ing how the anthropogenic and biomass burning sources massively contribute to the observed anomalies. The paper is well-written (also little bit too long, see below). The figures are excellent (also some small improvement are still possible, see below). The presented analysis is very clean and covers the issue from all different angles. Thus, I would like to recommend this paper for publishing by ACP with only some minor points listed below.

Minor comments:

- Title
  Because your main results are related to the biomass burning maybe: "The role of biomass burning as derived from...."
- P3 L4-15
  Please write out the abbreviations like MOZAIC, IAGOS or FLEXPART if they are used first time in the manuscript.
- P4 L1
  What do you mean with "fully validated"? It sounds very technical
- P4 L15-20
  Please add which type of met. data is used in SOFT-IO, ERA-Interim or ECMWF Analysis or even something very different (like MERRA-2)
- P5 L29
  "carbon fuel content" - what do you mean in context of the biomass burning
- Figure 2 and 3
  Both matrix-figures can be optimized by removing some redundant x-axis and y-axis captions. In this way the sub-panels become larger and easier to read.

- P6
  For me section 3.3 is much too long. It needs to much time to reach the most interesting part of the paper starting with section 4.
- P7 L5-9
  How do average vertically the profiles shown in Figure 4
- P7 L15
  “1, 100” - here is something wrong with the notation
- Title of section 4.2
  Maybe “Seasonality of climatological....”
- P7, L25
  ...are 10-30 ppbv higher than...
- Figure 6
  The profile availability is very difficult to read. Also the blue and red numbers are not sufficiently explained
- P9 L36
  even if explained before (“will focus on the strongest positive CO anomalies”) I would recommend to write: ”...represents the whole positive anomalies dataset”
- Figure 12
  one y-axis caption “Altitude” would be enough
- Figure 13
  I would replace the y-axis label “SOFT-IO contribution...” by “C_{AN+BB} contribution...” and remove the redundant x- and y-labels in this matrix figure
- P11-12, section 5.4, Figure 14
  For me this figure and the related explanation takes too much space in your

paper. There are no clear conclusions from this figure. Also it slightly disturbs the “dramatic line” of your paper because it belongs roughly to the previous part i.e. around Fig. 12 (i.e. where the quantities $C^{>p}$ are introduced). Maybe you can shift and shorten this part.

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