Review of "*Assimilation of IASI satellite CO fields into a global chemistry transport model for validation against aircraft measurements*" by Klonecki et al.

This paper discusses the assimilation of CO retrievals from the IASI instrument into the chemical transport model LMDz-INCA. The authors give a careful description of the techniques used and present an evaluation of the impacts of data assimilation on modeled CO fields through comparison to aircraft observations of CO during the POLARCAT campaign. The sub-optimal Kalman filter assimilation technique is well established and has been applied in previous studies.

The work described is generally sound and the manuscript well written, but it includes little scientific content and, in my opinion, might be more suited for GMD than ACP unless the authors find a way to increase the scientific significance.

General comments:

The authors discuss the impact of assimilation of CO on modeled CO fields, but it would also be interesting to see if and how other chemical species changed.

The quality of the figures could be improved. Many of them are fuzzy and labels are often too small to read.

Specific comments:

Section 2, page 31694, line 25
Do I understand correctly that there are only two profiles used as a priori, one for polluted and one for unpolluted cases? And the model is used to geographically separate these cases?

Section 2.3
Does the assimilation include both daytime and nighttime retrievals?

Section 2.3, page 31699, equation 4
If the variability is considered in the error and also added to the superobservations, isn't it counted for twice then?

Section 2.3, page 31700, line 8
Is there a reason behind the Nobs >=4 or is this threshold chosen arbitrarily?

Section 3.1
Why was a climatology used for the emissions and not the emission inventory that was developed specifically for the POLARCAT time period? It can be expected that

model output using climatological emissions is not able to capture measured patterns well, especially in the presence of fires.

Section 4.3.1
It would be helpful to specify the number of data points available for each bin in Figures 8 and 9. I assume most data points will be at the cruise altitude and few below? I also suggest adding horizontal error bars on the mean difference plots to show if the improvement with assimilation is within the variability.

Line 15: I would not say that the assimilation "seems" to increase the mean bias, it clearly does. Could there be an issue with the vertical correlation length?

Figure 9: Does the seasonal cycle also improve for the other latitude bands?

Section 4.3.2
Figure 12: I suggest also adding here the number of data points per bin and including horizontal error bars in the difference plots.

Section 5:
I would label this section "Summary" as it does summarize the findings discussed previously but does not present any more discussions.