Black: referee's comments red: authors' answers
First of all, we want to thank the two referees for the detailed analysis of our paper.
For the details, please look into the paper with keeping track of changes.

Referee #2

General comments: The authors present a study on ozone retrievals from infrared spectra recorded in Xinghe, China and on Reunion Island. Data from these sites are highly needed since these areas are poorly represented in the networks. This study uses the 3040 cm-1 spectral region and presents results of a one year time series and a characterisation of the 3040 cm-1 ozone product. Moreover, using spectra from Reunion Island data obtained from the 3040 cm-1 region are compared with those with the standard NDACC retrieval at 1000 cm-1. The comparison shows a good correlation, but a bias of 5.5 to 9.0 % and reduced degrees of freedom compared to the standard microwindow. Ozone retrievals in the 3040 cm-1 region are very useful since there are several FTIR spectrometers without an MCT detector around the globe.

For the 3040 cm-1 retrieval a modified version of the recipe of Garcia et al., 2014, was used. As a result, the key findings are very similar to those obtained by Garcia et al., 2014. However, since the recent study doesn't use exactly the same recipe, strictly speaking, it cannot be used as confirmation of the Garcia recipe and as an extension including more sites covering different conditions. To my impression, it is not clear whether it is a confirmation of the Garcia paper showing similar retrieval results or whether there is an improvement as compared to the Garcia paper. If the authors claim the latter this should be demonstrated or at least discussed in detail. To do so the authors might think in adding a Garcia type retrieval for comparison.

Therefore, I would recommend publishing this paper after major revisions although the paper is well written and fits well to the scope of AMT. Please also see specific comments below.

Specific comments:
- The statement in the abstract 'as the harmonized . . . uses the 1000 cm-1 spectral range, we designed an alternative O3 retrieval strategy . . .' is not correct since there is a published 'alternative' retrieval recipe for FTIR sites without MCT detector as published by Garcia et al., 2014.
Thanks for pointing out the inappropriate statement.
The sentence is reworded in the revised version "we apply the O3 retrieval in the 3040 cm−1 spectral range at Xianghe."

- The recipe from Garcia et al. 2014, has been modified. The modifications made and the rationale behind these modifications should be described in more detail. Moreover, a comparison with retrieval results using the full recipe from Garcia et al. would be very useful to see the effect of these modifications.
Thanks for the suggestion. The comparison between the FTIR O_3 retrievals using the window in this study and García et al., 2014 window has been added in the Appendix A of the revised paper.

In general, the retrieved O_3 total columns at Xianghe using the windows in this study and the window from García et al. 2014 are very close to each other. The mean and standard deviation of their relative difference are 0.8% and 1.2%, which are quite small compared to the retrieval uncertainty. However, we have more successful retrievals when using the windows in this study compared to their window choice, especially in summer with more H2O. The RMS of the residual using the windows in this study is about 0.20%, which is less compared to the one using Garcia's window of about 0.24% mainly due to several bad CH_4 fittings. In addition, the mean of daily standard deviation of the retrieved total column for all days with more than 4 measurements using the García's window is 1.4%, which is slightly larger compared to 1.3% using the windows in this study. As the water vapor abundance is relatively high in summer at Xianghe, we suggest using the window of 3039.9-3040.6 cm^{-1} instead of the window of 3042.48-3043.72 cm^{-1}.

- p. 4: 'a few badly fitted absorptions': Fig. 1 shows strong residuals at ozone line positions in particular in microwindow 1, not included in the Garcia paper. Does this additional window really improves the fit results although the line list needs improvement for this window?
Thanks for the comments. By comparing FTIR O_3 [3040 cm^{-1}] retrievals with other datasets (FTIR O_3 [1000 cm^{-1}] retrievals, FTIR O_3 [3040 cm^{-1}] retrievals using García's window and TROPOMI measurements), it is found that the FTIR O_3 [3040 cm^{-1}] retrievals are generally in good agreement with other datasets apart from a systematic uncertainty. Adding the microwindow 1 does not harm the retrieval, although the O_3 lines are not perfectly fitted. On the contrary, by adding the microwindow 1, the O_3 retrieval has more information in the troposphere due to a stronger O_3 line intensity compared to the lines in microwindows 2 and 3. The averaged DOF is 2.2 using only bands 2 and 3, and the DOF is 2.4 using 3 bands together at Xianghe.

- p. 3: 'One specific optical bandpass filter (2000 – 4000 cm-1)': This is not the standard NDACC type optical filter. The NDACC type filters provide a smaller bandwidth and increase the signal to noise ratio.
The filter used in Xianghe is the standard narrow bandpass Filter 3 (2420-3080 cm^{-1}) used by the NDACC-IRWG community, and it is wedged. This information is added in the paper.

- p. 4: 'the ILS . . . retrieved simultaneously . . .': Since differences to the ideal ILS are hardly to distinguish with differences of the profile shape it is strongly recommended to retrieve the ILS from cell spectra. How does the resulting ILS looks like? Does it differ with respect to the ideal ILS and how much does it vary with time?
Thanks for the comments.
Simultaneous retrieving ILS allows us more freedom to fit the residual. We tune the sigma of the ILS parameter in sfit4.ctl to constrain the retrieved ILS and to make it close to the ILS results derived from the LINEFIT using the HBr cell measurements. Figure 1a shows the modulation efficiencies (ME) retrieved by the LINEFIT14.5 code from 4 HBr cell measurements at Xianghe. Figure 2 shows an example of the a priori and retrieved ME, as well as the time series of the retrieved ME at the maximum optical path difference (MOPD = 175 cm). The a priori ME is the ideal status, and the retrieved ME is close to the LINEFIT results. The mean and standard deviation of the retrieved ME at the MOPD are 0.88 and 0.04, respectively, and the retrieved ME is relatively stable with time.

The LINEFIT retrieval also suffers from the uncertainties of the cell pressure, temperature and gas abundance, and it is not easy to estimate these uncertainties. Therefore, we prefer to

retrieve the ILS but with a reasonable sigma to constraint the retrieved ILS parameters and to make them close to the cell measurements instead of using the LINEFIT outputs directly.

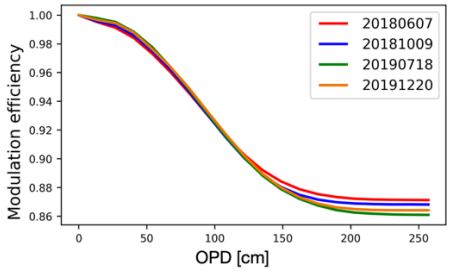

Figure 1a. The modulation efficiencies retrieved by the LINEFIT14.5 code from HBr cell measurements at Xianghe on 7 June 2018, 9 October 2018, 18 July 2019 and 20 December 2019.

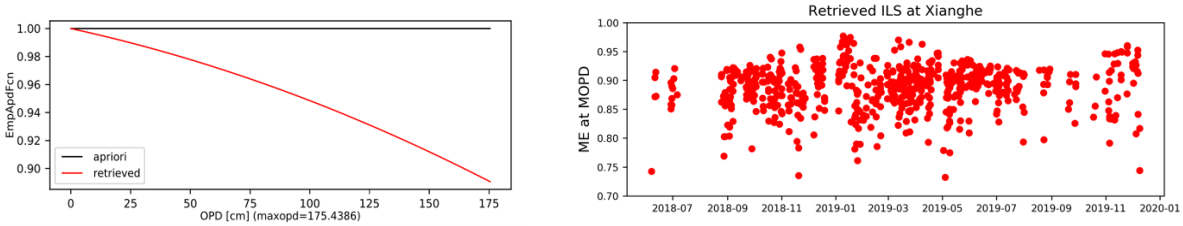

Figure 2a. Left panel: a typical example of the a priori and retrieved modulation efficiencies (ME) along with the optical path difference (OPD) at Xianghe. Right panel: the time series of the retrieved ME at the Maximum OPD (175 cm).

Technical corrections:
- p. 3, line 1: in June at Xianghe => at Xianghe in June
- p. 4, line 15: O3 retrieved profiles => retrieved O3 profiles
- p. 6, line 23: mainly the => mainly from the
– p. 7, line 4: larger the => larger as compared to the
– p. 16, line 2: a MCT => an MCT?

Corrected

Reference:

García, O. E., Schneider, M., Hase, F., Blumenstock, T., Sepúlveda, E., and González, Y.: Quality assessment of ozone total column amounts as monitored by ground-based solar absorption spectrometry in the near infrared (> 3000 cm-1), Atmos. Meas. Tech., 7, 3071–3084, https://doi.org/10.5194/amt-7-3071-2014, 2014.