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 #1

General comments: This manuscript presents a generally well written study on ozone retrievals from ground-based Fourier-transform infrared (FTIR) solar absorption spectra in the 3040 cm-1 spectral region. This is not a new approach, it was previously used (Rinsland et al., 1996; Goldman et al., 1999; Meier et al., 2005; Fu et al., 2007; Sung et al., 2007) for ozone retrievals, and as the study shows, this is not an optimal region for retrieving ozone. The 1000 cm-1 region proved to be more adequate for this purpose (Lindenmaier et al., 2010), and was adopted by the Network for the Detection of Atmospheric Composition Change for its harmonized FTIR ozone retrieval strategy (Vigouroux et al., 2015). However, for this particular site, Xianghe, where the spectral range is limited to the 1800 - 11000 cm-1 domain, it can give useful information about the seasonal ozone variations and its long-term trends. This retrieval approach can be extended to other FTIR sites recording spectra in this range. Therefore, I recommend this study for publication in AMT after minor revisions.

1) P3L25 – You mention "One specific optical bandpass filter. . .." Can you please be more specific? Is that the standard narrow bandpass Filter 3 (2420-3080 cm-1) used by the NDACC-IRWG community? Is it wedged?
Yes. 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.

2) P4L2 – Explain what is epsilon.
Done

3) P4L12-14 – What was the criteria for choosing these three particular windows for your retrievals? In the 2000 – 4000 cm-1 there are other windows that could be used for ozone retrievals, e.g. 2775 cm-1, 3023 cm-1. Also, you affirm that the first window has the strongest ozone absorption lines and the least interference with H2O. Why did you add the other two? Wouldn't have been enough to use only the first? You should explain in the text. Also, clarify if these windows were used simultaneously.
Thanks for the comments/suggestions. More texts are added in the revised version.

Comparing to 2775 cm^{-1}, the O_3 lines around 3040 cm^{-1} have stronger intensity. Comparing to 3023 cm^{-1}, the O_3 lines around 3040 cm^{-1} have less impact from other species, especially from H_2O. The retrieval windows used in this study are basically from Garcia's choise with some modification. We replace one of their windows with the window 1 in this study, which has less H_2O influence. The comparison between the retrieved O_3 total column using Garcia's windows and our windows is added in the revised paper: it is found that the retrieved O_3 total columns from Garica's windows and our choices are very close to each other. However, we have more successful retrievals when using the windows in this study compared to the one using Garcia's window.

The 3 retrieval windows are used simultaneously. Using three window together allows us to get a larger DOFS (2.4) compared to only using first window (1.5). According to Figure 1, the first window has the strongest ozone absorption lines and the least interference with H_2O, but

the latter two windows have more weak absorptions, which have more information in the stratosphere.

4) P4L19-20 – Have you tried fitting the minor interfering species to improve the residual? For example, for the 3039.9 – 3040.6 cm-1 window, what is the result if you fit also CH3Cl? Solar lines are not mentioned at all in the text, only in the caption of Figure 1. Among the weak species for this same window, beside solar lines you have HDO, NH3, and OH. Have you tried fitting these species? It would be great to add some text here and explain how you picked the interfering species for each window rather than just list them.
Thanks for the suggestions. Solar lines are now added in the text.
We have tested fitting the minor interfering species to improve the residual, for example adding CH_3Cl/HDO/NH_3 and OH in the window 1, the largest improvement of the RMS is less than 0.001% and the change of the retrieved O_3 total column is within 0.01%. Considering the relatively large systematic and random uncertainties of the O_3 retrieved column of 13.7/1.4%, these weak species can be ignored.

5) P5 Figure 1 – Please enlarge the panels for each window (make them as those in Figure 2 for clarity. Also, the values on the x and y axes are too small, hard to read. Bring them at the size in Figure 2.
Done

6) P9L15-20 – This part is confusing. What is the accuracy and precision of the IAP ozonsondes? What does "higher ozone detecting performance" mean? I would give numbers here, the error for the IAP ozonsondes.
Thanks for the comments. Numbers are added in the revised version. The precision of the IAP ozonsondes is within ±5% in the troposphere and within ±10% in the stratosphere, respectively.

7) P10 Figure 4 – Please enlarge the numbers on the x and y axes
Done

8) P11L6 – FTIR measurements are compared with TROPOMI OFFL at both sites, but for what window? Specify.
Added

9) P16L8 – To me it looks like it is more 10 to 40 km rather than 5 and 40 km (text). In my opinion it is not correct then to use surface to 20 km. Use 10 to 20 km in the entire manuscript, I think it is more appropriate.
Done. We change '5 and 40 km' to '10 to 40 km'.
We prefer to keep the partial column between the surface and 20 km. As the DOFS for the partial column between surface and 20km is about 1.1 (see Fig. 2), including 0.25 from surface to 10 km and 0.85 from 10 to 20 km. To have >1.0 DOFS, it is better to use the partial column between surface and 20 km. We agree with the referee that the O_3 retrieval (3040 cm^{-1}) is mainly sensitive to 10-40 km, and we highlight in the paper that the lower partial column (surface-20 km) is mainly sensitive to the upper troposphere and lower stratosphere (UTLS), and less sensitive to the boundary layer.

There are some typos in the text:
P2L15 – Change "the continue" to "to continue"
P6L24 – Change "mainly the" to "mainly from the"

P13 Figure 6 caption L5 – Change “and the back solid line” to “and the black solid line”
Corrected

References:

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Meier A, Paton-Walsh C, Bell W, Blumenstock T, Hase F, Goldman, A, et al. Evidence of reduced measurement uncertainties from an FTIR instrument intercomparison at Kiruna, Sweden. JQSRT 2005; 96:75–84.

Fu D, Walker KA, Sung K, Boone CD, Soucy MA, Bernath PF. The portable atmospheric research interferometric spectrometer for the infrared, PARIS-IR. JQSRT 2007; 103:362–70.

Sung K, Skelton R, Walker KA, Boone CD, Fu D, Bernath P. N2O and O3 Arctic column amounts from PARIS-IR observations: retrievals, characterization and error analysis. JQSRT 2007; 107:385–406.

Lindenmaier R, Batchelor RL, Strong K, Fast H, Goutail F, Kolonjari F, et al. An evaluation of infrared microwindows for ozone retrievals using the Eureka Bruker 125HR Fourier transform spectrometer, JQSRT 2010; 111(4):569-585.