Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2020-127-RC1, 2020

Atmospheric Measurement Techniques Discussions

Interactive comment on "Ground-based FTIR O_3 retrievals from the 3040 cm^{-1} spectral range at Xianghe, China" *by* Minqiang Zhou et al.

Anonymous Referee #1

Received and published: 27 May 2020

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?

2) P4L2 – Explain what is epsilon.

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.

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.

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.

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.

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

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

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.

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”

References: Rinsland CP, Connor BJ, Jones NB, Boyd I, Matthews WA, Goldman, A, et al. Comparison of infrared and Dobson total ozone columns measured from Lauder, New Zealand. Geophys Res Lett 1996; 23:1025–8.

Goldman A, Paton-Walsh C, Bell W, Toon GC, Blavier JF, Sen, B, et al. Network for the Detection of Stratospheric Change Fourier trans- form infrared intercomparison at Table Mountain Facility, Novem- ber 1996. J Geophys Res 1999; 104:30481–503.

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.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2020-127, 2020.