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Interactive comment on "Sources of error in open-path FTIR measurements of N_2O and CO_2 emitted from agricultural fields" *by* Cheng-Hsien Lin et al.

Anonymous Referee #1

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I found this to be one of the most useful papers that I have read on open-path FT-IR spectroscopy. I have only a few comments.

Both Griffiths and Russwurm have shown that triangular apodization causes greater deviations from Beer's law non-than other apodization functions and so it is a pity that this was the apodization function used in this study. Incidentally, rather than citing the short paper written by Zhu and Griffiths given in this paper, either of the following two citations would have been better: "Errors in Absorbance Measurements in Infrared Fourier Transform Spectrometry Because of Limited Instrument Resolution," R.J. Anderson and P.R. Griffiths, Anal. Chem., 47, 2339-2347 (1975) and "Extending the Range of Beer's Law in FT-IR Spectrometry. Part I: Theoretical Study of Norton-Beer Apodization Functions", C. Zhu and P. R. Griffiths, Appl. Spectrosc., 52, 1403-1408 (1998).

A discussion as why the effect of increasing the temperature above ambient and changing the relative humidity reduces the accuracy to which the concentration of the analytes can be predicted would have been useful. I believe that this is caused by the fact that the width of the lines in the vibration-rotation spectra of N2O and CO2 are temperature dependent so that the resolution parameter, , for each line varies with temperature. Similarly, the FWHH of these lines increases with the polarity of the broadening gas, so that it would again be expected that that would decrease as the temperature increases. The term zero-filling factor (ZFF) appears to be used in different ways depending on which software is being used. For example, I am used to a ZFF of 2 meaning that there are two data points per resolution element. It is stated on page 5 that spectra were calculated with a zero-filling factor of one but Figure 2 shows that there are four data points per resolution element. I would have written that ZFF = 4, not 1. Can the authors state how ZFF is defined in this paper.

The abbreviation S-OPS was not defined in the text (page 10). In the same paragraph it is stated that the physical path length for the OP-FTIR measurements was 150 m, but Figure 1 shows that measurements were also made with physical pathlengths of 50 and 100 m.

These are minor criticisms and I recommend that this excellent manuscript be accepted with only minor changes.

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