

Atmos. Chem. Phys. Discuss., referee comment RC1  
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## Comment on acp-2022-354

Anonymous Referee #1

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Referee comment on "Understanding the variations and sources of CO, C<sub>2</sub>H<sub>2</sub>, C<sub>2</sub>H<sub>6</sub>, H<sub>2</sub>CO and HCN columns based on three years of new ground-based FTIR measurements at Xianghe, China" by Minqiang Zhou et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-354-RC1>, 2022

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This paper uses the SFIT4 code to retrieve Carbon monoxide (CO), acetylene (C<sub>2</sub>H<sub>2</sub>), ethane (C<sub>2</sub>H<sub>6</sub>), formaldehyde (H<sub>2</sub>CO), and hydrogen cyanide (HCN) five species from the FTIR spectra for more than three years and discusses the correlation between them.

The paper is nicely organized and results summarized well (though some minor editorial work needed here and there) but I have a few concerns with the scientific significance and value of this research. Within the NDACC, these five species are conventional gases. There is no improvement or innovation in the inversion algorithm in this study. It seems that the selection of these five gases is that they are in the mid infrared band which is lack of scientific significance. Some key issues:

- In table2, what's the reason for different gases with different spectral resolutions, e.g., CO with 0.0035 cm<sup>-1</sup> where H<sub>2</sub>CO, C<sub>2</sub>H<sub>6</sub> with 0.0051 cm<sup>-1</sup>. How is the spectral band range determined? For TCCON, each inversion window is carefully selected, how is inversion window determined for these five species?
- The author use the optimal estimation method (OEM) for CO and use the Tikhonov L1 method for other four species? Can you give a discussion about the two method and the reason for choosing different method for different species?
- Since Xianghe FTIR measurements compliant with the NDACC-IRWG protocols and the algorithm is available in the published literature, just a brief description is needed here for completeness.
- It seems strange that CO has no seasonal changes. Could you please compare it with CO total column retrieved by TCCON algorithm?