We thank the Dr. Mengqi Zhang for his/her constructive comments and suggestions to improve the quality and clarity of our manuscript. Item-by-item responses to the specific comments are provided below, in which the reviews' comments are in blue, our responses in **black**, and modifications of the original manuscript are indicated by highlight in <mark>yellow</mark> in the revised manuscript.

Community comment:

This article used the GIIRS, which is the fisrt geostationary Infrared hyperspectra Sounder over the world, to retrieve the diurnal carbon monoxide. CO is very important atmospheric pollutant and a tracer of CO2. This work is very meaningful and the paper is well-writen and well organized. This would be the sencond work on atmospheric trace gas retrieval after Lieven Clarisse(2021)(https://doi.org/10.1029/2021GL093010), and also is the fisrt work on GIIRS-FY4B and CO.

As a community comment, I highly recommend publication to raise awareness of thermal infrared detection of trace gases.

Thank you for your very positive comments.

I also have the following suggestions and questions.

The colormap in Figure 10(a) and Figure 11(b) shoud be changed. The viridis colormap is hard for reading and knowing the spatial change. May jet ,rainbow, or some other colormap are suitable.

We have changed the colormap to "Spectral" in Python which has a range of colors for describing the CO gradience in the study area.

The GIIRS of FY4A has a certain degree of wavelength calibration offset. Is the GIIRS of FY4B better in wavelength calibration? How is this considered in the inversion? Should the wavelength be calibrated first, or should it be brought into the inversion model for optimization iterations?See the GIIRS FY4A wavelength calibration problem on: https://www-cdn.eumetsat.int/files/2021-01/8%20-%20Coheur%20-%2017h15%20-%20Preliminary%20results%20on%20NH3%20retrievals%20using%20GIIRS.pdf

Thanks for bringing this up. Fortunately, FY-4B/GIIRS has a much better performance, compared to its predecessor, according to Li et al. (2022). Also from our own assessment, there is no evidence of a large spectral shift, judged from the spectral fitting residual, that may affect our retrievals.

P12,L320. The x_a, x_{true} in the formula shoud be differentiated from the previous formula (Eq 5). The same express x_a and $\mathbf{x_a}$ may lead some confusion. May CO_a or CO_true

be better. This may be helpful for some readers. **x_a** in Eq 5 including CO_a and other state vectors.

Thank you for your great suggestion. We have made the changes as suggested.

Are there any plans to apply the algorithm to FY4A with data from 2019? (Although FY4B has better instrument performance.)

Yes. We do have a plan to apply the retrieval algorithm to FY-4A/GIIRS as it has a longer time period. But it will require some re-calibration to fix the spectra shift like you have just mentioned, and re-evaluation of the spectral accuracy.

GIIRS completes a scan cycle in about 2 hours, so the data at a certain position within 0-2h is just an instantaneous value within the cycle. Although there is no difference in value, it may be better to remind readers to pay attention.

We have added this statement in Section 6.3.

The temperature profile is a key physical quantity for CO inversion, and the ERA5 reanalysis data was used in this study. How sensitive is the algorithm to the temperature profile? The CO2 absorption band of GIIRS has the ability to invert temperature profiles. Would the inversion results for trace gases be better using their inversion temperature profiles?

The atmospheric temperature profile is a key parameter as it regulates the atmospheric thermal emissions. The temperature profile from ERA5 reanalysis has been shown to be very accurate as it assimilates various observations. Nonetheless, we have retrieved a scale factor (with a priori of one and a small variability allowed) to the temperature profile. The retrieved scale factor is still very close to one, suggesting using the reanalysis is not causing a bias.

Retrieving the temperature profile from GIIRS's own spectra is an alternative way of getting the profile information for our retrieval algorithm, but it will take some time to get this information ready. This can be done in future investigations.

P5, Figure 1c. …. (bottom) Jacobian for CO ….. May add the matrix would be better(Jacobian matrix).

The Jacobian values in Fig. 1C is a vector, representing the change of radiance at different channels to a perturbation in CO concentration. So we keep "Jacobian" in the label. Instead, in the figure caption, we added "… **Jacobian at different channels …**"

Overall, this article is very valuable and meaningful. I highly recommend publication.

Thanks again for your positive comment.