Anonymous Referee #1

I appreciate the efforts the authors have made in this revised manuscript. Overall, the readability of the manuscript has been greatly improved, and the details about the data and methods have been added and described more clearly. I only have some minor suggestions:

We thank the Reviewer for the constructive comments and suggestions. We have revised the manuscript accordingly, and we address the comments as follows.

Specific comments:

Page 1, Line 17: "high-resolution satellite fire detection"
While 1 km resolution can be considered "high resolution" for a global emissions dataset, it is inaccurate to call it "high-resolution" in terms of remote sensing. "High-resolution" remote sensors generally have a spatial resolution finer than 10 meters. I suggest removing "high-resolution" here.
Response: We revised the manuscript according to the reviewer's comment. We removed "high-resolution".

Page 1, Line 33-34: "carbon emissions exhibited significant seasonal variability, peaking in …, with an average of …, which was higher than the monthly average of…"
It is evident that emissions during the peak-burning months are higher than the all-month average. If you just want to make a comparison, consider changing "which was higher than…" to "substantially higher than…".
Response: We revised the manuscript according to the reviewer's comment. We changed the sentence to "substantially higher than…". Please refer to the Line 34.

Page 2, Line 63: "Similar to the MERSI-2 instrument, the Fengyun-3D (FY-3D) satellite has spatial resolutions of 250 and 1000 m at the nadir"
"MERSI-2 instrument" is not mentioned earlier in the text, so readers may be unfamiliar with it. Also, it would be better to indicate which channels in FY-3D have 250 m resolution and which have 1000 m resolution.
Response: We revised the manuscript according to the reviewer's comment. We newly added the channels in FY-3D with 250 m resolution and 1000 m resolution as follows. Please refer to the Line 65.
"Similar to the MERSI-2 instrument, the Fengyun-3D (FY-3D) satellite has spatial resolutions of 250 m (0.47–0.86 μm and 10.80–12.02 μm) and 1000 m (1.38–8.55 μm) at the nadir (Yin et al., 2020)".

Page 3, Line 73-75: "Given these limitations in the monitoring frequency with the LFTA product, employing the FY-3D GFR product and allocation approaches for short fires are expected to yield reliable estimates of OBB emissions."
A shortcoming in other products does not guarantee good performance of the FY-3D based OBB emissions estimates. The entire logic chain should be provided by saying something like "The shorter revisit time of FY-3D allows for…".

Also, the meaning of "short fires" is unclear to me.

Response: We revised the manuscript according to the reviewer's comment. We revised this expression into following sentence and deleted the misrepresentation of "short fires". Please refer to Line 76.

"The shorter revisit time of FY-3D allows for monitoring more fires lasting for one day, which are expected to yield reliable estimates of OBB emissions.".

Page 3, Line 81: "However, this approach leads to …"

You mentioned previous approaches to derive F and CF in the previous sentences. However, it is unclear what the phrase "this approach" refers to.

Response: We revised the manuscript according to the reviewer's comment. Please refer to Line 86.

"This approach of calculating CF leads to …".

Page 4, Line 102

There's a typo here: Ei (g) should be Ei (x)

Response: Here, (g) is the unit of Ei and represents pollutant type i emissions at location x for Ei (x). We wrote Ei (x) in equation (1), please refer to the Line 106.

Page 4, Line 115-116: "This approach eliminates the limitations posed by fixed thresholds in the MODIS and VIIRS algorithms, which set T4 to greater than 360 K (320 K at night) and fixed the moving window size at 21×21"

I believe the MODIS/VIIRS active fire algorithms used variable window sizes (from 3x3 to 21x21), not fixed sizes.

Response: We revised the manuscript according to the reviewer's comment. We changed the mis misdescription, please refer to Line 120.

"This approach eliminates the limitations in the MODIS and VIIRS algorithms, which set T4 to greater than fixed 360 K (320 K at night) and the variable moving window size to a maximum of 21×21 (Giglio et al., 2016)".

Page 4, Line 117: "re-identification index"

It's hard to understand what "re-identification index" is and how its use may have led to improvement. Please provide a brief explanation.

Response: We revised the manuscript according to the reviewer's comment. We newly provided a brief explanation. Please refer to Line 123.

"Based on the initially identified fire spots, FY-3D employed the re-identification index to further remove false fire spots at cloud edges, water body edges and other high-reflection underlying surfaces. (Chen et al., 2022)".

Page 4, Line 120-121: "far-infrared band with a high resolution of 250 m, and channels 24 and 25, which has a higher resolution than MODIS (1 km)"

Are channels 24 and 25 part of the 'far-infrared bands'? Why are you mentioning them here?

Response: We deleted this sentence, as it does not directly relate to the subsequent content. Please refer to Line 127.

"FY-3D employs a far-infrared band with a high resolution of 250 m, which has a higher resolution than MODIS (1 km)".

Page 4, Line 128: "...for accuracy and accuracy without omission"

I noticed the authors have tried to clarify the term "accuracy without omission" in the revision. But I still don't understand what exactly it means. Please provide a better explanation.

Response: We revised the manuscript according to the reviewer's comment. We newly provided a better explanation. Please refer to Line 136.

"… for accuracy (omitted fire) and accuracy without omission (misidentified fire).".

Page 4, Line 129-131

This sentence seems to have grammatical errors. Please revise for clarity and correctness.

Response: We revised the manuscript according to the reviewer's comment. We newly provided a better explanation. Please refer to Line 136.

"These accuracies were determined by comparing the results of a large-scale field experiment conducted jointly by the State Grid Corporation of China and China Meteorological Administration with the GFR product, including omitted and misidentified fire (Chen et al., 2022).".

Page 5, Line 135: "The location, timing and burned area of the fire events used in the GEIOBB were determined globally using the FY-3D GFR"

A major assumption in the method of this study is to use active fire detection as a proxy for the burned area. This assumption is accompanied by large uncertainties and may lead to lower quality than the BA products derived using the change-detection method. Active fires can be obscured by thick clouds and smoke. Burning between satellite overpass gaps is often omitted. The diurnal cycle cannot be sufficiently represented using observations from polar orbiting satellites. I highly recommend discussing these uncertainties in the 'Discussion' section.

Response: We revised the manuscript according to the reviewer's comment. We newly added uncertainties. Please refer to Line 518.

"The detected active fires were also underestimated due to cloud cover/thick smoke and omitted between satellite overpass, with an omission error of approximately from 10%–30% (Giglio et al., 2006; Schroeder et al., 2008; Roberts et al., 2009). Furthermore, the diurnal cycle cannot be sufficiently represented using observations from polar orbiting satellites, as these satellites have limited temporal coverage and may not capture the full range of fire activity throughout the day (Huang et al., 2024; Zheng et al., 2021b).".

Page 18, Line 430-433

The overpass times are 10:30 and 13:30 LT for Terra and Aqua, and 14:00 for FY-3D. There are only 30 minutes between the Aqua and FY-3D overpass times. How did you conclude that "However, the use of FY-3D, which captures data at 14:00, was highly effective in capturing such events"? Please provide more details on how this conclusion was reached.

Response: We revised the manuscript according to the reviewer's comment. Please refer to Line 444.

“Additionally, emission estimates during the periods by FINN, GFED, and GFAS were generated using data from the Terra and Aqua satellites, which captured data at 10:30 and 13:30 LT. However, the use of FY-3D, which captures data at 14:00, proved highly effective in capturing such events. Furthermore, fire incidents tend to peak in the afternoon (Mehmood et al., 2022b), with agricultural waste and crop residue burning more frequently occurring during this period due to higher temperatures that enhance burning efficiency (Jurdao et al., 2012).”.

We newly added the following references according to the reviewer’s comment.

Huang, J., Loría-Salazar, S. M., Deng, M., Lee, J., and Holmes, H. A.: Assessment of smoke plume height products derived from multisource satellite observations using lidar-derived height metrics for wildfires in the western US, Atmospheric Chemistry and Physics, 24, 3673–3698, https://doi.org/10.5194/acp-24-3673-2024, 2024.

Jurdao, S., Chuvieco, E., and Arevalillo, J. M.: Modelling Fire Ignition Probability from Satellite Estimates of Live Fuel Moisture Content, fire ecol, 8, 77–97, https://doi.org/10.4996/fireecology.0801077, 2012.

Mehmood, K., Bao, Y., Saifullah, Bibi, S., Dahlawi, S., Yaseen, M., Abrar, M. M., Srivastava, P., Fahad, S., and Faraj, T. K.: Contributions of Open Biomass Burning and Crop Straw Burning to Air Quality: Current Research Paradigm and Future Outlooks, Front. Environ. Sci., 10, https://doi.org/10.3389/fenvs.2022.852492, 2022b.

Zheng, Y., Liu, J., Jian, H., Fan, X., and Yan, F.: Fire Diurnal Cycle Derived from a Combination of the Himawari-8 and VIIRS Satellites to Improve Fire Emission Assessments in Southeast Australia, Remote Sensing, 13, 2852, https://doi.org/10.3390/rs13152852, 2021b.