Anonymous Referee #1

This study developed a global daily emission inventory of OBB with 1km×1km based on global fire point monitoring data from the Chinese Fengyun-3D satellite, fuel loading, combustion factor and emission factor. Considering the scientific impact of each study, several analysis is needed to substantiate the conclusions in your manuscript. Firstly, the manuscript emphasizes that the compared with MODIS, significant advantage of using the FY–3D fire detection product is the ability to enhance the detection of small fires, but the analysis of the results does not show how much the use of the FY–3D detection product has increased the emission estimates of small fires? Secondly, in the section about verification, the manuscript emphasizes the consistency with other datasets, but does not quantify the advantages of this study. Thirdly, the advance of activity data selected in this study needs to be verified, such as the quality and the resolution of the data. The manuscript can be considered for publication if the issues mentioned above and following specific comment could be addressed.

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

Specific comments：

P1 line23–25: The full name are not given for some regions (e.g., BONA), and them are given for some regions (e.g., SHSA).

We added full name for other regions.

"72.71 (Boreal North America; BONA), 165.7 (Temperate North America, TENA), 34.1 (Central America; CEAM), 42.9 (Northern Hemisphere South America; NHSA), 520.5 (Southern Hemisphere South America; SHSA), 13 (Europe; EURO), 8.4 (Middle East; MIDE), 394.3 (Northern Hemisphere Africa; NHAF), 847 (Southern Hemisphere Africa; SHAF), 167.4 (Boreal Asia; BOAS), 27.9 (Central Asia; CEAS), 197.3 (Southeast Asia; SEAS), 13.2 (Equatorial Asia; EQAS), and 82.4 (Australia and New Zealand; AUST) Tg".

P2 line64–65: The detection accuracy of MODIS and other related indexes should be clearly given to facilitate readers to compare directly. As well as the comparison with MODIS, other commonly used polar–orbiting satellite sensors (SNPP–VIIRS, Landsat–8, etc.) can be considered for comparison to highlight the advantages of FY–3D.

We revised according to the reviewer's comment. We added comparisons with other product. The changes are as follows.

"Furthermore, the Global Fire Monitoring (GFR) product with FY–3D employs optimized automatic identification algorithms for fire spots (Shan and Zheng, 2022), leading to an improved accuracy of fire point detection. This resulted in an impressive overall accuracy rate of 79.43% and an exclusion omission error accuracy of 88.50%, surpassing the capabilities of MODIS satellite products (Chen et al., 2022; Xian et al., 2021), based on field–collected references throughout 2020 in China. The cross–verification between MODIS and FY–3D shows the highest consistency results (over 80%) in Africa and Asia, while America, Europe, and Oceania demonstrate consistency exceeding 70% (Chen et al., 2022). In July, August, and September, the number of fire spots was higher, with a mean consistency of over 85% between MODIS and FY–3D fire products (Chen et al., 2022). Although Landsat Fire and Thermal Anomaly (LFTA) product has finer spatial resolution, its lower temporal resolution typically allows global coverage only every 16 days, which does not allow for frequent detection of biomass burning activity. Therefore, employing the FY–3D GFR product and allocation approaches for small fires is expected to yield reliable estimates of OBB emissions."

Furthermore, we added the comparison of parameters related to MERSI–II, MODIS, and VIIRS. Please refer to Table 1.

P4 line128: It is suggested that formulas could be transferred to the manuscript from SI, with the supplement of corresponding unit of the variable.

We revised according to the reviewer's comment. We transferred the formulas to the manuscript from SI, with the supplement of corresponding unit of the variable. Please refer to Line 145.

P5 line148: Source of the constant 0.013 in the formula? Empirical values should give literature. The fitted values should depict the fitting process and significance test results.

We revised according to the reviewer's comment. We added the reference to the constant 0.013 in the formula.

P5 line152: There are other products (MODIS) of NDVI with a time interval of 8d. Why the products of 16d was selected in this study?

The 8d product is based on mod09 calculations and because it is measured in the absence of atmospheric scattering or absorption, the product contains lower data, as well as cloud cover. The 16–day product was derived from the 8–day product, offering advantages such as an enhanced signal–to–noise ratio and reduced cloud contamination. This is achieved through a longer temporal composite period, leading to more dependable and precise assessments of vegetation health and productivity.

In the process of assessing vegetation conditions, the accuracy and completeness of the data are prioritized over the requirement for event resolution. Therefore, we opt to utilize the 16–day product.

P6 Table 1: The EF for specific biomass (e.g., crop) is fixed value for different regions with various crop distribution characteristic. Regional or crop differences should be reflected in EF values.

We made a distinction in the CF for different types of fire event emissions in different regions, and the EF was only used as a factor between the pollutant emitted and the type of fire.

Table 2. Emission factor (g/kg) of different species.

Species	Grasslands and Savannas	Woody Savanna or Shrubs	Tropical Forest	Temperate Forest	Boreal Forest	Temperate Evergreen Forest	Crop			
							Maize	Sugar	Sugar	Wheat
C	488.31	489.41	491.77	468.31	478.88	493.18	687.09	323.35	368.04	429.17
CO_2	1,686[a]	1,681[a]	1,643[a]	1,510[a]	1,565[b]	1,623[a]	2,327[c]	1,130[c]	1,177[c]	1,470[e]
CO	63.00[a]	67.00[a]	93.00[a]	122.00[a]	111.00[b]	112.00[a]	114.70[c]	34.70[c]	93.00[c]	60.00[e]

CH_4	2.00[a]	3.00[a]	5.10[a]	5.61[a]	6.00[b]	3.40[a]	4.40[c]	0.40[c]	9.59[c]	3.40[e]
NO_X	3.90[a]	3.65[a]	2.60[a]	1.04[a]	0.95[b]	1.96[a]	4.30[c]	2.60[c]	2.28[c]	3.30[e]
SO_2	0.90[a]	0.68[a]	0.40[a]	1.10[a]	1.00[b]	1.10[a]	0.44[c]	0.22[c]	0.18[c]	0.85[e]
OC	2.60[a]	3.70[a]	4.70[a]	7.60[a]	7.80[b]	7.60[a]	2.25[c]	3.30[c]	2.99[c]	3.90[d]
BC	0.37[a]	1.31[a]	0.52[a]	0.56[a]	0.20[b]	0.56[a]	0.78[d]	0.82[d]	0.52[d]	0.52[d]
NH_3	0.56[a]	1.20[a]	1.30[a]	2.47[a]	1.80[b]	1.17[a]	0.68[c]	1.00[c]	4.10[c]	0.37[e]
NO_2	3.22[a]	2.58[a]	3.60[a]	2.34[a]	0.63[b]	2.34[a]		2.99[f]		
$PM_{2.5}$	7.17[a]	7.10[a]	9.90[a]	15.00[a]	18.40[b]	17.90[a]		6.43[f]		
PM_{10}	7.20[a]	11.4[a]	18.50[a]	16.97[a]	18.40[b]	18.40[a]		7.02[f]		

All the value of C were Calculated by CO_2, CO, and CH_4.

[a] is average value from (Akagi et al., 2011).

[b] is average from (Akagi et al., 2011) and (Urbanski, 2014).

[c] is average from (Akagi et al., 2011; Fang et al., 2017; Liu et al., 2016; Santiago-De La Rosa et al., 2018; Stockwell et al., 2015).

[d] is from (Kanabkaew and Kim Oanh, 2011).

[e] is from (Cao et al., 2008).

[f] is from (Li et al., 2007).

P11 line269: What does "intensify both the frequency and frequency of fires in the area" mean?

We changed "intensify both the frequency and frequency of fires in the area" to "intensify frequency of fires in the area" make it clear to understand.

P15 line352: Why the dataset is not include FINN (e.g., FINNv2.5)? The resolution of it is the same with the dataset developed in this study (1km, 1d).

The analytical discussion in this study is based on the example of Carbon, for which no estimation exists in FINN (FINNv2.5, 0.1 degree), so there is no FINN product. In SI, we added the comparison results with FINN for CO2 analysis in different regions.

P16 line377–379: There is a lack of clarity in the explanation of how FY–3D can capture small fires more effectively compared to MODIS, and how the difference in transit times between the two satellites affects the detection of agricultural small fires. More data analysis is needed to support this question.

P18 line410: The article should add a comparative analysis of how much the addition of FY–3D improves emission estimates for small fires, which is a key factor in determining the innovativeness of the study.

We added Comparison of parameters related to MERSI–II, MODIS, and VIIRS to explain the advantages of the FY–3D for fire point detection at the hardware level. Please refer to Table 1. Furthermore, we added more details about FY–3D GFR product to support FY–3D can capture small fires more effectively.

Table 1. Comparison of parameters related to MERSI–II, MODIS, and VIIRS.

	MERSI–II (FY–3D)	MODIS (AQUA)	VIIRS ((NOAA–20))
Orbit altitude (km)	836	705	824
Equator Crossing time	14:00 LT	13:30 LT	14:20 LT
Swath (km)	2900	2330	3060
Pixel resolution at nadir (km)	1	1	0.75/0.375
Pixel resolution at the edge (km)	>6	4	1.5/0.75
ID MIR Band (s)	21	21/22	M–13/I–4
Spectral range (μm)	3.973–4.128	3.929–3.989 3.940–4.001	3.973–4.128 3.550–3.930
TMAX (SNR–NEΔT on orbit)	380 K (0.25)	500 K (0.183) 331 K (0.019)	634 K (0.04)
ID TIR Band (s)	24	31	M–15/I–5
Spectral range (μm)	10.300–11.300	10.780–11.280	10.263–11.263 10.500–12.400
TMAX (SNR–NEΔT on orbit)	330 K (0.4)	400 K (0.017)	343 K (0.03)

"…Compared to MODIS, FY–3D fire products have been optimized in terms of auxiliary parameters, fire identification and re–identification. Firstly, FY–3D introduces the adaptive threshold and eliminates the limitations by fixed thresholds of MODIS and VIIRS algorithms by automatic identification algorithms for fire spot detection (Chen et al., 2022). Secondly, FY–3D uses a re–identification index reflecting varying geographical latitude and underlying surfaces types, together with the effect by cloud, water, and bare land (Zheng et al., 2020). The integration of multiple influencing factors increases the accuracy of fire detection. For example, the influences of factory thermal anomalies and high reflectance of photovoltaic power plants are greatly removed. Finally, the far–infrared channel employed in FY–3D has a high resolution of 250 m, higher than MODIS with 1 km, resulting in higher accuracy in big fire detection (Zheng and Chen, 2020). Overall, the FY–3D GFR product achieves an accuracy of 94.0% globally, with accuracies of 94.6%, 94.1%, 90.6%, 91.8%, and 92.7% in South–central Africa, East central South America, Siberia, Australia and Indochinese Peninsula (Chen et al., 2022), respectively. Specifically, due to the removal of underlying surface interference in China, the FY–3D achieves accuracies of 79.43% and 88.50% for accuracy and accuracy without omission, respectively, both of which are higher than the accuracies of 74.23% and 79.69% achieved by MODIS (Chen et al., 2022)."

P19 line435: What is the difference between the 1° spatial resolution of FY–3D mentioned here and the 1km mentioned previously (line 106)?

We changed "1 degree" to "1 km".

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