

# ***Interactive comment on* “Estimation of emissions from biomass burning in China (2003–2017) based on MODIS fire radiative energy data” by Lifei Yin et al.**

## **Anonymous Referee #2**

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Review comment: reject. This study developed a biomass burning emission inventory for China from 2003 to 2017 using a method based on FRE and presented the change of biomass burning emissions from different land cover types. The reason for rejection is that the biomass burning emissions from different land cover types are not reasonable. The aim of this study is to construct an inventory of biomass burning emission for China that could be used in global and regional air quality modeling. So the accuracy of the emission data is very important for data users. In addition, the improving estimation of biomass burning emissions in this study over other estimations was not well proved. The main problem is that the land cover data used in the study is of low accuracy over China. Emission factors for each land-cover type were derived from pub-

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lished studies. So the emissions of different gases were related with land cover types. The quality of the land cover data decided the quality of the emission estimation. If the land cover data were not accurate, the results wouldn't be credible. However, all of the discussions were based on the inventory. The spatial distribution of CO<sub>2</sub> emissions is not reasonable, especially the distribution from grassland, cropland, and shrublands. If you have read the papers about Chinese land cover written by Zengxiang Zhang et al (2014) and Jun Chen et al., (2016), you could find out that the distribution of the three land cover types were different from what the paper showed. I suggest that you could change the land cover data and improve your writing.

Some detailed comments and suggestions are listed as follows: The introduction didn't have a good logic. The aim of the study is to develop a biomass burning emission inventory for China from 2003 to 2017. The method based on FRE was not innovated by this study, but most of the introduction was about the most often used methods and approach based on FRE. In the introduction, the paper didn't provide a summary about the existing studies for Chinese biomass burning. Maybe some studies were mentioned when the method based on FRE was introduced. Although you mentioned that "few studies have used this approach to estimate emissions from agricultural burning on a national scale", the words didn't support this conclusion. What about other land cover types? What about regional scale? What's more, the cropland distributed intensively in several plains in China. It is not necessary to estimate emissions on a national scale if there are already some studies focusing on the main agricultural regions. Actually, the paper also studied other land cover types. Agricultural burning was not the only study aim. Page 1: line 10: what does "available emission factors" mean specifically? Page 1: line 12: The paper didn't show how the method based on FRE provides a more reasonable estimate from small fires directly. Page 1: line 19-21: this conclusion is not special for this study, so you don't have to put it here. Page 2: line 7: a reference or link need to be added here. I doubted that biomass burning from crop residues leading to substantial pollutant emissions in China. The paper concluded that forest was the major source of biomass burning in China. Page 3: line 12: to prove a method to be

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valid should base on field survey, not a comparison with results from another research. Page 3: line 12: it will be better to put “According to the accumulated temperature, China is...” into a new paragraph. Page 3: line 15: is the method that parameterizes the FRP diurnal cycle for crop zones and harvest seasons innovated by you, or it was proposed by former studies? If it was proposed by you, you should put it in the method section. If it was proposed by former study, a reference should be provided. Page 3: line 23: introduction about the global land cover data should be put in the data section. Page 4: line 10-12: why did you use the average value, not one of them? When the two values were provided, didn't the researchers give suggestions about their applications? As the CR was very important in calculating the emissions, the value should be decided more carefully. Page 4: line 16: the method section should introduce the method used in the study and how you used the method to get the results, not the method provided by the former research. The expression should be improved. Page 4: line 24: that “the origin formula couldn't provide reasonable estimations” and that “h has little effect on the final calculation” seems to be contradictory. Page 5: line 2: is  $\varepsilon$  a constant or variable? Maybe a variable, as you didn't present its value. If it was a variable, how did you decide its value? Page 5: line 14: the expression is not accurate. GlobCover maybe the most detailed map of earth land surface at the same spatial resolution. The reference was not the newest. Many new land cover datasets have been produced in recent decades. Maybe other land cover datasets like Globeland30 (Jun Chen et al., 2016) or NLUD-C (Zengxiang Zhang et al., 2014) are more suitable. The four main land cover types used in this study could be found in this dataset. And the accuracy of Globeland30 is better than GLOBCover 2009 since it has higher spatial resolution. Page 7: line 7: if figure 2 was presented on a national province map, it would be clearer that how the emissions distribute in different provinces. A land cover map can be presented simultaneously. Page 9: line 16: to decide if the results are reasonable or not, you should compare the calculating results with field data or the statistical data from government, not just compare it with other research data. Page 9: line 18: if you mean that the discrepancy between the former studies (GFED4s and

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GFASv1) and your results is caused by the high omission rate of small fires in the two existing datasets, then you should prove this by comparing the two results directly, not just by citing a reference. Page 10: line 10: although the paper concluded that the estimation of biomass burning emissions in this study was improved, it was hard to confirm its credibility. As the words “perhaps due to” were used in this paper. Page 10: line 20: in this paragraph, you mentioned several sources of errors. The Monte Carlo simulations seemed to calculate the uncertainty caused by emission factors. What about the uncertainties caused by other error sources? Page 11: line 13: if your estimates were just very close to the results from GFED4s and GFASv1.0, then why the users would choose your estimations?

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