## General comment

The authors quickly made some changes according to my comments. I find the responses to my line-by-line comments are generally satisfactory. To address my major concerns, the authors added additional figures showing time series of temperature and radiation at the Beijing station. They also included detailed discussions or caveats. I find some of these changes can be further improved.

Response: The authors thank for your encourage and sharing your time in this manuscript. The detailed responses to the comments are given point to point.

One of the major limitations of this paper is that the calculated BVOC emissions are not evaluated by ANY sort of observations or observation-constrained emission estimates. I understand that flux measurements may not be available and making top-down estimates from satellites would be very challenging for this region.

Response: The authors appreciate your precious comments. It is true that the lack of canopy-scale observation makes it difficult to qualitatively evaluate the inventory, so what we can do is focusing on the inputs of the model and giving a primary estimation of local BVOCs emission. If it is possible, we would involve some observation research on this topic by cooperating with other individuals in the future.

I also understand that this paper concentrates on LAI and PFT, and perhaps that is why the analysis on WRF performance is not quite emphasized. However, as the authors recognized, the WRF performance is important to BVOC calculations. One way to improve your WRF story is to consider reporting temperature and radiation (absolute values from the model) at more sites, or showing the data in maps by season, even though radiation can only be evaluated carefully at the Beijing station. This would allow the readers to discern if they are reasonable, or determine ranges of BVOC emissions based on their own met data and the information given from this paper.

Response: The authors appreciate your precious comments. We agreed to the reviewer's point that the meteorological conditions are crucial to estimating BVOCs emission. Therefore, we collected the data of four more meteorological sites in Beijing, meanwhile, some missing values for the former sites are also filled this time. In addition, we also found that there was a mistake in the NCL (NCAR Command Language) script used to extract the downward shortwave radiation (DSW) data from the WRF output file, and this mistake would lead to the time dimension malposition of observation and simulation data, which directly affects the verification of DSW simulation. According to the reviewer's suggestion, we re-evaluated the meteorology simulation by using new observation data and we reorganized this part in the manuscript.

Firstly, the verification statistics by season of average hourly temperature at 2 m height (T2) among 19 sites and DSW in Beijing station are showed in Table R1 to provide the results of general evaluation for meteorological condition, and it has been added to manuscript to replace the previous ***Table 2***. As showing in Table R1, the simulation of DSW is relative acceptable refer to other studies like Li et al. (2013) and Wang et al. (2011) currently. Additionally, the Figure R1 was updated and kept as ***Figure 1*** in the manuscript to directly present the time-series of daily T2 and DSW, but the tab of verification statistics above the figure was removed since the Table R1 has presented the detailed verification statistics. We didn't use the hourly T2 to draw Figure 1 because the hourly data are too dense to present the information. Secondly, the verification statistics of specific sites are presented in Table R2, and it would be added to the supplement to provide the evaluation of each site. The results of four new sites, including Shangdian Zi, Xiayun Lin, Zhai Tai and Tanghe Kou, are emphasized by blue color in Table R2, and verifications of these four sites do not show obvious bias. Meanwhile, Figure R2, which is ***Figure 2*** in the manuscript, is updated to show the locations of all sites and explain that the simulation bias of the suburban sites, including Da Xing, Tong Zhan and Fang Shan, can be expected to have little impact on the estimate of whole BVOC emissions because of relative low emission potential.

**Table R1. Verification statistics of hourly temperature at 2 m height (T2) and daily downward shortwave radiation (DSW). The ME, MB and RMSE are abbreviations for mean error, mean bias, and root mean square error, respectively.**

| Variable | Season | Mean | | ME | MB | r | RMSE |
|---|---|---|---|---|---|---|---|
| | | Obs. | Sim. | | | | |
| T2 (°C) | Spring | 12.59 | 10.55 | 2.43 | -2.04 | 0.97 | 2.84 |
| | Summer | 25.08 | 24.63 | 1.72 | -0.45 | 0.87 | 2.21 |
| | Fall | 12.23 | 11.04 | 1.82 | -1.19 | 0.97 | 2.15 |
| | Winter | -4.04 | -6.14 | 2.67 | -2.10 | 0.86 | 3.18 |
| | Year | 13.06 | 11.68 | 2.11 | -1.38 | 0.98 | 2.57 |
| DSW (W $m^{-2}$) | Spring | 205.54 | 262.71 | 59.66 | 57.17 | 0.75 | 75.94 |
| | Summer | 184.36 | 269.59 | 88.14 | 85.23 | 0.77 | 106.61 |
| | Fall | 124.40 | 155.34 | 34.71 | 30.94 | 0.79 | 48.54 |
| | Winter | 93.91 | 132.96 | 41.86 | 39.05 | 0.69 | 53.14 |
| | Year | 157.60 | 212.35 | 57.77 | 54.76 | 0.81 | 76.80 |

**Table R2. The meteorological validation with hourly T2 in-situ observation. The ME, MB and RMSE are abbreviations for mean error, mean bias, and root mean square error, respectively.**

| Name | ME (°C) | MB (°C) | r | RMSE (°C) |
|---|---|---|---|---|
| Beijing | 1.97 | -0.72 | 0.98 | 2.54 |
| Hai Dian | 2.11 | -0.65 | 0.98 | 2.7 |
| Chao Yang | 2.63 | -1.7 | 0.97 | 3.18 |
| Shun Yi | 2.51 | -1.71 | 0.98 | 3.06 |
| Huai Rou | 1.93 | -0.07 | 0.98 | 2.48 |
| Tong Zhou | 5.39 | -5.28 | 0.97 | 5.94 |
| Chang Ping | 2.18 | -0.96 | 0.98 | 2.81 |
| Yan Qin | 2.5 | 1.64 | 0.98 | 3.24 |
| Feng Tai | 3.25 | -2.51 | 0.97 | 3.83 |
| Shijing Shan | 2.05 | -0.44 | 0.98 | 2.61 |
| Da Xing | 5.56 | -5.36 | 0.96 | 6.27 |
| Fang Shan | 4.94 | -4.68 | 0.96 | 5.73 |
| Mi Yun | 2.58 | -0.69 | 0.97 | 3.13 |
| Mengtou Gou | 2.19 | -0.91 | 0.98 | 2.71 |
| Ping Gu | 3.52 | -2.87 | 0.97 | 4.2 |
| Shangdian Zi | 1.9 | 0.00 | 0.98 | 2.45 |
| Xiayun Lin | 2.51 | -1.37 | 0.97 | 3.1 |
| Zhai Tang | 3.13 | 2.17 | 0.97 | 3.87 |
| Tanghe Kou | 3.36 | 0.11 | 0.95 | 4.19 |

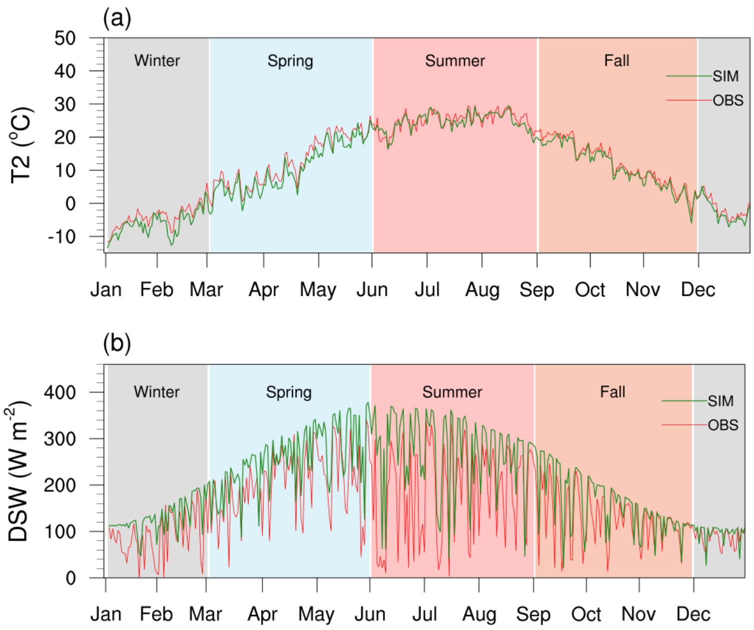


**Figure R1. Time-series plots of (a) station-averaged simulated/in-situ 2m temperature (T2) as well as (b) simulated/in-situ downward shortwave radiation (DSW) in Beijing Station.**

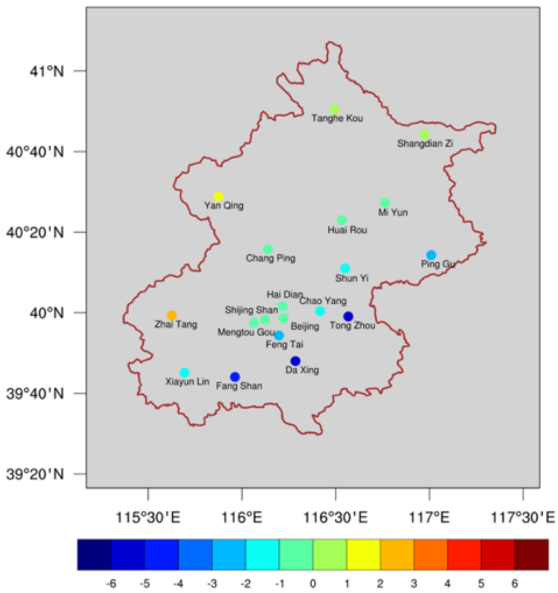


**Figure R2. Spatial distribution of the mean bias (MB) of temperature (T2) from all available sites.**

The corresponding modification in the manuscript is on P5, L15 as:

"The temperature at 2m height (T2) simulated by WRF was primarily verified by in-situ data from 19 monitoring sites among the Beijing region, and the daily downward shortwave radiation (DSW) was also validated using the in-situ data from Beijing station. Table 2 presents the verification statistics of average hourly T2 among all sites and DSW of the Beijing station, and Figure 1 shows the time-series of stations-averaged daily T2 and DSW. As showed in Table 1, the mean error (ME), mean bias (MB), correlation coefficient (r), and root mean square error (RMSE) of stations-averaged hourly T2 series are 2.11 °C, –1.38 °C, 0.98 and 2.57 °C, respectively. The r in summer (0.87) and winter (0.86) are relative lower than those in spring (0.97) and fall (0.97), and simulation shows cooling biases of -

2.04 °C, -0.45 °C, -1.19 °C and -2.1 °C in spring, summer, fall and winter, respectively. And the ME, MB, r and RMSE of the whole year DSW series are 57.77 W $m^{-2}$, 54.76 W $m^{-2}$, 0.81 and 76.80 W $m^{-2}$, and the simulation of DSW exits overestimation of 57.17 W $m^{-2}$, 85.23 W $m^{-2}$, 30.94 W $m^{-2}$ and 39.05 W $m^{-2}$ in spring, summer, fall and winter, respectively. The detail statistics of hourly T2 of specific stations are given in Table S3 in the supplement for checking. Across all sites, Tong Zhou, Da Xing, and Fang Shan have the most obvious underestimates of surface temperature, with high negative biases of –5.28 °C, –5.36 °C , and –4.68°C, respectively. Figure 2 shows the location of all sites, with the MB of T2 indicated by the color scale, and these sites are located in the suburban regions of Beijing, where are under the fast urbanization and BVOC emissions are lower, and the WRF didn't simulate the urban heat island phenomenon in these regions. And the main source of BVOCs is the rural forest around Beijing, and Table S3 as well as Figure 2 indicate relative good simulation among the sites in rural region; thereby, the simulation bias of the suburban regions can be expected to have little impact on the estimate of whole BVOC emissions."

The authors moved cross-walking table related material to the main text, which is helpful. They state in the Abstract that "Adopting the "maximum biomass" table made the CCI-LC relatively consistent with the other two LC products, such that the estimates of BVOC emissions in the Beijing region by the three LC products consistently fell within the range of 28.5–30.5 Gg for isoprene…..". Similar statements appear in the main text too. Again, I think the authors should be careful asserting that calculations within the range of 28.5–30.5 Gg for isoprene etc are correct/desirable, due to the lack of evaluation on your BVOC emissions.

Response: The authors appreciate your constructive comments. We agree with the reviewer that the lack of direct verification of BVOC emissions directly limited validity of this kind of conclusion. We think that removing such conclusion and just leave the discussion of the influence of Cross-Walking Table could be a more safe or conservative way.

## Reference


Li, L. Y., Chen, Y., and Xie, S. D.: Spatio-temporal variation of biogenic volatile organic compounds emissions in China, Environmental Pollution, 182, 157-168, https://doi.org/10.1016/j.envpol.2013.06.042, 2013.

Wang, X., Situ, S., Guenther, A., Chen, F. E. I., Wu, Z., Xia, B., and Wang, T.: Spatiotemporal variability of biogenic terpenoid emissions in Pearl River Delta, China, with high-resolution land-cover and meteorological data, Tellus B, 63, 241-254, 10.1111/j.1600-0889.2010.00523.x, 2011.