Review of "Sensitivity of Biogenic Volatile Organic Compounds Emissions to Leaf Area Index and Land Cover in Beijing" by Wang et al., 2017

The authors report the sensitivity of WRF (v3.3.1)-MEGAN (v2.1) calculated BVOCs emissions to land cover and LAI inputs over the Beijing area in 2013. The results were compared with previous studies and related to regional air quality. This material is original and suitable for ACP.

The methodology section needs to be significantly expanded to include more descriptions on experiment setup (see my specific comments below). Any novel settings should be highlighted.

The paper can benefit from careful language editing, preferably with help from a native English speaker. I recognize that the authors made some efforts to address this issue brought up during the ACPD quick report phase. However, the current version still contains many grammar mistakes and awkward sentences. References are often inaccurate/inappropriate. Transitions from one sentence to another, from one paragraph to another are not smooth. Also, when one paragraph ends and a new one begins, the authors should either indent the first line of the new paragraph, or leave a line space between the two paragraphs. Here are some suggested edits to the first sentences of your abstract.

P1, L11: air quality pollution $\rightarrow$ air pollution

P1, L12: delete "still", and also requires other emission inventories.. A sentence saying BVOC emissions are sensitive to land and met conditions should be placed here.

P1, L15-16: "based on" $\rightarrow$ "using"; add "the" before "Model of ….."; delete "model" after v2.1

P1, L19: "are used to design five experiments, as E1-E5, to calculate and test the sensitivity of the model" $\rightarrow$ are used in five model sensitivity experiments, as E1-E5

P1, L20: "Based on the meteorological conditions from Weather Forecasting and Research (WRF) model, this inventory is an hourly inventory with 3-km spatial resolution."$\rightarrow$These sensitivity calculations were driven by hourly, 3 km meteorological fields from the Weather Forecasting and Research (WRF) model.

A number of specific comments and suggestions are given below:

1) Novelty: The authors argue that using spatially and temporally varying meteorological fields output from WRF is advantageous, compared with the approaches in some previous studies. Using WRF fields to drive MEGAN calculations is not at all a novel approach and has been widely used in a large number of studies, including some cited by the authors. As the authors are already aware, the uncertainty in their WRF simulation contributed to the estimated BVOC emission biases. There is no need to emphasize the benefit of driving MEGAN using WRF. Rather, if any novel configurations were applied to your WRF simulation, which helped reduce errors in the modeled T2, radiation, moisture, etc, they should be highlighted. See also my next comment.

2) More information regarding your WRF simulation and evaluation approach should be provided in Section 2.2.1. These should include:
- introduce the initialization time for each domain
- introduce the vertical spacing for each domain

- introduce your physics options for each domain and their suitability for the Beijing area (based on literature and/or any sensitivity simulations the authors may have conducted)
- introduce the land cover and vegetation dynamics (e.g., green vegetation fraction) input data, including the year(s) these input data represented, and discuss how they may have contributed to biases from your WRF simulation.
- P4, L23: Skamarock et al., 2005 is for WRF version 2. Please cite WRF version 3 documentation.
- P4, L27: justify "we considered the second day as the reasonable results", for example, compare the 1-day and 2-day model performance.
- P4, L29: explain why daily T2 was evaluated, instead of hourly T2? Change "among" to "within"
- P5, L1/L4: unit is missing for these biases. Why was the MB of -1.5 degree mentioned twice?
- P5, L9: which single station?

3) Issues regarding satellite products:
- P6, L22: "Because of the highest spatial resolution of the FROM LC product, the experiment using FROM PFT and GLASS LAI as inputs is the baseline experiment (E1)". I don't understand the logical connections between resolution and choice of the baseline experiment.

- Although the land cover datasets used in this study differed by at least a factor of ten in resolution (30m vs 500/300m), they are all at much finer resolution than the 3 km WRF-MEGAN grid. It would be helpful to explain how these data were regridded to your WRF-MEGAN model grid. This would help us understand how the original data resolution may have affected your results. Approach used to reproject the original 1 km LAI data should also be provided. Missing a "respectively" in P5, L25.

- P5, Section 2.2.2: The land cover and LAI data citations are not helpful. For each dataset, please cite the corresponding algorithm/validation paper, and provide the dataset doi or/and accurate links to retrieve the data. MOD15 is not an accurate description for the used MODIS LAI data. I assume the correct format should be MCD15A2H, Collection/Version XX. Same issue exsits in Table 4.

- Did the author screen the LAI data and if so, based on what criteria? What values were used for grids with missing data/unrealistic (e.g., extremely high) LAI? Previously studies have reported MEGAN sensitivity to PFT and LAI, so it'd be helpful to compare your findings with theirs.

4) Section 2.1: Some introductions on how LAI impacts the MEGAN calculations should be added. Using equations consistent with Guenther et al. (2012) and Sindelarova et al. (2014) is recommended. Equations should be numbered and referenced in text. Please also clarify how γsm and ρ were handled in this study.

5) The uncertainty section (3.5) is not well written, and the current discussions are very qualitative and not informative.

6) P2, L25-27: Please provide the source for "the statistical data from the Nation Forest Resources Survey (NFRS) reported that the forest coverage rate in Beijing rose from 20.6% to

35.8% during 1998-2013". This is also the right place to mention the impact of different met conditions during the earlier periods and 2013.

7) P1, L14; P2, L28; P3, L1: "new" is not accurate. Previous estimates of BVOCs emissions introduced by the authors are not for 2013.

8) P5, L25: Shouldn't the last sentence belong to Section 2.2.1? Define MCIP, and use the correct link for MCIP.

8) P5, L28: four species → four groups

9) P9, Section 3.3: Method of this sensitivity test should be first introduced in Section 2.

10) To comply with the ACP policy, data availability should be included in the "Acknowledgements" section.

11) Captions of Figures 4, 6, 7: specify which experiment these were based on.