

Response to SC1:

A tremendous work for the CO₂ simulation over LA megacity has been well reported. While reading, I am so interested in it, and I would like to add some comments for further improvements.

Line 18-23: The authors wrote that WRF-Chem was modified without detail description, and they only referred to Mahadevan et al. (2008), in which only VPRM is described. Would you please add more detail about the modification of WRF-Chem?

We did not modify WRF-Chem but used defaults for this study. To avoid confusion, we will clarify it in the revision. We will also add a table to the revised paper showing the default values of the VPRM parameters. Thanks!

In addition, WRF-VPRM would be very sensitive to its VPRM parameters especially for nighttime respiration as Pillai et al. (2009) also showed. I wonder authors made or modified new parameters for each vegetation class over the study domain. They may want to explain it. A table containing VPRM parameters could be good, and it will surely be a very useful for the future studies done by others. If the values were modified comparing with the default numbers, please explain the method to get the parameters.

We agree that VPRM is very sensitive to the parameters. Previous studies have used flux tower measurements to optimize the parameters (e.g. Hilton et al. (2013)). For CalNex, however, we had limited amount of samples to do so. Additionally, the biogenic CO₂ is very small versus anthropogenic CO₂ in Los Angeles. Given these two reasons, the default values were used for simplicity in this paper. We appreciate your comments. We will take it into account in future work.

Some figures must be corrected as below:

Figure 8(d) has no dashed line for Vulcan 4km. Is it overlapped?

Yes, it's overlapped. The 4-km and 1.3-km Vulcan at Pasadena hold the same amount of fossil fuel emission. The original resolution of Vulcan is 10km by 10 km. Regridding the emission to 4-km or 1.3-km from one (original) grid cell won't make any difference in this case.

Figure 12: Subtitles of each panel seems wrong. There are two "WRF-Hestia 4km"s.

Thanks for capturing this error. We will correct the subtitle in the revision.

Figure 13(e): How come WRF-VPRM 1.3 km shows less temporal resolution? Please double check the legend and describe the reason please.

The legend is correct. We noticed that a large botanical garden covering 207 acres (i.e. The Huntington Library) is about 1.6 km away from the Pasadena site. For the 4-km run, this location and the Pasadena site is likely to be aggregated into one grid cell, which can explain the additional variability in the 4-km run at the Pasadena site. In contrast, these two locations can be in different grid cells in the 1.3-km run which could show different temporal evolutions. Please see Page 20 Line 24 – 30 for more details.

Thanks for the good work.