

## ***Interactive comment on “Impacts of seasonal and regional variability in biogenic VOC emissions on surface ozone in the Pearl River Delta region, China” by S. Situ et al.***

### **Anonymous Referee #3**

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The manuscript addresses a very relevant question and a rather large task, describing emission measurements at a particular site, simulating the air quality of a rather complex region as well as carrying out some sensitivity analyses. I appreciate this effort very much although the necessary multitude of assumptions makes the paper difficult to digest. Overall it is well written although sometimes I would appreciate a more stringent style.

The greatest problem I see is that the measurements and simulations at the site scale hardly match but are still used to justify the application on the regional scale. Despite being judged as ‘reasonable’, micrometeorological conditions are considerable biased

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towards more radiation (more than 30% off) and higher wind speed (100 % off). Peak monoterpenes emissions are 2-fold the size of the measurements and peak isoprene emission 15-fold. Even compared to separate isoprene concentrations the model is hardly touching the measurement at the lower range. Nevertheless, the simulations are described as 'agrees well' in both cases.

While the meteorological conditions are at least covered in the sensitivity analyzes, the emission factor uncertainty is probably not. If the arithmetic mean of 0.7 ppm (0.1-1.3) emission is a sensible indicator for the simulated isoprene emission, at least the 7-fold uncertainty range has to be investigated. In fact, using the average OH concentration rather than the maximum observed for calculation, and/or using a LAI of 4 as indicated in Zhang et al. 2006 for evergreen deciduous forests in this region, would probably lead to even higher estimates of isoprene concentrations. Overall, the decision is if the measurements are judged as trustworthy and representative – in this case the emission factors should be reduced – or if the model assumptions are judged as more reasonable – in that case a clear statement is required, the problem of using point sources for evaluation of area integrated model results can be discussed, and the description of the measurements could be shortened.

Some particular remarks:

- P6730, L15: delete 'significantly'
- P6730, L17 (and discussion): Why are some cases more affected in summer and others in autumn? I think that the explanation should be a main result here.
- P6731, L17ff: rather old references (see e.g. Laothawornkitkul et al. 2009).
- P6732, L4: For eucalypt emissions, Winters et al. 2009 would be a more appropriate ref.
- P6735, L18: biogenic sources for anthropogenic emissions?
- P6738, L14/15: repetition

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- P6742, L20ff: Barkley et al. reported isoprene shutdown prior to the dry season. However, in I don't expect such an impact at the measurement site here. Nevertheless, is it possible that a winter-downregulation occurred since the coldest month is January?
- P6743, L1ff: MEGAN uses 24 hour as well as 240 hour means of temperature and radiation to account for seasonal developments. However, it is assumed that this is still dampening the speed of adjustment (Grote et al. 2010).
- P6744, L20ff: This is a true but very general statement. I would think it is okay for the introduction but in discussion or conclusion it should be used only in context with a specific example.
- P6746, L1: limited
- P6748, L10ff: The exercise to run the model at a different season is particularly problematic if the statement is kept that the seasonality in MEGAN is not appropriate.
- P6750, L22ff: Please note that the ranges that can be found in the literature also include 4 (Steward et al. 2003) and 5 (Simpson et al. 1999) fold uncertainties.
- P6752, L1ff: This conclusion is only another summary except for the last paragraph. What about the need for more evaluation measurements and better representations of processes? What can be derived for decision making e.g. is the consideration of BVOC emissions important for air quality studies? Under which circumstances?
- Fig. 2: note the difference units
- Fig. 3: I think the reference is to Fig. 1, not 2
- Fig. 4: note that this is simulated

#### References mentioned

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