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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modeling organic aerosol composition at the puy de Dôme mountain (France) for two contrasted air masses with the WRF-Chem model" *by* C. Barbet et al.

Anonymous Referee #2

Received and published: 22 July 2015

This paper attempts to reconcile calculated aerosol particle concentrations with measurements over a brief period at the Puy De Dome site. Model parameter adjustments are made in an attempt to derive some conclusions as to the wider relevance of processes included in the model. There are a number of general and specific points that need addressing before the paper is considered for publication in my opinion.

Regarding the general points, I would like the authors to consider the following:

1) How are the measurements and model sampled to get the statistical data for meteorology and chemistry? Without this information, I cannot evaluate how meaningful

the statistics are. For example, an RMSE of 0.0 for humidity (absolute or relative?) is striking.

2)The authors do not seem to re-examine the gas-phase comparisons when discussing different model runs. For the changes in emission rates and oxidation rates I would think it essential to see how these changes effect conclusions, especially given the noted 'novelty' of the suite of gas phase measurements. I would suggest this could be changed in a new attempt.

3) Sensitivity studies in which parameters are adjusted between two values can be deceiving. How should we know if you have pushed the model behaviour to its limiting state or not? For example, would the ASOA mass loadings increase by 100% if you increased the oxidation rate to 8 x10ˆ-11? Additional points of reference would highlight any potential non-linear behaviour such that one could make this informed guess. Is there a limiting factor to performing these additional runs? It is not clear in the manuscript.

Regarding specific points, I would like the authors to consider the following:

page 13400 line 6: please remove the 'most recent one called'

line 9: 'far from real atmospheric conditions':Is this a direct statement from the referenced paper or do you have something specific to back this statement up?

line 24: 'For the first time': Please see Lowe et al (2015) to re-assess this statement.

Lowe, D., Archer-Nicholls, S., Morgan, W., Allan, J., Utembe, S., Ouyang, B., Aruffo, E., Le Breton, M., Zaveri, R. A., Di Carlo, P., Percival, C., Coe, H., Jones, R., and McFiggans, G.: WRF-chem model predictions of the regional impacts of N2O5 heterogeneous processes on nighttime chemistry over north-western Europe, Atmos. Chem. Phys. Discuss., 14, 20883-20943, doi:10.5194/acpd-14-20883-2014, 2014.

Page 13401 Section 2.1, line 8: 'The simulations last one week'? What was the spinup period for your simulations?

ACPD

15, C5138–C5141, 2015

line 8: 'timescale of interest for simulation SOA formation episodes' - Generally or for this study?

line 16:'Vertical levels..' How many vertical levels? Also the discussion following this is entirely qualitative, where is the evidence for this improvement? Are you missing a reference?

Page 13403

line 21: 'and are' does not make sense. Suggest re-phrasing to capture the notion that volatility bins are separated by an order of magnitude.

Page 13404

line 2-4. 'Among OCVs, only SVOCs are aging': Do you mean you only treat the SVOCs as those that are oxidised by OH?

line 6: Where has the 7.5% come from?

Page 13409 section 3.2

line 16: 'relatively isolated pic topographic configuration'. What does pic mean?

line 17. By suggesting the BLH is well represented, it would help the reader to add some statistics here, despite reference to a graph.

lines 17-27 on the discussion of the inability to capture the correct height of PUY, dosnt this suggest a higher resolution sub-domain would have been better?

On this note, how will this reflect the transport and meteorology at this prescribed height?

What is the vertical profile for chemical constituents at the measurement site? If a significant gradient exists, how can the authors justify not taking this into account in their analysis?

Page 13410 section 3.4

ACPD

15, C5138–C5141, 2015

line 11-12: 'the statistics for all meteorological parameters for both situations are well within the acceptable range'. What is an acceptable range??

Page 13413 line 8-12. Since the diurnal cycle of nitrate is wrong, does this suggest N2O5 heterogeneous chemistry is needed? Please check Lowe et al 2015.

Page 13417 line 6. 'For example..exhibit interacting responses'. Im not sure I understand this sentence. Interacting responses?

Page 13416 line 21: 'estimation of isoprene biogenic emissions over Europe varies from a factor of 3 up to a factor of 10'. What do the authors use as a base value to define this 'factor'? Is it seasonally averaged?

Please also add some statistics in the text without the reader having to keep checking the table.

Page 13421 line 17-23. On the discussion of Henrys law constants, how certain are the authors that the values presented by Raventos-Duran et al (2010) vary by 5 orders of magnitude with respect to these OCVs?

Page 13425 line 18 Replace 'has' by 'have'. line 19: Please indicate the fator by which the authors note increasing BVOCs decreases ASOA.

Page 13427 The authors note that they had a 'unique opportunity to target individual parameters

implicated in SOA formation' and yet this information was barely used in my opinion. Could the authors, if

they do want to retain this novelty, make more use of these measurements in their previous discussions?

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 13395, 2015.