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Atmospheric Chemistry and Physics Discussions

Interactive comment on "LES study of the impact of moist thermals on the oxidative capacity of the atmosphere in southern West Africa" *by* Fabien Brosse et al.

Anonymous Referee #1

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Review of 'LES study of the impact of moist thermals on the oxidative capacity of the atmosphere in southern West Africa' by Fabien Bosse et al.

Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2017-969

The authors present a study of the impact of turbulent mixing and segregation of OH radicals and OH sinks on modelled reaction rates and OH reactivity. A number of simulations are presented for various cases, including regions dominated by biogenic and anthropogenic emissions. However, the paper is lacking an overall summary and conclusion on the impact of these effects on model simulations for [OH] and OH reactivity.

The introduction provides an overview of some previous OH reactivity measurements

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Discussion paper

and studies investigating the impacts of air mass segregation. However, the studies investigating air mass segregation are typically concerned more with simulations of OH radical concentrations rather than OH reactivity. Are measurements of OH reactivity typically made on a timescale sufficiently rapid for the impacts of turbulence and segregation to be investigated?

The discussion and conclusion would benefit from a discussion of the overall impacts of neglecting effects of turbulence and air mass segregation. Are the differences in [OH] and OH reactivity significant? How do they compare to measurement uncertainties? Uncertainties in the rate constant and mechanism for OH + isoprene? What is the ultimate impact of the results reported? Are there regimes for OH reactivity for which turbulence/air mass segregation is more or less significant (i.e. are there ranges of OH reactivity for which the effects can/cannot be neglected)?

Minor comments are listed below:

Page 1, lines 6,7 & elsewhere: Please clarify the comparisons being made and the meaning and relevance of 'resp' throughout the manuscript.

Page 1, line 12: Insert 'the' in 'during daytime'.

Page 1, line 13: Remove 'the' in 'by the ozone photolysis'.

Page 1, line 16: Change 'measured reactivity' and 'calculated reactivity' to 'measured reactivities' and 'calculated reactivities'.

Page 1, line 17: Change 'reaction constants' to 'reaction rate constants'.

Page 1, line 18 onwards: Please make the distinction between calculated reactivity (from observed concentrations of OH sinks) and modelled OH reactivity (which includes concentrations of intermediates produced in the oxidation of the observed sinks), and clarify whether the studies referred to include any model intermediates.

Page 2, lines 7-9: Provide some references and further details to the statements made.

Page 2, line 10: ‘lox’ to ‘low’. Please include the definitions of NOx and HOx, and state the values for ‘low’ NOx.

Page 2, line 13: Subscript in HO2.

Page 3, line 2: ‘asses’ to ‘assess’.

Page 3, line 25: Change ‘whose’ to ‘in which’ and ‘in the spin-up’ to ‘of the spin-up’.

Page 3, line 33: State the locations of the observation sites.

Page 4, line 13: ‘ozone gaseous precursors’ to ‘gaseous ozone precursors’.

Page 4, line 16: What is the justification for choosing this particular flight? Can the flight track be provided?

Page 4, line 18: Why not for NO?

Page 4, line 29: Please quantify ‘very low’.

Page 5, line 5: Is ALD2 C>2 or C$\geq$2?

Page 5, line 15-18: What is the reason for the difference in the threshold values and why is the value of 1 taken as the threshold in this study?

Page 5, line 21: ‘specie’ to ‘species’.

Page 5, line 29: ‘ratios’ to ‘ratio’.

Page 6, line 8: Italicise ‘i’ in ‘i-th’.

Page 6, line 9: ‘in a similar way than’ to ‘in a similar way to’.

Page 6, line 21: What is the impact of this error and its neglect in previous studies?

Page 7, line 22: Please quantify ‘slightly overestimates’.

Page 9, line 1: Formaldehyde is not C>2.

Page 9, line 5: Subscript in HNO4.

Page 9, line 13: ‘mn’ to ‘min’.

Page 9, line 21 and page 10, line 20: Change ‘chemical equilibrium’ to ‘steady state’.

Page 10, lines 4&5: Change ‘lower’ to ‘shorter’ and ‘low’ to ‘short’.

Page 11, lines 8-11: Please clarify the meaning here. What, specifically, is implied about the reaction(s)?

Page 11, line 10: ‘reactants’ to ‘reactant’.

Page 11, line 12: Consider changing the section title, which ‘environment’ does this refer to? Would ‘surroudings’ be a better description?

Page 11, lines 24-25: Quantify the budgets.

Page 11, line 31: ‘photochemistry’ to ‘photochemical’.

Page 12, line 4: Change ‘is maximum’ to ‘is at a maximum’.

Page 12, lines 11 and 21: Can the errors be shown?

Page 12, line 19: ‘reactants’ to ‘reactant’.

Page 13, line 3: Please provide details of the ‘simple chemistry’.

Page 13, line 35: Please re-word ‘remains not negligible in the OH loss’. Do you mean it is significant for OH loss?

Page 14, line 15: ‘imply’ to ‘implies’.

Page 14, line 10: ‘imply’ to ‘implies’ and ‘have’ to ‘has’.

Page 14, line 21: ‘percents’ to ‘percent’.

Page 15, line 17: ‘HO’ to ‘OH’.

Page 26, Fig. 1a: Why does the blue line stop at 1800 hours?

Page 30, Table 3: Subscripts in O3 and NOx.

References: There are a number of formatting issues in the references, please check thoroughly prior to publication.

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