

## ***Interactive comment on “Aerosol size distribution and radiative forcing response to anthropogenically driven historical changes in biogenic secondary organic aerosol formation” by S. D. D’Andrea et al.***

### **Anonymous Referee #1**

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This study describes the response of SOA, and related radiative impacts, to millennial changes in BVOC emissions based on previous work by Acosta Navarro et al., 2014. The study is straight-forward and the paper is clearly presented. I have only minor technical comments and suggestions, detailed below.

1. Abstract, lines 1-12: These lines summarize results from a previous study and therefore do not belong in the abstract of this study.
2. Pg 26299, lines 4-7: For completeness, the authors may wish to mention the impor-

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tant role that BVOC emissions (esp. isoprene) play as an O<sub>3</sub> precursor.

3. Page 26299, lines 21-22: the language “competing factors” and “anthropogenic factors” is a bit vague. It would be helpful if the authors could outline all the controlling factors, and perhaps define here which factors are considered as “anthropogenic” and which are included in this study. For example, the study considers the effect of CO<sub>2</sub> fertilization and land use change, but not O<sub>3</sub> damage to vegetation, another leading anthropogenic factor, and this isn’t clear until the methods are presented.

4. Page 26300, line 29: Jimenez et al., 2009 only report non-refractory measurements of aerosol (AMS); strictly speaking this is not “total mass”.

5. General: the paper makes inconsistent use of the oxford comma. See for example in the same paragraph line 17 vs. lines 25-26. Please harmonize.

6. Page 26304, line 28: It seems that “approximately constant” would be a fairer characterization than “increase overall” for a 1% change.

7. Page 26306, line 11: missing word “however, we will discuss. . .”

8. Page 26307, line 9: errant reference typo? “(Lamsal et al., 2008)”

9. Page 26307, lines 7-11: Note that while high absolute concentrations of any species may call into question the atmospheric relevance of chamber experiments, the NO:HO<sub>2</sub> ratio within a chamber is an equally critical parameter for describing the chemical regime of SOA formation (i.e. fate of peroxy radicals).

10. Page 26307, lines 24-26: It would be useful if the authors could briefly summarize previous model evaluation of this particular simulation, since no comparison with observations is presented in this study.

11. Page 26309, lines 17-22: What is the source of the properties used in these calculations (refractive indices, densities, hygroscopicities, etc)?

12. Page 26322, lines 10-11: this statement is missing a reference

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