

Review of acp-2014-755, version 2, referee# 2:

This manuscript addresses important current scientific questions in atmospheric chemistry, and do so with an attention to detail and uncertainties. The authors have adequately responded to the previous reviews, and there are no important lingering scientific issues.

There are a few places in their response to the previous reviews where the authors opted not to make any significant changes to the manuscript, instead arguing that the reviewers' concerns were misplaced. While it is their prerogative to do so it is still the opinion of this referee that there are some places in the manuscript that could be improved had the authors taken these comments more seriously.

a) Both referees comment on and discuss in some detail that phase separation may not be a safe assumption under some conditions, so phase mixing and/or a water soluble organic phase should be discussed in the manuscript. While the authors state the assumption of phase separation, a discussion of the implications and the limits of these assumptions is still warranted.

b) In response to referee #1: "Given the relatively large number of "visualization" spaces that have been proposed and presented for representing SOA, could a similar analysis be presented in the context of existing representations (rather than introducing a new one)?" the author's dismiss the reviewers concerns stating that "If we had felt that a similar analysis was possible in the context of previously proposed visualization spaces, there would have been no motivation for introducing the chemical partitioning space approach in the first place"

The introduction provides a relatively good account of the other visualizations and how they are lacking or complemented by this work, so it is reasonable to feel this is an unwarranted concern, though the authors could have been more helpful in their response to referee #1. I raise this comment due to its possible connection to comment (a) above. The authors point out that the added value of their visualization is the explicit consideration of LWC in phase partitioning. This is lacking in the Donahue et al. 2D graphical space, which essentially assumes a single phase with parameterized chemistry. It seems to me, therefore, that a discussion of phase separation vs phase mixing is relevant also to discussion of the broader use of the proposed visualization versus those that already exist

c) The authors dismiss Referee #2, comment 4, regarding α -pinene functionalization as being already discussed in the manuscript. It is true that the regions of α -pinene functionalization are shown in Figures

6 and 11, but why is only dimerization discussed in Figure 10 and Section 3.5 (specifically lines 622-635), and not functionalization? Couldn't Figure 10 include functionalization, or could there be some figure like figure 7 for α -pinene? Lines 622-624 ("So far, we have only considered transformations that lead to functionalization of an aliphatic or aromatic carbon structure. Dimerisation reactions in the condensed phase are also believed to play a role in SOA formation.") ignore any role of functionalization (of biogenics) other than dimerization, which leaves the reader questioning the gap.