Atmospheric
Measurement
Techniques
Discussions

Open Access

EGU

Reply on RC2

Michael S. Taylor Jr. et al.

Specific Responses to Reviewer 1 Comments

Comment: I find the concept [growth yield] and its value a little difficult to grasp.

Response: Hopefully, the above discussion provides clarity (renaming to growth factor; improved discussion of the motivation for the modeling approach used). We will also revise section 2.3 to indicate why we introduce this term – specifically, one cannot directly compare growth rates (nm/hr) in flow tube experiments if the condensation sink changes from one experiment to the next. Therefore, we need to define a new parameter that takes condensation sink into account.

Comment: Model was not applied to any measurements in this paper… I worry that because of the complexity of most reaction systems that it is difficult to constrain the model.

Response: Hopefully, the above discussion provides clarity (the SOA "model" is meant just to simulate complex growth in the flow tube). As we stated above, working with actual data requires too much of an expansion of the paper, making it unwieldy. Besides, we still would not know how the growth kinetics change inside the flow tube.

Specific comment 1: Why don't the more volatile SVOCs contribute to the growth yield?

Response: For the simplified SOA formation model we use, we find that they don't contribute substantially to the growth we calculate, so we don't include them. It is conceivable that a more detailed SOA formation model would cause more highly volatile SVOCs to contribute to growth.

Specific comment 2: How well are the rates of loss of products to the walls understood,

and how does this impact the modeling?

Response: We will add some discussion of this point, but actually it is beyond the scope of this paper. In our experimental work, we switch back and forth between two sets of conditions in a manner that keeps the wall condition the same.

Specific comment 3: What happens to the model when dimer formation is treated as reversible instead of irreversible?

Response: Hopefully, our general comments above clarify why we don't use a more sophisticated SOA formation model for this work. If we were to include reversible dimer formation in the simulation, it could reduce the amount of growth one observes depending on the timescale of dimer dissociation relative to the timescale of the experiment. The result would be a lower growth factor for both the simulated flow tube data and the interpretive modeling, but the conclusion would be the same – that interpretive modeling gives a robust measure of growth kinetics (Figure 5 of the revision).

Specific comment 4: Isn't water likely to affect the dimer formation process?

Response: Yes, it is likely that dimer formation reactions are somewhat different in organic and aqueous media. The goal of this work is not to accurately represent that, but simply to show that the volume associated with a few monolayers of water on the particle surface have the potential to substantially enhance SOA growth. We will add clarifying text to the manuscript on this point. We include this in the paper because it is not intuitively obvious that a small amount of surface water could have such a large effect.

Response to technical comments: Problems noted by the reviewer in lines 157 and 190 will be corrected.