Atmos. Chem. Phys. Discuss., 14, C11990–C11992, 2015
www.atmos-chem-phys-discuss.net/14/C11990/2015/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Revisiting Twomey's approximation for peak supersaturation" *by* B. J. Shipway

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Received and published: 6 February 2015

Many thanks for taking the time to review this manuscript and for your very encouraging comments.

Minor comments:

1. Page 25903, lines 17 and 24. Aerosol activation can also arise from diabatic cooling, e.g., radiation fog, so remove "adiabatic".

   The specific example is for an adiabatic updraft, but you are correct that this term need not be adiabatic. This has been removed from the text.

2. Page 25904, line 11. Replace "simple" with "simply".

   This has been corrected.

3. Page 25904, line 16. Replace "which" with "that". The text uses "which" often when "that" is more appropriate". "Which" is better in parenthetic situations, while "that" is best when there is no pause.

   Thank you for pointing out my overuse of "which", which I often use in place of "that" that is more grammatically appropriate! I've modified the text to use "that" for essential clauses and "which" for nonessential clauses.

4. Page 25908, line 6. For clarity define x and y.

   Clarified in the text that these are dummy variables.

5. Page 25910, lines 18-22. This is unclear. What is meant by gradient alpha? Alpha is a supersaturation production rate. It is assumed to be a constant external parameter. How can you replace it with the supersaturation tendency? This is surely a poorapproximation near Smax.

   This is a miscommunication on my part. By 'gradient' I am referring to the slope of the line which forms the top of the trapezoid in figure 1. In Twomey's approximation this slope is α (i.e. $s = \alpha t$ +constant). I have re-worded this slightly to be:

   > For this, we simply take the gradient of the topmost edge of the trapezoid in Fig. 1 (which is assumed to be α in Twomey's approximation) to be the mean gradient given by ...

6. Page 25913, line 4. Replace "provided" with "providing".

   Corrected.

7. Page 25914, line 8. You can't cite a manuscript in preparation. Just say that your team is conductive a more comprehensive analysis.

The ACP guidelines (http://www.atmospheric-chemistry-and-physics.net/submission/manuscript_preparation.html) state that 'Works "submitted to", "in preparation", "in review", or only available as preprint should also be included in the reference list.' (It should also be noted that this is not work being done by my team).

8. Page 25915, lines 11-13. ". . .allows the form. . .of the approximation. . .to be relaxed" doesn't seem right. You have introduced a more realistic approximation.

   I have reworded this sentence as:

   > However, another benefit is that it is not constrained to use the fixed form of the lower bound approximation of Twomey (1959), which is frequently used to make analytic integration feasible, and so a more accurate approximation is derived.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 25901, 2014.