Geoscientific
Model Development
Discussions

Interactive comment on "**Unified parameterization of the planetary boundary layer and shallow convection with a higher-order turbulence closure in the community atmosphere model: single column experiments**" *by* P. A. Bogenschutz et al.

S. J. Ghan (Referee)

steve.ghan@pnnl.gov

Received and published: 24 July 2012

This manuscript describes encouraging results from application of an advanced turbulence/subgrid microphysics scheme to a widely used community atmosphere model. The scheme simulates boundary layer clouds with much less sensitivity to vertical or temporal resolution and more realistically than the boundary layer cloud schemes in a community atmosphere model. This improvement is related to the unified treatment of stratiform and shallow cumulus clouds.

The presentation is clear and balanced, and the selection of figures is parsimonious and effective.

1. Page 1746, line 10. Insert "consistently with the PDF of total water" after "ratio".

2. Page 1746, line 18. Insert "to" before "predict".

3. Page 1746, line 24. Replace "includes" with "includes".

4. Page 1746, line 26 and page 1747, line 21. Change "2011" to "2012".

5. Page 1748, line 7. Can you provide a reference for a ""incomplete" predictive third-order turbulence closure" scheme?

6. Page 1748, lines 24-27. It is worth mentioning here that aerosol activation should be integrating over the pdf of w (Ghan et al., JGR 1997). Calculation at a single up-draft velocity is done only for computation expedience, and is an approximation that is questionable if the pdf of w is skewed.

7. Page 1749, line 3. Change "advantage" to plural form.

8. Page 1752, line 3. Replace "relatively little" with "much less".

9. Page 1753, lines 13-16. How do droplet number concentrations estimated by CLUBB with single and pdf of w compare? Now that we have a scheme that can produce skewed distributions of w, we should start integrating activation over the pdf of w. The activation scheme is coded for it, and I have an approximation to the Abdul-Razzak scheme that calculates activation 10 times faster. Please contact me for the code.

10. Page 1753, line 26. Insert "the" before "CAM-BASE".

11. Page 1757, lines 20-25. You might note here that the CAM-BASE simulations seem to be less sensitive to vertical resolution than the CAM-CLUBB simultations.

12. Figure 9. Label says 30L and 240L, not 30L and 60L.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

13. Page 1757, line 26 – page 1758, line 6. Again, integrate activation over the pdf(w) with CLUBB.

14. Page 1758, lines 14-24. Could you comment on the strong $2\Delta t$ oscillations in simulations at 1800 s time step? Are they also present for 60 s?

Steve Ghan

Interactive comment on Geosci. Model Dev. Discuss., 5, 1743, 2012.