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Interactive Comment

# *Interactive comment on* "Modeling the diurnal cycle of conserved and reactive species in the convective boundary layer" *by* D. H. Lenschow et al.

**D. H. Lenschow et al.**

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Response to Reviewer 1:

1. Title: in the title of a GMD paper, the name and version of the model should be indicated

To accommodate the reviewer's request, we have changed the title to: Modeling the diurnal cycle of conserved and reactive species in the convective boundary layer using SOMCRUS

2. A section on the availability of the model code is missing

We can add the sentence: SOMCRUS can be obtained in the currently-reported O3-NO-NO2 configuration by requesting a copy from lenschow@ucar.edu.

3. p. 9336, line 6: is there a specific reason why a value of 0.993h was chosen?

Yes, we can add the sentence: Using h = 1.0 causes numerical difficulties because of the discontinuity in the concentration profile.

Technical comments:

4. p. 9325, line 4: the acronym 'CBL' is already explained in the abstract

We can easily remove the CBL definition in the text if the editor so advises; it was our understanding that the abstract was supposed to stand alone.

5. p. 9329, line 11: I think 'Si(z)' should read 'Si(z,t)'

Yes, we will change that to S_i(z,t).

6. p. 9333, line 4: here the acronym 'PBL' is used without further description. Since all PBLs discussed in this manuscript are CBLs, I would suggest using the latter term consistently throughout the manuscript.

Yes, our mistake, we will change PBL to CBL here, and elsewhere if it appears elsewhere.

7. p. 9337, line 13: pls change 'In' into 'in'

Yes, we will change.

8. p. 9340, line 7: add a comma after 'case B'

Yes, we will change

9. p. 9341, line 16-17: remove one of the two occurrences of 'directly' from this sentence

Yes, we will change



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10. p. 9342, line 4: change 'whose the reactive' into 'whose reactive'

Yes, we will change

11. p. 9342, line 16: remove 'that'

Yes, we will change

12. p. 9343, line 2: remove 'for O3,'

We will remove

13. p. 9349, line 9: add 'it is' between 'and' and 'easy', and 'to; between 'and' and 'quickly' to make the sentence grammatically correct

Here we defer to the editor; we're happy to make the change, but to us, it is OK as it stands.

14. p. 9349, line 11: remove 'adding'

We will remove

15. p. 9349, line 12: change 'incorporating' in 'to incorporate'

Here again, we defer to the editor, as we think it is OK as it stands.

p. 9350, line 7: do you mean 'numerically', instead of 'numerally'?

Yes, we will change.

16. figure 10, caption: the figure shows the species variances at 10:00, 12:00 and 14:00, while the caption only mentions 12:00 LT. Further, the last sentence of the caption does not seem to apply to the figure.

Yes, we will change.

17. A list of abbreviations in the appendix would be a great help for the reader

Here again, we defer to the editor, as to whether this would be a desirable addition.



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Response to Reviewer 2:

1. A previous attempt to describe these processes with second order closure models, though for nighttime conditions, is Galmarini et al. (1997) that the authors may want to consider in their literature overview (http://journals.ametsoc.org/doi/pdf/10.1175/1520-0450(1997)036.

Yes, an egregious omission on our part. We will add to p. 9326, l. 10 the following:

. . .Vilà-Guerau de Arellano et al. (1995) and Galmarini et al. (1997b). Galmarini et al. (1997a) also used a one-dimensional second-order closure model to study nitrogen oxide chemistry in the nocturnal boundary layer. âĂŤâĂŤâĂŤ Galmarini, S., Duynkerke, P. G., and Vilà-Guerau de Arellano, J.: 'Evolution of Nitrogen Oxide Chemistry in the Nocturnal Boundary Layer', J. Appl. Meteorol., 36, 943–957, 1997a. Galmarini, S., Vilà-Guerau de Arellano, J., and Duynkerke, P. G.: 'Scaling the Turbulent Transport of Chemical Compunds in the Surface Layer Under Neutral and Stratified Conditions', Quart. J. Roy. Meteorol. Soc., 123, 223–242, 1997b.

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Interactive comment on Geosci. Model Dev. Discuss., 8, 9323, 2015.



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