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January 24, 2015

Dr. Hang Su  
Editor, Atmospheric Chemistry and Physics

**Re: Response to Reviews**

Manuscript Number: acp-2014-477

Manuscript title: Explaining Variance in Black Carbon's Aging Timescale

Manuscript Authors: L. Fierce, N. Riemer, T.C. Bond

Dear Dr. Su,

Please find attached our responses to the remaining comments regarding the above paper. Reviewer #1 identified a few lingering technical errors, and we are grateful for the care taken in the review of our manuscript.

We have responded to each of the reviewer's comments individually, and all changes are marked in the revised manuscript.

Yours sincerely,

Nicole Riemer

# 1 Reviewer #1

We thank the reviewer for their careful review of our manuscript. We have responded to each comment individually and have noted changes in the revised comment.

- (1) Line 222: Please clarify the definition of  $S_{c,i}$ .  $S_{c,i}$  means  $S(D_{c,i})$ ?

*The definition of  $S_{c,i}$  and  $D_{c,i}$  are clarified in lines 221-226 of the revised manuscript.*

- (2) Equation (7):  $N_{\text{train}}$  in the denominator should be  $N_{p,\text{train}}$ .

*This error has been corrected in the revised manuscript.*

- (3) Line 450-451: across all fresh BC-containing particles

*This error has been corrected in the revised manuscript.*

- (4) Line 453: Section 4.1 should be Section 4.2?

*The subsections in Section 4 appear to be numbered correctly.*

- (5) Line 472: Please correct  $\tau_{\text{aging},j}$ .

*This error has been corrected in the revised manuscript.*

- (6) Equation (12): this equation is similar to equation (8), but  $\tau_{\text{aging}}$  is written without “ $\hat{\phantom{\tau}}$ ”. Is this correct? Similarly, please clarify the  $\tau$  in Figure 7 is  $\tau_{\text{aging}}$  with “ $\hat{\phantom{\tau}}$ ” or without “ $\hat{\phantom{\tau}}$ ”.

*Equations (12) and (13) should be written in terms of  $\hat{\tau}_{\text{aging}}$ . The timescale shown in Figure 7 is also a prediction, and should be denoted  $\hat{\tau}_{\text{aging}}$ . The instances where  $\tau_{\text{aging}}$  was changed to  $\hat{\tau}_{\text{aging}}$  are marked in Section 4.2.*

- (7) Lines 593-662: This part is sufficiently long. I recommend this part or some of this part should be Section 5.1. Then, Sections 5.1 and 5.2 will be Sections 5.2 and 5.3, respectively.

*We created a new section for part of the introductory material. Section 5.1 now includes lines 620 to 667 of the revised manuscript. The numbering on the following subsections of Section 5 have been modified accordingly.*

- (8) Line 600-601: BC-containing particles ( $n_{\text{fresh}}(D)$ ) and the number

*The suggested change is included in the revised manuscript.*

- (9) Line 604: fresh BC containing particles ( $n_{\text{fresh}}(D)$ )

*The suggested change is included in the revised manuscript.*

(10) Line 615: taffect → affect

*This error has been corrected in the revised manuscript.*

(11) Line 724: oft his → of this

*This error has been corrected in the revised manuscript.*

(12) Table 2: At the explanation of G2, turn of NH3 should be turn off NH3.

*This error has been corrected in the revised manuscript.*