

Interactive comment on “High resolution vertical distributions of NO₃ and N₂O₅ through the nocturnal boundary layer” by S. S. Brown et al.

Anonymous Referee #1

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In this paper Brown et al. present direct evidence that stratification of the nocturnal boundary and residual layers results in chemical layering with distinctly different lifetimes for the species NO₃ and N₂O₅. The idea that such stratification and layering exists has been discussed previously. As the authors note, what is new here is the detailed profiling of the layered structure. The study offers a tantalizing view of new things what we might learn from high resolution measurements of the composition of these distinct layers and should be published with minor changes.

I note a couple of items that require additional thought and comments by the authors:

1) In examples 1 and 2, the discussion focuses on the one half to two thirds of NO_x that is stored as NO₃ and N₂O₅ in the residual layer. Some additional discussion of

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the fate of the one third to one half of NO_x that is permanently removed via chemistry of NO_3 and N_2O_5 would be desirable. Do the products of these reactions have any consequences for the chemistry that occurs once the sun rises? Also, if there is some mixing bringing higher NO_x air into this layer, might the losses even be higher than indicated?

2) I think the discussion would benefit from restructuring. As the data presented by the authors clearly shows (ozone is often but not always titrated), indicating that there are episodes that have seen input of high NO_x emissions in the NBL. I suggest that the authors assume the primary process affecting NO and its higher oxides in the NBL is episodic pulsed emissions—such as air passing over a highway. Subsequent chemical evolution and dilution of plumes such as these are likely the primary factor affecting NO_x , O_3 , NO_3 and N_2O_5 . The other factors discussed by the authors, soil emissions and deposition, should be compared in magnitude and variance to the effects of this dominant feature in the data.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 9431, 2006.

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