

Interactive comment on “Measurements of N₂O₅, NO₂, and O₃ east of the San Francisco Bay” by E. C. Wood et al.

Anonymous Referee #2

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The manuscript by Wood et al. describes the first field deployment of a new instrument to measure dinitrogen pentoxide (N₂O₅) in the atmosphere. The combination of thermal decomposition of N₂O₅ followed by the detection of NO₃ via laser induced fluorescence is a novel technique that offers a number of advantages. The strength of this manuscript is in its very clear and detailed description of the experimental procedures and the application of this technique in the atmosphere. In particular the various challenges during the field deployment, such as interferences from aerosol particles, are thoroughly investigated and solutions to these problems are presented. The data measured in Berkeley is very interesting and demonstrates the capabilities of this new technique.

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The quantitative interpretation of the data is the weaker part of the manuscript. In their calculation of the N_2O_5 pseudo steady state the authors assume that loss processes of NO_3 can be ignored. It would help to expand the manuscript in this section to provide a more quantitative description of the uncertainty introduced by this and other assumptions in the pseudo steady state calculation. In addition, the authors should consider recent publications showing that vertical transport of N_2O_5 can not be ignored for pseudo steady state calculations of N_2O_5 (Geyer and Stutz, JGR 2004).

The authors conclude that N_2O_5 loss is a more important NO_x sink than the reaction of NO_2 with OH during the day in winter. While I do not disagree with this general conclusion, I would suggest to balance this statement with the fact that N_2O_5 was only observed on a few nights during the experiment. On several nights N_2O_5 appears to be unimportant and the daytime loss of NO_x will dominate. In addition, the authors should take the altitude dependence of N_2O_5 concentrations into account, and consider that the boundary layer is typically higher during the day than at night. The higher daytime boundary layer will increase the significance of the $\text{OH} + \text{NO}_2$ reaction as a NO_x loss process, since it occurs in a much larger volume than the nocturnal N_2O_5 loss.

Technical comments:

I am unclear on the meaning of the unit ppbv. It would help to briefly introduce this unit in the manuscript.

I would suggest using the term “pseudo steady state” instead of “steady state” since a true steady state is rarely achieved in the atmosphere.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 6645, 2004.