**Atmospheric
Chemistry
and Physics
Discussions**

Interactive
Comment

Interactive comment on "Combining Bayesian methods and aircraft observations to constrain the HO[.] + NO₂ reaction rate" *by* B. H. Henderson et al.

Anonymous Referee #1

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In this paper the authors apply Baysian methods to aircraft observations of the NO2/HNO3 ratio obtained during the INTEX-A aircraft campaign in order to constrain chemical reaction rates in the upper troposphere. They use a simple convective turnover model of the upper troposphere to examine how uncertainties in chemical rate constants affect their comparison to observations. The authors find that the OH + NO2 -> HNO3 rate constant is currently too high by 22%. They interpret this as a lower temperature sensitivity than currently recommended. These are significant results obtained using an elegant and innovative approach. The assumptions are clearly described. The paper is well written and organized in a clear way. I only have very minor comments as listed below.

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Interactive Discussion

Discussion Paper

Section 2.2: page 24197 line 20-23. What is assumed for the heterogeneous uptake of N2O5? Given its relevance to the NO2/HNO3 ratio it would be useful to have a bit more detail beyond referring to "GEOS-Chem model version 9-01-01" which is a very opaque reference for most readers.

Are all the observations always between 8-10 km? If would be useful to mention this again in the figure caption of figure 2 as well as in Tables A1-3.

Similarly it would be useful to reiterate the criteria used to choose the 'initial conditions' in Table A1.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 24191, 2011.