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Interactive comment on "Parameterization of N_2O_5 reaction probabilities on the surface of particles containing ammonium, sulfate, and nitrate" *by* J. M. Davis et al.

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We sincerely appreciate the comments provided by Dr. Steve Brown. Since our manuscript focuses on a linkage between laboratory measurements and model parameterizations, it is extremely useful to get perspectives from a researcher who has measured N_2O_5 in the atmosphere. After reading the comments by Brown (2008), we made a few modifications to our manuscript.

1. *Role of organics.*
Although we are well aware of the limitations imposed by excluding organics from our parameterization, these limitations were conveyed only in Sections 2 and 5.1 of our original manuscript. In the revised manuscript, we stress in the abstract that our pa-

rameterization for inorganic ammonium salts lays a necessary foundation for future research that will parameterize γ in organic/inorganic mixtures. In addition, we added the following sentences to our conclusions. “Though we account for various effects of inorganic constituents, our parameterization may provide only an upper limit for γ on ambient particles. Additional research is necessary to parameterize the suppression of γ when inorganic particles are mixed or coated with organic material.”

2. *Relative humidity dependence.*
We appreciate the information provided by Brown (2008) with regard to the lack of a clear dependence of γ between 62 – 82% RH in his field measurements. We have incorporated this into a new appendix of the revised manuscript (Appendix A), where we also provide an alternative parameterization obtained when one considers all measurements except the KAN01 data. The contents of this appendix were also motivated by comments we received from Anonymous Referee #1 (2007).

3. *Effect of inorganic aerosol composition.*
It is reassuring to learn of the agreement between field data and lab measurements, which both indicate an enhancement in γ when the ammonium-to-sulfate ratio decreases. Our parameterization captures this trend at temperatures below 298 K (see Section 4.1 of revised manuscript). At higher temperatures, the acidity enhancement disappears from our parameterization due to the slightly stronger inverse-T dependence on NH_4HSO_4 than on $(NH_4)_2SO_4$ particles (compare β_{12} with (β_{12} + β_{22}) in Table 3). The β_{22} term was not statistically significant in our original parameterization (Davis et al., 2007), but it became significant when we included 4 MOZ88 data points in response to a comment by Anonymous Referee #1 (2007).

4. *Sea salt aerosol.*
We agree that the different mix of products which can result from N_2O_5 hydrolysis on other particle types (e.g., $ClNO_2$ from chloride-containing particles) is noteworthy, but we could not find a good place to mention this without disrupting the flow of our manuscript. Given our focus on continental domains where chloride-containing parti-

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cles are far fewer in number than ammoniated sulfate and nitrate particles, omission of this note seems reasonable.

5. *Temperature dependence and winter measurements.*
We are very pleased by this endorsement of our appeal for more laboratory measurements at low temperatures (Brown, 2008) and look forward to the availability of winter field data from Brown and co-workers in the future. We received a private communication from another reader (Dr. William Simpson, University of Alaska at Fairbanks) who supports our appeal for more low-temperature laboratory data and has begun analyzing N_2O_5 loss rates from field measurements collected under cold Arctic conditions.

References

Anonymous Referee #1: Interactive comment on "Parameterization of N_2O_5 reaction probabilities on the surface of particles containing ammonium, sulfate, and nitrate" by J. M. Davis et al., Atmos. Chem. Phys. Discuss., 7, S8004–S8008, 2007.

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