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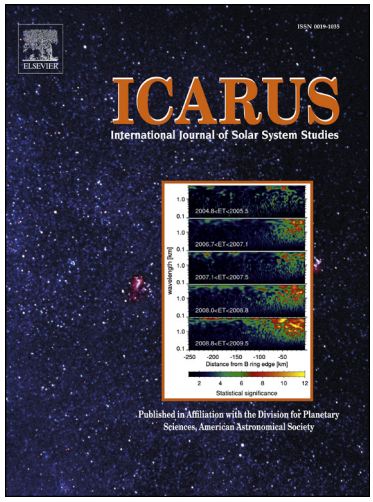

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Neal Parsons, Deborah A. Levin, Andrew C. Walker, Chris H. Moore, David B. Goldstein, Philip L. Varghese, Laurence Trafton

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Influence of *ab initio* Chemistry Models on Simulations of the Ionian Atmosphere

Neal Parsons[a,*], Deborah A. Levin[a], Andrew C. Walker[b], Chris H. Moore[c], David B. Goldstein[d], Philip L. Varghese[d], Laurence Trafton[d]

[a]*Department of Aerospace Engineering, The Pennsylvania State University, 229 Hammond Bldg, University Park, PA 16802, USA*
[b]*Intelligence and Space Research Division, Los Alamos National Laboratory, P.O. Box 1663, Los Alamos, NM 87545, USA*
[c]*Electromagnetic Theory, Sandia National Laboratories, Albuquerque, NM 87185, USA*
[d]*Department of Aerospace Engineering and Engineering Mechanics, The University of Texas at Austin, 1 University Station, C0600, Austin, TX 78712, USA*

Abstract

There is significant scientific interest in simulating the unique atmospheric conditions on the Jovian moon Io that range from cold surface temperatures to hyperthermal interactions which possibly supply the Jovian plasma torus. The Direct Simulation Monte Carlo (DSMC) method is well suited to model the rarefied, predominantly SO_2, Ionian atmosphere. High speed collisions between SO_2 and the hypervelocity O atoms and ions that compose the plasma torus are a significant mechanism in determining the composition of the atmosphere; therefore, high-fidelity modeling of their interactions is crucial to the accuracy of such simulations. Typically, the Total Collision Energy (TCE) model is used to determine molecular dissociation probabilities and the Variable Hard Sphere (VHS) model is used to determine collision cross sections. However, the parameters for each of these baseline models

*Corresponding author
Email address: nsp5088@psu.edu (Neal Parsons)