

Accepted Manuscript

Influence of *ab initio* chemistry models on simulations of the ionian atmosphere

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

PII: S0019-1035(14)00294-2

DOI: <http://dx.doi.org/10.1016/j.icarus.2014.05.041>

Reference: YICAR 11123

To appear in: *Icarus*

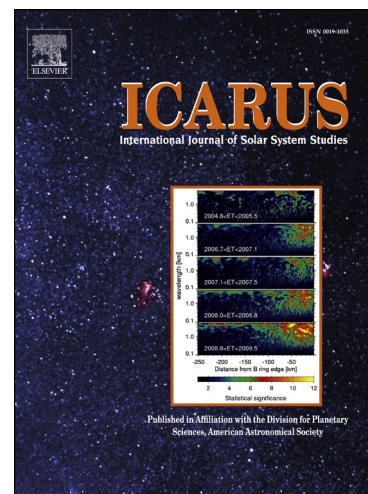
Received Date: 12 March 2014

Revised Date: 16 May 2014

Accepted Date: 27 May 2014

Please cite this article as: Parsons, N., Levin, D.A., Walker, A.C., Moore, C.H., Goldstein, D.B., Varghese, P.L., Trafton, L., Influence of *ab initio* chemistry models on simulations of the ionian atmosphere, *Icarus* (2014), doi: <http://dx.doi.org/10.1016/j.icarus.2014.05.041>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



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 SO₂, Ionian atmosphere. High speed collisions between SO₂ 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)

Download English Version:

<https://daneshyari.com/en/article/8137880>

Download Persian Version:

<https://daneshyari.com/article/8137880>

[Daneshyari.com](https://daneshyari.com)