

## Contents of Volume 2

<b>7: Numerical Methods</b>	<b>751</b>
The Search for Solutions in Rarefied Gas Dynamics <i>G.A. Bird</i>	753
Hydrodynamic Fluctuations in a Dilute Gas <i>M. Mareschal, U. Krebs and M. Malek Mansour</i>	763
Corner Flow Jet Interaction: Computations and Experiment <i>J.F. Chauvot, L. Dumas and D. Dupuis</i>	773
Comparison of Continuum and Molecular Approaches for Rarefied Gas Flows <i>T.G. Elizarova, I.A. Graur, A. Chpoun and J.C. Lengrand</i>	780
DSMC Computations of Complex Test Cases and Industrial Configurations <i>F. Coron, J.F. Pallegoix and B. Sportisse</i>	787
Loadbalancing for the DSMC Method in a Parallel Implementation <i>Stefan Dietrich and Iain D. Boyd</i>	794
Molecular Dynamics Computations for a Diatomic Gas Using a Rigid Dumbbell Model <i>D. Jesurun, I. Greber and H. Wachman</i>	801
Collision Model of Diatomic Molecules for DSMC Method <i>Y. Matsumoto and T. Tokumasu</i>	808
Computational Aspects on Discrete-Ordinate-Velocity Description of Rarefied Gases <i>H. Oguchi, M. Hatakeyama and H. Honma</i>	815
Model of Electronic Energy Relaxation in the Test-Particle Monte Carlo Method <i>P. Roblin, A. Rosengard and T.T. Nguyen</i>	822

## Contents of Volume 2

xix

A Radiation Absorption Model for the DSMC Method <i>Jeff C. Taylor, H.A. Hassan and Lin Hartung Chambers</i>	829
Random Discrete Velocity Models and Particle Simulation Schemes for the Boltzmann Equation <i>Wolfgang Wagner</i>	836
The Application of Adaptive Unstructured Grid Technique to the Computation of Rarefied Hypersonic Flows using the DSMC Method <i>L. Wang and J.K. Harvey</i>	843
Accurate Numerical Methods for Integrating Model Boltzmann Equations <i>J.Y. Yang, J.C. Huang and L. Tsuei</i>	850
Discretization of the Boltzmann Equation and Discrete Velocity Models <i>A.V. Bobylev, A. Palczewskii and J. Schneider</i>	857
The Monte Carlo Method in the Problem of Gas Atom Reflection from a Rough Surface <i>M.V. Anolik</i>	864
Parallel Algorithms Based on the Direct Approaches of Solving the Boltzmann Equation <i>V.V. Aristov and I.G. Mamedova</i>	871
A Discrete-Velocity Scheme for the Boltzmann Operator of Rarefied Gas Dynamics <i>C. Buet</i>	878
Finite Difference Approximation of the Homogeneous Fokker-Planck Equation <i>Pierre Degond and Brigitte Lucquin-Desreux</i>	885
An Alternative Procedure for Collision Simulation in MCDS <i>V.P. Memnov, S.A. Plusov, A.Ph. Sizova and A.V. Yurkov</i>	892
Comparison of the DSMC Method with an Exact Solution of the Boltzmann Equation <i>J. M. Montanero and A. Santos</i>	899
Application of the C-L Model to Vibrational Transitions of Diatomic Molecules during DSMC Gas-Surface Interaction <i>R.S. Simmons and R.G. Lord</i>	906

DSMC Method for Linearized Boltzmann Equation  
*S.L. Gorelov and Y.I. Khlopkov*

913

## 8: Gas-Surface Interactions

919

Fundamental Insight into Gas-Surface Accommodation Coefficients  
from Helium Atom Scattering Experiments  
*J. Peter Toennies*

921

The Role of the Rotational State in Molecule-Surface Kinetics  
*L.J.F. Hermans*

931

Thermal Polarization of Bodies in the Rarefied Gas Flow and  
Thermophoresis of Aerosols  
*S.P. Bakanov*

941

A Detailed Surface Chemistry Model for the DSMC Method  
*Frank Bergemann*

947

The Effect of the Surface Chemical Composition on a Free Molecular  
Gas Flow in a Cylindrical Channel  
*A.V. Nakarjakov, S.F. Borisov, F.M. Sharipov and P.E. Suetin*

954

New Approach to Study the Molecular Internal to Translational Energy  
Transfer in Surface Collisions  
*P.L. Chapovsky, E.J. van Duijn, B. Nagels, L.N. Cornelisse and  
L.J.F. Hermans*

960

Accommodation Measurements involving Hypersonic  
Gas-Surface Interactions  
*Steven R. Cook, Jon B. Cross and Mark A. Hoffbauer*

967

Rotational Accommodation of NO on a Hot SiC-Surface in a  
Rarefied Flow  
*G. Grundlach and C. Dankert*

974

Wall Slip Condition of Vibrational Temperature  
*M. Nishida, K. Tanabe, Y. Sakamura and K. Yamamoto*

981

Measurements of Recovery Temperatures, Heat Transfer and Force  
Accommodation Coefficients for a He Free Jet on a Clean Single  
Crystal of LiF (001)  
*H. Legge, J.P. Toennies and J. Lüdecke*

988

Molecular Dynamics Simulation of O<sub>2</sub> Scattering from a  
Graphite Surface  
*Y. Matsumoto, N. Yamanishi and H. Shobatake*

995

The Thermal Accommodation Coefficient of Helium on Tungsten at  
Low Temperatures  
*Lloyd B. Thomas, D. Vincent Roach and Frank O. Goodman*

1002

Interaction of Thermal and Fast Atomic Oxygen (up to 5 eV) with  
Polymer Films  
*V.E. Skurat, A.V. Anisimov, A.P. Nikiforov and A.I. Ternovoy*

1009

Slip-Boundary Equations for Thermal and Chemical Nonequilibrium  
Flows with Surface Catalysis  
*J.R. Tang and B. Tao*

1016

Variational Calculation of the Temperature Jump for a Polyatomic Gas  
*Carlo Cercignani, Maria Lampis and Andrea Lentati*

1023

The Diffusion Process as a Model of Rarefied Gas Atom Scattering  
from a Surface  
*O.A. Aksenova and I.A. Khalidov*

1030

Influence of Thermoconductivity and Viscosity upon Surface Waves  
Attenuation due to Gas Loading  
*O.E. Aleksandrov and V.D. Seleznev*

1037

Adsorption Kinetics of Gas-Surface Interactions  
*G.V. Dubrovskiy, V.V. Kozachek and Yu.G. Markoff*

1044

Analytical Approximations of Kinetic Boundary Conditions (KBC)  
*G.V. Dubrovskiy, V.A. Fedotov and D.V. Kulginov*

1051

Physical Models of the Dissociative Adsorption  
*Vladimir A. Fedotov*

1058

The Investigation of Possibility of the Energy Accommodation  
Coefficient Decrease for 7.5-15 km/s Gas Flows by means of the Ion  
Beam Technology  
*M.N. Kogan, V.V. Skvortsov, A.A. Uspensky and V.T. Zabolotny*

1065

A Molecular Dynamics Study of Gas-Surface Interaction  
with Adsorbates  
*J. Matsui, M. Miyabe and Y. Matsumoto*

1072

Kinetic Investigations of Near-Surface Phenomena in the Gas and Dust Envelopes of Small Celestial Bodies <i>A.A. Pyarnpuu, V.I. Shematovich and S.B. Svirschevsky</i>	1079
Kinetic Simulation of Ecological Gas-Surface Phenomena in the Near-Earth Space Environment <i>A.A. Pyarnpuu, G.A. Tsvetkov, V.I. Shematovitch and G.G. Svirschevskaya</i>	1086
Wall Slip-Boundary Equations with Catalysis for Multicomponent Chemical Nonequilibrium Gas Flows <i>J.R. Tang and B. Tao</i>	1093
Simple Model for Scattering of Gas-Molecules from Industrial Surfaces <i>Tomohide Ni-imi, Tetsuo Fujimoto, Yasushi Oishi and Hiroshi Kaneda</i>	1100
Temperature Jump in a Binary Gas Mixture with Imperfect Accommodation <i>Hidekazu Tsuji and Yoshimoto Onishi</i>	1107
DSMC Studies Complementing LIF Experiments on Gas-Surface Interaction <i>Andreas Danckert</i>	1114
<b>9: External Flows, Space Vehicles and Vacuum Technology</b>	1121
Rarefied Hypersonic Flows: Simulations, Experiments and Applications <i>James N. Moss</i>	1123
DSMC Solutions for Transonic Flow about 2-D Aerofoil Sections <i>D.J. Auld and A. Barclay</i>	1133
Three-Dimensional Wake Flow Simulations for A 70-deg Blunted Cone During Re-entry <i>M. Cevdet Çelenligil</i>	1140
Vortices and Turbulence in Hypersonic Rarefied Flows <i>Carlo Cercignani and Stefan Stefanov</i>	1147
Rarefaction Effects on Blunt-Body Wake Structure <i>V.K. Dogra, J.N. Moss, J.C. Taylor, D.B. Hash and H.A. Hassan</i>	1154

70° Aerobrake Vehicle plus Afterbody in Hypersonic Rarefied Nitrogen Flow <i>Martin R. Gilmore, Andrew K. Owen and Terry V. Jones</i>	1161
Aerothermodynamics of Pyrolyzing Surfaces in Hypersonic Rarefied Flows <i>Brian L. Haas and Frank S. Milos</i>	1168
DSMC Analyses for Highly Complicated and Interactive Flow based on the Object-Based Mechanism and GUI Environments <i>M. Hatakeyama, I. Kaneko and H. Uehara</i>	1175
Analysis of Control Surfaces Efficiency in Hypersonic Rarefied Flows <i>M.S. Ivanov, S.G. Antonov, G.N. Markelov and E.V. Titov</i>	1182
On the Drag and Heat Transfer Coefficients in Free-Molecular Flow <i>Carlo Cercignani, Maria Lampis and Andrea Lentati</i>	1190
The Drag of Axially Aligned Cylinders and Cones at Angles of Attack in a Low Density Hypersonic Flow <i>A.K. Owen, T.V. Jones and R.S. Simmons</i>	1197
The Numerical Investigation of Two-Component Gas Mixture Flows in the Spherically Symmetric Gravitational Field <i>A.V. Shcheprov</i>	1204
Three-Dimensional DSMC Calculations of Jet/Corner Flow Interactions <i>R.G. Wilmoth and P.V. Tartabini</i>	1209
Development of a Hybrid Scheme and its Application to a Flat Plate Flow <i>Jörn Eggers and Alfred E. Beylich</i>	1216
The Local Interaction Theory and its Application to the Lift and Drag Calculation in the Transitional Regime Flow <i>O.A. Aksenova, M.V. Anolik, I.A. Khalidov and R.N. Miroshin</i>	1223
Viscous Hypersonic Flows for various Aerophysical Models <i>Yu. Khlopkov, I.V. Yegorov and V.S. Nicol'skiy</i>	1230
Monte Carlo Simulation of Hypersonic Rarefied Nitrogen Flow around a Circular Cylinder <i>Katsuhisa Koura and Mikinari Takahira</i>	1236

Direct Simulation of Rarefied Flow over a Sharp 45° Cone with Incomplete Surface Accommodation <i>R.G. Lord</i>	1243
Three-Dimensional Studies of a Flat Plate in Hypersonic Flows with Emphasis on the Effects of Wall-Gas Interactions <i>F.C. Hurlbut</i>	1250
Some Features of Hypersonic Rarefied Gas 3D Flows <i>A.I. Erofeev, K.V. Nikolaev and V.D. Perminov</i>	1258
Hypersonic Rarefied Gas Flow over a Porous Plate <i>A.I. Erofeev, O.G. Freedlander, V.D. Perminov and S.V. Svischev</i>	1264
Three-Dimensional Rarefied Flow with Swept Wedge <i>S. Igarashi</i>	1270
DSMC Analysis of Small Spacecraft Heat Transfer and Flow Field Characteristics at Low Earth Orbits <i>S.B. Svirschevsky, E.V. Titov and I.D. Voronov</i>	1277
Validation DSMC Computations for the Flowfield around a 70° deg Blunted Cone <i>Michael A. Gallis and John K. Harvey</i>	1284
<b>10: Jets and Plumes</b>	1291
Numerical Analysis of Freejets at Small Knudsen Numbers <i>V.V. Aristov</i>	1293
DSMC Comparisons to Rotational Temperature Measurements in Jet Expansions with Finite Background Pressures <i>David H. Campbell, Dean Wadsworth and Lawrence A. Gochberg</i>	1300
Axi-Symmetric Hypersonic Jet Interaction: A Combined Experimental and Computational Study <i>Martin R. Gilmore and Keith Warburton</i>	1307
DSMC Comparisons with Electron Beam Measurements of Sonic Orifice Expansion Flows of Nitrogen <i>David P. Weaver, Dean C. Wadsworth, David H. Campbell and E.P. Muntz</i>	1314

Role of Gas Dynamics in the Formation of Pressure Pulsations on a Solid Surface Irradiated by Laser Impulse <i>N.M. Bulgakova and L.I. Kuznetsov</i>	1321
Non-Uniqueness of Gas Dynamic Structures in Two Supersonic Opposing Underexpanded Jets Interaction <i>V.S. Favorsky, A.V. Savin, I.V. Shatalov and E.I. Sokolov</i>	1328
Monte Carlo Simulation of Highly Expanded Jet in He-Ar Binary Gas Mixture <i>Hiroaki Matsumoto and Kyoji Kamemoto</i>	1335
Plume Impingement on a Concaved Surface <i>T. Soga, B.G. Kim and M. Yasuhara</i>	1342
Structure of Supersonic Free Jets Issuing from Annular Orifices <i>Koji Teshima</i>	1349
<b>11: Space Engineering</b>	1357
The Wake Shield Flight Experiment - Preliminary Results of Shuttle Flight One <i>Charles Justiz, Alex Ignatiev and Ronald Sega</i>	1359
A Rarefied Aerodynamics Modelling System for Earth Satellites (RAMSES) <i>G. Koppenwallner, D. Johannsmeier, H. Klinkrad, M. Ivanov and A. Kashkowski</i>	1366
Direct Monte Carlo Simulation of Orbital Debris <i>John P.W. Stark</i>	1373
Satellite Protection and Drag Reduction using a Purging Gas Flow <i>G.P. Cathcart and M.N. Macrossan</i>	1380
Direct Simulation and Test Particle Monte Carlo, and Navier-Stokes Predictions of the Re-entry State of the FSW-1 Satellite <i>Martin R. Gilmore and Richard Crowther</i>	1387
Plasma Relaxation Phenomena Observed from Sudden Variation of Electrode Potentials in the Stratosphere and the Upper Atmosphere <i>R. Godard and J.S. Chang</i>	1394

xxvi	<i>Contents of Volume 2</i>	
	Statistical Simulation of Space Debris Cloud Aerodynamics in the Free-molecular and Transitional Regimes <i>M.S. Ivanov, A.V. Kashkovsky and E.I. Grinberg</i>	1401
	Measuring the Thermal Accommodation Coefficient while Aerobraking Magellan <i>Daniel T. Lyons</i>	1408
	Simulation of Rarefied Flows for Space Engineering <i>C. Theroude, P. Chèoux-Damas and I. Gibek</i>	1415
	<b>12: Experimental Techniques and Instrumentation</b>	1423
	Electron-Beam Fluorescence Measurements of Density and Rotational Temperature in a Simulated Martian Atmosphere <i>D.R. Farley and R.J. Cattolica</i>	1425
	Rotational Temperature Determination of O <sub>2</sub> using LIPF near a Hot Model Surface in Hypersonic Free Jet Flows <i>E. Hirai and G. Gundlach</i>	1432
	Effect of T-R Energy Transfer on the Angular Distribution of Molecular Flux Effusing into a Vacuum <i>H. Sasaki, K. Nanbu, V.V. Serikov and K. Denpoh</i>	1439
	Two-Dimensional Imaging of Rarefied Gas Flow using O <sub>2</sub> -LIPF <i>T. Ishida, T. Ni-imi and T. Fujimoto</i>	1446
	Electrostatic Cylindrical Probes in a Magnetic Field <i>R. Godard, T. Lagarde and Y. Arnal</i>	1453
	The Peculiarities of Rarefied Gas Flow Generation in Wind Tunnels <i>V.N. Gusev</i>	1460
	Laser Fluorescence Diagnostics of a Free Jet <i>H. Hulsman and J. Korving</i>	1467
	Density and Temperature Measurements in Rarefied Gas Flow Fields by Largely Detuned Laser Induced Fluorescence and Life Time Technique <i>Seizo Kato and Hiroyuki Okazoe</i>	1474

	<i>Contents of Volume 2</i>	xxvii
	Electron-Beam X-ray Diagnostics of Impulse Free Jets <i>L.I. Kuznetsov, M.V. Parfyonov, E.S. Voronel and V.N. Yarygin</i>	1481
	<b>Author Index</b>	xxix
	<b>Subject Index</b>	xxxiii