

## ALEXEY N. VOLKOV

Work address: 359 H M Comer Hall, 7<sup>th</sup> Avenue, Department of Mechanical Engineering,  
University of Alabama, Tuscaloosa, AL 35487, USA  
Work phone: +1 (205) 348-4882  
Fax: +1 (205) 348-6419  
E-mail: avolkov1@ua.edu

---

## WORK EXPERIENCE

- August 2013 – to date** Assistant Professor, Department of Mechanical Engineering, University of Alabama, Tuscaloosa, AL, USA
- July 2007 – August 2013** Research Scientist, Department of Materials Science and Engineering, University of Virginia, Charlottesville, VA, USA
- July – September 2006,  
February – May 2007,** Research Scientist, National Centre for Laser Applications, National University of Ireland, Galway, Ireland
- February 2005 – February 2006,** Research Associate, University of Virginia, Charlottesville, VA, USA
- September 2003 – May 2007,** Senior Scientist, Center for Advanced Studies, St. Petersburg State Polytechnical University, St. Petersburg, Russia
- December 1996 – May 2007,** Associate Professor, Baltic State Technical University, St. Petersburg, Russia

## EDUCATION

- Ph.D. in Fluid Mechanics (Candidate of Science in Physics and Mathematics), **1996**  
St. Petersburg State University / Baltic State Technical University, St. Petersburg, Russia  
“Two-phase gas-solid particle flows with inelastic collisions between solid particles”
- M.S. in Applied Mathematics (Engineer-Mathematician), **1995**  
St. Petersburg State University, St. Petersburg, Russia  
“Statistical simulations of two-phase gas-solid particle flows”
- M.S. in Aerospace Engineering (Engineer), **1993**  
Baltic State Technical University, St. Petersburg, Russia  
“Numerical modeling of supersonic gas-solid particles flows over a blunt body”

## RESEARCH INTERESTS

- Multiscale and multiphysics simulations including continuum, kinetic, and molecular dynamics simulations.
- Gas-assisted methods of material fabrication.
- Carbon nanotube and nanofiber materials and applications.
- Laser-material interactions and laser plume expansion.
- Selective laser melting of metal powders.
- Multiphase flows, heat and mass transfer.
- Rarefied gas dynamics and direct simulation Monte Carlo method.
- Planetary sciences: comets, upper atmospheres, thermal escape.
- Computational fluid dynamics.
- High-performance computing.

## **RESEARCH EXPERIENCE**

### **August 2013 – Present, Assistant Professor, University of Alabama, Tuscaloosa, AL**

- DSMC simulation of rarefied gas flows based on ab initio models of interatomic collisions.
- Gas diffusion and heat transfer in porous materials.
- Hydrodynamic and kinetic simulations of laser-induced plasma plume expansion and plasma shielding.
- Development of computational models for simulations of multidimensional rarefied gas flows in atmospheres of the Kuiper belt objects.
- Simulations of thermal and mechanical processes in carbon nanotube materials.
- Atomistic simulations of nanocomposite systems.
- Modelling of CW laser melting of metal targets
- Simulations of rarefied gas flows based on ab initio collisional cross sections.
- Smooth Particle Hydrodynamics simulations of selective laser melting.

### **December 2010 – August 2013, Research Scientist, University of Virginia, Charlottesville, VA**

- Development of mathematical models and computed codes for simulations of continuous wave laser ablation of metal targets. Responsibilities include
  - Development of a kinetic model of a continuous wave laser ablation of an aluminum target and aluminum vapor burning in an external air flow. Development of a computer code based on this model and the Direct Simulation Monte Carlo method designed for high-performance massively parallel simulations. Performing of simulations of aluminum vapor burning in a range of laser intensities and external air pressure.
  - Development of a two-dimensional hydrodynamic computational model of the melt flow in the spot at the surface aluminum target surface. Performing simulations of the melt flow in a range of laser intensities; spot sizes and target thicknesses; comparison of the simulations results with available experimental data.
  - Development of a combined computational model accounting for the melt flow, external air flow, and aluminum vapor burning, and their interaction with each other.
- Development of mesoscopic computational models for simulation of the heat transfer processes in the carbon nanotube-based (CNTs) materials and accounting for the effect bending buckling of individual nanotubes, their intrinsic thermal conductivity, and structural properties of CNT networks. Development of the thermal transport model for nanocomposite materials with an organic matrix reinforced by carbon nanotubes. Development of a theoretical approach for prediction of the effect of intrinsic conductivity of CNT on the effective thermal conductivity of CNT networks. Performing simulations of thermal transport properties of pure CNT materials and CNT-reinforced nanocomposites in a range of material densities and CNT lengths. Study of structural properties of CNT-based materials and structural dependence of their transport properties. Supervising a post-graduate student working on this project.
- Development of kinetic model and parallel computer codes of thermal escape in multicomponent one-, two-, and three-dimensional atmospheres; Development of the computational models accounting for the effect of stellar radiation on dynamics of the upper atmosphere. Development of combined computational models for simulations of the thermal state of a planetary body and its atmosphere. Performing simulation in the range of parameters specific for atmospheres of Pluto, Titan, and certain exoplanets. Study of two- and three-dimensional flow effects on thermal escape from planetary atmospheres.
- Development of a computational model to investigate the effect of multiple laser pulses on laser heating and melting of Si targets. Study of multiple pulses effects for metal and silicon targets irradiated by nano-, pico-, and femtosecond laser pulses. Development of an industrial computer code implementing this model under the contract with Electro Scientific Industries, Inc. (<http://www.esi.com/>). Supervising a post-graduate student working on this project.

### **July 2007 – May 2010, Research Scientist, University of Virginia, Charlottesville, VA**

- Development of a mesoscopic “tubular” potential describing interaction between carbon nanotubes (CNTs) of arbitrary length and orientation.
- Development of mesoscopic computational models for carbon nanotubes-based materials and nanocomposites. Study of formation of entangled networks of CNT bundles, their structural, mechanical, and thermal properties.

- Development of analytical and numerical models to study transport properties in disordered fibrous materials governed by the thermal contact resistance. Comparison of prediction of analytical models, numerical simulations, and experiments.
- Kinetic study of thermal escape from single-component spherically symmetric planetary atmospheres.

**July – September 2006, February – May 2007, Research Scientist, National Centre for Laser Applications, National University of Ireland, Galway, Ireland**

- Development of a combined molecular dynamics/hydrodynamic model for large-scale simulations of laser nanopatterning of metal targets.
- Development of kinetic model for laser multiphase plume expansion at nanosecond laser ablation. Study of two-phase laser plume expansion into an ambient gas from flat Si targets and from a bottom of a cylindrical cavity.
- Development of a continuum computational model for simulation of the laser heating of a gold nanoparticle in liquid based on the IAPWS95 multiphase equation of state for water. Study of thermal and pressure wave in liquid induced by ultra short laser heating of a nanoparticle.

**February 2005 – February 2006, Research Associate, University of Virginia, Charlottesville, VA**

- Development of a hydrodynamic model for simulations of laser-induced non-equilibrium phase transformations, heat and mass transfer in metal targets.
- Study of heat and mass transfer in a medium induced by a fast laser heating of immersed Au nanoparticle.

**September 2003 – May 2007, Senior Scientist, Center for Advanced Studies, St. Petersburg State Polytechnical University, St. Petersburg, Russia**

- Development of models and computational codes for simulation of cluster formation processes during laser ablation of aerosols under the contract with Samsung Electronics Co. Development of an industrial software package for simulations of cluster formation in an aerosol. Responsibilities include both research and the managing the group of code developers.
- Development of a computational model for the plasma gun evaporation system.
- Development of a compute code for simulation of fully three-dimensional thermal state of a rotating comet nucleus and the comet atmospheres. Study of thermal state of rotating comet nuclei and rarefied near-nuclei atmospheres with particular attention paid to effects induced by the nucleus rotation.
- Study of laser-induced evaporation of Si and carbon aerosol particles.
- Kinetic study of the aerodynamic forces and the heat flux on a spinning spherical particle in transitional flow of a rarefied gas.

**December 1996 – May 2007, Associate Professor, Baltic State Technical University, St. Petersburg, Russia**

- Development of a combined computational model and a computational code for simulations of two-way coupling multiphase flows based on hydrodynamic model of the carrying gas and kinetic model for admixture of solid particles.
- Study of two-phase flows over bodies with collisions between particles, two-way coupling effects, and effects of particle-generated turbulence.
- Investigation of the structure of the laminar two-phase boundary at the body surface in supersonic gas-solid particle flow.
- Study the structure of two-phase wake behind a cylinder in gas-solid particle flows and hydrodynamic interference of bodies in gas-solid particle flows.
- Study of the effect of solid particles on the flow structure and oscillations in supersonic two-phase jets impinging a flat obstacle in the self-oscillation regime.

**May 1993 – December 1996, Ph.D. student, Baltic State Technical University, St. Petersburg, Russia**

- Development of the full Lagrangian approach for simulations of particle motion in two-dimensional flows. Simulation of collisionless sup- and supersonic flows of the particulate phase around a number of bodies.
- Development of a kinetic model for simulations of two-phase gas-solid particle flows with inelastic collisions between particles.
- Study of the effect of collisions on the structures of sub- and supersonic two-phase flows over bodies. Investigation of the shielding effect of collisions between particles on the momentum and energy exchange between the particulate phase and the body surface.
- Study of the effect of particle size distribution on the flow structure of the particulate phase.

## RESEARCH PROJECTS

### Current projects

Project Title	Sponsor	Role	Amount (Share)	Duration
CAREER: Multiscale modeling of gas-assisted synthesis and properties of porous nanocomposite materials	NSF	PI	\$500,000	07.01.2016 - 06.30.2017
Computational design of carbon nanotube network materials and polymer matrix nanocomposites PI: Prof. Leonid Zhigilei, University of Virginia, Total amount \$449,997.	NASA, ESI	Co-I	\$207,341	01.28.2016 - 01.27.19
Development of computational codes for two-dimensional kinetic simulations of the material removal and plasma shielding in high-power multi-pulse laser ablation of metal targets	ESI, USA	PI	\$60,000	05.01.2016 - 04.30.2017

### Projects completed in the University of Alabama since 2013

Project Title	Sponsor	Role	Amount (Share)	Duration
Plasma shielding of metal and multilayer targets at nanosecond laser ablation: Development of computational models and simulation study	ESI, USA	PI	\$50,000	Oct. 2014 – Sept. 2015
Simulations of continuous wave and pulsed laser ablation of aluminum films / Merging hyperspectral imaginary and multi-scale modeling for laser lethality	DoD/AFOSR, subcontract with UVa	PI	\$84,505	Jan. 2014 - Sept. 2015
Molecular escape and evolution of the atmosphere of Pluto	NASA, Outer Planet Research Program,	Co-I	(no funding through UA)	2013-2015
Atomistic and mesoscopic simulations of thermal and mechanical properties of carbon nanotube-based materials	NSF XSEDE	PI	No funding	2015

### Pending projects

Project Title	Sponsor	Role	Amount (Share)	Duration
Collaborative Research: Pore Formation Mechanisms in Laser Powder-Bed Fusion Additive Manufacturing: Particle -Resolved Modeling and Fundamental Experimentation	NSF	PI	\$110,000	

### Past projects

Project Title	Sponsor/Foundation	Role	Duration
Atomistic and mesoscopic simulations of thermal and mechanical properties of carbon nanotube-based materials	National Science Foundation / Extreme Science and Engineering Discovery Environment, USA	Principal Investigator	2013
Short pulse laser interaction with a metal target covered by an optically transparent film: Development of computational models and simulation study	Electro Scientific Industries (ESI) Inc., USA	Investigator	2012-2013
Computational study of non-thermal surface processing driven by laser-induced acoustic pulses (award W91CRB-11-1-0007)	Department of Defense /DARPA, USA	Investigator	2011-2012
Atomistic Simulations of heat Transfer in carbon nanostructures and laser – material interactions (project TG-DMR110090)	National Science Foundation / TeraGrid, USA	Investigator	2012
Merging hyperspectral imaginary and multi-scale modeling for laser lethality (award FA9550-10-1-0541)	Department of Defense / Air Force Office of Scientific Research, USA	Co-Principal Investigator	2010-2015
Scaling laws and mesoscopic modeling of heat transfer in	Department of Defense / Air	Investigator	2010-2013

nanofibrous materials and composites (award FA9550-10-1-0545)	Force Office of Scientific Research, USA		
Computational study of thermal transport in carbon nanotube based nanocomposites (award CBET-1033919)	National Science Foundation, USA	Investigator	2010-2013
Plasma interactions and heating of planetary atmospheres (award NNX09AB68G)	NASA, USA	Investigator	2009-2010
Multiscale computational investigation of multifunctional nanocomposite ablator materials (project MAT009)	National Center for Computational Sciences, Oak Ridge National Lab, USA	Investigator	2009-2012
Multiscale computational model for multifunctional nanocomposite ablator material (award NNX07AC41A)	NASA, USA	Investigator	2007-2009
Mathematical modelling of spatial nonequilibrium flows in a circumnuclear gas-dust cometary atmosphere with reference to problems of mission "Rosetta"	RFBR: Russian Foundation for Basic Research, Russia	Investigator	2007-2009
Theoretical and experimental studies of two-phase impinging jets and development of technologies of abrasive material processing	ISTC: International Science & Technology Center, Russia	Investigator	2006-2008
Plasma gun MgO evaporation system simulator development	Samsung Electronics Co., Ltd., Samsung Development Institute, Republic of Korea	Investigator	2007
Enhancement and control of laser-assisted materials processing	Marie Curie Transfer of Knowledge Program, European Union	Fellow	2006- 2007
Multi-scale computational model of non-equilibrium processes in metal targets irradiated by ultra-short laser pulses	Office of Naval Research (US) through a sub-contract to the Electro-Optics Center, Pennsylvania State University, USA	Investigator	Feb 2005 – Feb 2006
Development of mathematical model and direct statistical simulation technology of circumnuclear gas-dust cometary atmospheres	RFBR, Russia	Investigator	2004-2006
Development of package of mathematical models and computer programs for modelling of production processes of silicon nanoparticles by the pulsed laser ablation	Samsung Electronics Co., Ltd., Republic of Korea	Deputy Principal Investigator	2004
Mechanisms of cluster formation under pulsed laser ablation	INTAS: International Association for the Promotion of Co-operation with Scientists from the New Independent States of the Former Soviet Union, European Union	Investigator	2004-2005
Influence of dispersed phase on the heat transfer and the flow over a body moving through the region with spatially non uniform distribution of solid particles (part III)	RFBR, Russia	Principal investigator	2003
Unsteady phenomena in supersonic two-phase impinging jets	Gracenas: Grant Center for Natural Sciences at St. Petersburg State University, Russia	Principal investigator	2003-2004
Effect of solid particles on self-sustained oscillations in two-phase impinging jets	Gracenas, Russia	Principal investigator	2003
Influence of dispersed phase on the heat transfer and the flow over a body moving through the region with spatially non uniform distribution of solid particles (part II)	RFBR, Russia	Principal investigator	2002
Influence of dispersed phase on the heat transfer and the flow over a body moving through the region with spatially non uniform distribution of solid particles (part I)	RFBR, Russia	Investigator	2002-2003
Theoretical, experimental and numerical investigation of two-	INTAS, European Union	Investigator	2001-2003

phase gas-particle flows over bodies			
Theoretical and numerical modeling of the separated two-phase gas-solid particles flows and the aerodynamic interference of particles phase flows over a set of bodies (part II)	RFBR, Russia	Principal investigator	2001
Numerical modeling of development of the three-dimensional disturbances in large-scale vortex structures in the wake behind a body	Gracenas, Russia	Principal Investigator	2001
Theoretical and numerical modeling of the separated two-phase gas-solid particles flows and the aerodynamic interference of particles phase flows over a set of bodies (part I)	RFBR, Russia	Investigator	1999-2001
Improvement of kinetic and numerical models of two-phase gas-solid particles flows	Gracenas, Russia	Principal Investigator	1998
Particles dynamics in the two-phase gas-solid particles flows	Gracenas, Russia	Investigator	1996-1997
Theoretical investigation and numerical modeling of two-phase gas-solid particles flows and erosion of streamlined obstacles	RFBR, Russia	Investigator	1996-1998
DSMC modeling of gas-solid particles flows	Gracenas, Russia	Principal investigator	1996
Behaviour of particles, heat transfer and surface erosion in dusty gas flows over bodies	International Science Foundation and Government of Russian Federation	Investigator	1995
Particles phase flows and surface erosion in the dilute dusty gas flows over bodies	RFBR, Russia	Investigator	1994
Mathematical modeling of two-phase gas-solid particles flows over bodies: boundary layer effects, reflection of particles from the body surface, particle-particle collisions, surface erosion	Gracenas, Russia	Investigator	1994-1995

## TEACHING EXPERIENCE

### 2013-Present, University of Alabama, Tuscaloosa, AL

#### Taught undergraduate courses

ME 349 Engineering Analysis (2013-14, 2014-15, 2015-16,2016-17).

#### Taught graduate courses

ME 501 Mechanical Engineering Analysis (2013-14, 2014-15, 2015-16).

ME 591 / 491 Non-Equilibrium Gas Dynamics (2016-17).

ME 691 DSMC Simulations of Gas Flows (2015-16).

#### Advising graduate and undergraduate students

4 Ph.D Students (Deepak Shah, ME Department; Omid Ranjbar, ME Department; Md Abu Horaira Banna, ME Department; Arun Thapa, ME Department).

1 M.S. Student (Austin Palya, ME Department).

5 undergraduate student (Grace Silverstein, ME Department through the Computer-Based Honors Program (CBHP); George Parker, ME Department; Liye Fu, ME Department; Austin Palya, ME Department; Patrick Davis, ME Department).

#### Ph.D thesis Committee

Ph.D. Committee in the Department of Mechanical Engineering (Bradley Thomson, 2014-2017).

Ph.D. Committee in the Department of Mechanical Engineering (Xiaoqing Wang, 2016-2017).

Ph.D. Committee in the Department of Mechanical Engineering (Tahmina Keya, 2017).

Ph.D. Committee in the Department of Materials Science and Engineering at the University of Virginia (Bernard Wittmaack, 2014-2017).

#### M.S. thesis Committee

Member of the M.S. Committee in the Department of Mechanical Engineering (Eileen Mirynowski, 3/24/2016).

## **2009-2011, University of Virginia, Charlottesville, VA**

### Taught lectures

Direct Simulation Monte Carlo of gas flows (parts of graduate level courses in Departments of Materials Sciences and Engineering and Mechanical and Aerospace Engineering, 2010-2012)

### Ph.D thesis Committee

Member of the Ph.D. Committee in the Civil Engineering Department (2011-2012)

### Supervision of post-graduate students in Materials Science and Engineering Department

## **1996-2007, St. Petersburg State University, St. Petersburg, Russia**

### Taught lectures

Direct Simulation Monte Carlo of gas flows (part of graduate level courses in the Department of Aero- and Hydrodynamics)

## **1996-2007, Baltic State Technical University, St. Petersburg, Russia**

### Taught courses

- Rarefied gas dynamics (4<sup>th</sup> year), 1996 – 1997, 2001 – 2007.
- Fluid and gas dynamics (3<sup>rd</sup> year), 1996 – 2007.
- High-enthalpy processes and modern technologies of material processing (5<sup>th</sup> year), 2006 – 2007.
- Scientific and engineering programming in C++ (5<sup>th</sup> year), 2004 – 2007.
- Thermodynamics and heat transfer (4<sup>th</sup> year), 2003 – 2007.
- High-speed and plasma flows (4<sup>th</sup> year), 2004 – 2006.
- Boundary layer theory (4<sup>th</sup> year), 1996 – 2003.
- Statistical modeling (5<sup>th</sup> year), 2001 – 2003.
- Physical mechanics (4<sup>th</sup> year), 1998 – 2000.
- Introduction in numerical methods (2<sup>nd</sup> year), 1998 – 1999.

### M.Sc. and Ph.D. advising

- Advising 3 Bachelor's and 8 Master's dissertations in Aerospace Engineering.
- Advising Ph.D. student V.V. Semionov who defended his Ph.D. thesis in Fluid Mechanics in 2008 in Dissertation Council of St. Petersburg State Polytechnical University (St. Petersburg, Russia).

### Administrative supervision of post-graduate students in the Department of Plasma- and Gas Dynamics and Heat Engineering (1998-2003)

## **SERVICE**

### **2013-Present, University of Alabama**

- Member of the Undergraduate Curriculum Committee at the Department of Mechanical Engineering (2017-present).
- Member of the PhD recruiting task force Committee at the Department of Mechanical Engineering (2015-present).
- Member of the Safety Committee at the Department of Mechanical Engineering (2013-2015).
- Member of the High Performance Computing Committee (College of Engineering, 2013).

### **1996-2007, Baltic State Technical University, St. Petersburg, Russia**

- Administrative supervision of M.Sc. students in the Department of Plasma- and Gas Dynamics and Heat Engineering (1998-2003)
- Member of the University Scientific Council (2000-2004).
- Member of the Council of the School of Aerospace Engineering (1998-2004).

## OTHER PROFESSIONAL ACTIVITY

### Peer reviewing of papers submitted to professional journal (2010-Present)

• Applied Mathematics and Computation • Applied Physics A • Applied Physics B • Applied Physics Letters • Applied Surface Science • Carbon • Composites, Part B • Diamond and Related Materials • Europhysics Letters • Icarus • International Journal of Heat and Mass Transfer • Journal of Physical Chemistry • ASME Journal of Heat Transfer • Langmuir • Laser & Photonics Reviews • Metallurgical Transactions B • Monthly Notices of the Royal Astronomical Society • Nanoletters • Nanomaterials • Nanoscale • Physica E • Physical Review B • Physical Review E • Physical Review Letters • Physics of Fluids • Reviews of Modern Physics • RSC Advances • Soft matter • Vacuum

### Peer reviewing of papers submitted to professional conferences (2005-Present)

- International Conference of Numerical Analysis and Applied Mathematics 2016 (1 paper).
- ASME International Mechanical Engineering Congress and Exposition 2015 IMECE (3 papers).
- International Conference of Numerical Analysis and Applied Mathematics 2015 (1 paper).
- International Conference of Numerical Analysis and Applied Mathematics 2014 (2 papers).
- The 8<sup>th</sup> International Conference on Laser Ablation COLA 2005 (2 papers).

### Peer reviewing of research projects submitted to research funds and government agencies (2011-Present)

- National Aeronautics and Space Administration (USA)
- National Science Foundation (USA)
- American Chemical Society Petroleum Research Fund (USA)
- Virginia Space Grant Consortium (USA)
- Research Council UK (United Kingdom)
- FWF Austrian Science Fund (Austria)
- New Zealand's Ministry of Business, Innovation & Employment (New Zealand)
- STW, Technology Foundation (STW, NWO) (Netherlands)

### Peer reviewing of the book proposals submitted to (2013-Present)

- Wiley (Wiley-VHC, Berlin, Germany)

**Co-organizer of the Symposium “Genomics and Informatics for Mesoscale Mechanics of Materials” at ASME 2015 IMECE Meeting, Houston TX, November 13-19, 2015.**

## PUBLICATIONS

### Book chapters

1. Zhigilei, L. V., Salaway, R. N., Wittmaack, B., Volkov, A. N., Computational studies of thermal transport properties of carbon nanotube materials, Chapter 5 in *Carbon Nanotube Interconnects: Process, Design and Applications*, A. Todri-Sanial, J. Dijon, A. Maffucci (Eds.) (Springer, 2016) (in press).
2. Zhigilei, L. V., Volkov, A. N., Dongare, A. M., Computational study of nanomaterials: From large-scale atomistic simulations to mesoscopic modeling, *Encyclopedia of Nanotechnology*, 2<sup>nd</sup> ed. (Springer, Heidelberg, 2016) (in press).
3. Wu, C., Karim, E. T., Volkov, A. N., Zhigilei, L. V., Atomic movies of laser-induced structural and phase transformations from molecular dynamics simulations, Chapter 4 in *Lasers in Materials Science*, M. Castillejo, P. M. Ossi, and L. Zhigilei (eds.), Springer Series in Materials Science 191, pp. 67-100 (Springer Verlag: New York, 2014).
4. Zhigilei, L. V., Volkov, A. N., Dongare, A. M., Computational study of nanomaterials: From large-scale atomistic simulations to mesoscopic modeling, *Encyclopedia of Nanotechnology*, B. Bhushan (Ed.), 470-480 (Springer, Heidelberg, 2012).
5. Zhigilei, L. V., Leveugle, E., Ivanov, D. S., Lin, Z., Volkov, A. N., Molecular dynamics simulations of short pulse laser ablation: Mechanisms of material ejection and particle generation, Chapter 7 in *Synthesis of Nanoscale Material by Action of High-Power Energy Fluxes on Matter* (Siberian Branch of the Russian Academy of Sciences, Novosibirsk, 2010), pp. 147-220 (in Russian).

### Textbooks



1. Volkov, A. N., Aerodynamic and heat properties of convex bodies in free molecular flows (Baltic State Technical University, Saint-Petersburg, 2004), 56 p. (in Russian).
2. Volkov, A. N., Introduction to the kinetic theory of rarefied gases. Part 1 (Baltic State Technical University, Saint-Petersburg, 2004), 140 p. (in Russian).
3. Volkov, A. N., Introduction to the kinetic theory of rarefied gases. Part 2 (Baltic State Technical University, Saint-Petersburg, 2006), 276 p. (in Russian).

### Papers in peer-reviewed journals

1. Volkov, A.N., Zhigilei, L. V., Melt dynamics and melt-through time in continuous wave laser heating of metal films: Contributions of the recoil vapor pressure and Marangoni effects, *Int. J. Heat Mass Transfer* **112**, 300–317 (2017).
2. Volkov, A. N., On the hydrodynamic model of thermal escape from planetary atmospheres and its comparison with kinetic simulations, *MNRAS* **459**, 2030–2053 (2016).
3. Johnson, R. E., Tucker, O. J., Volkov, A. N., Evolution of an early Titan atmosphere, *Icarus* **271**, 202–206 (2016).
4. A. N. Volkov, A criterion for the validity of Parker’s model in thermal escape problems for planetary atmospheres, *Astrophys. J. Lett.* **812**, L1 (2015).
5. Johnson, R.E., Oza, A., Young, L.A., Volkov, A.N., Schmidt, C., Volatile loss and classification of Kuiper belt objects, *Astrophys. J.* **809**, 43 (2015).
6. Volkov, A. N., Effects of exit boundary conditions on results of kinetic simulations of spherical expansion of mon- and diatomic gases in a gravitational field, *Vacuum* **109**, 308–314, 2014.
7. Lukianova-Hleb, E. Y., Volkov, A. N., Lapotko, D. O., Laser pulse duration is critical for the generation of plasmonic nanobubbles, *Langmuir* **30**, 7425–7434, 2014.
8. Volkov, A. N., Salaway, R. N., Zhigilei, L. V., Atomistic simulations, mesoscopic modeling, and theoretical analysis of thermal conductivity of bundles composed of carbon nanotubes, *J. Appl. Phys.* **114**, 104301 (21pp), 2013.
9. Johnson, R. E., Volkov, A. N., Erwin, J. T., Molecular-kinetic simulations of escape from the ex-planet and exoplanets: Criterion for transonic flow, *Astrophys. J. Lett.* **768**, L4 (6pp), 2013. Johnson, R. E., Volkov, A. N., Erwin, J. T., Erratum: “Molecular-kinetic simulations of escape from the ex-planet and exoplanets: Criterion for transonic flow” (2013, ApJL, 768, L4), *Astrophys. J. Lett.* **779**, L30 (1pp), 2013.
10. Volkov, A. N., Johnson, R. E., Thermal escape in the hydrodynamic regime: Reconsideration of Parker’s isentropic theory based on results of kinetic simulations, *Astrophys. J.* **765**, 90 (21pp), 2013. Volkov, A. N., Johnson, R. E., Erratum: “Thermal escape in the hydrodynamic regime: Reconsideration of Parker’s isentropic theory based on results of kinetic simulations” (2013, ApJ, 765, 90), *Astrophys. J.* **774**, 90 (1pp), 2013.
11. Volkov, A. N., Johnson, R. E., Tucker, O. J., Expansion of mon- and diatomic gases from a spherical source into vacuum in a gravitational field, *Fluid Dynamics* **48**(2), 239–250, 2013.
12. Lukianova-Hleb, E., Volkov, A., Wu, X., Lapotko, D., Transient enhancement and spectral narrowing of the photothermal effect of plasmonic nanoparticles under pulsed excitation, *Adv. Materials* **25**, 772–776, 2013.
13. Volkov, A. N., Zhigilei, L. V., Computational study of the role of gas-phase oxidation in CW laser ablation of Al target in an external supersonic air flow, *Appl. Phys. A* **110**, 537–546, 2013.
14. Tucker, O. J., Johnson, R. E., Deighan, J. I., Volkov, A. N., Diffusion and thermal escape of H<sub>2</sub> from Titan’s atmosphere: Monte Carlo simulations, *Icarus* **222**, 149–158, 2013.
15. Jacobs, W. M., Nicholson, D. A., Zemer, H., Volkov, A. N., Zhigilei, L. V., Acoustic energy dissipation and thermalization in carbon nanotubes: Atomistic modeling and mesoscopic description, *Phys. Rev. B* **86**, 165414, 2012.
16. Volkov, A. N., Zhigilei, L. V., Heat conduction in carbon nanotube materials: Strong effect of intrinsic thermal conductivity of carbon nanotubes, *Appl. Phys. Lett.* **101**, 043113, 2012.
17. Volkov, A. N., Shiga, T., Nicholson, D., Shiomi, J., Zhigilei, L. V., Effect of bending buckling of individual carbon nanotubes on thermal conductivity of carbon nanotube materials, *J. Appl. Phys.* **111**, 053501, 2012.
18. Tucker, O. J., Erwin, J. T., Deighan, J. I., Volkov, A. N., Johnson, R. E., Thermally driven escape from Pluto’s atmosphere: A combined fluid/kinetic model, *Icarus* **217**, 408–415, 2012.
19. Volkov, A. N., Asymptotic thermal analysis of a rotating and sublimating sphere illuminated by a light source, *Int. J. Heat Mass Transfer* **55**, 1441–1456, 2012.
20. Volkov, A. N., Transitional flow of a rarefied gas over a spinning sphere, *J. Fluid Mech.* **683**, 320–345, 2011.

21. Zhigilei, L. V., Volkov, A. N., Leveugle, E., Tabetah, M., The effect of the target structure and composition on the ejection and transport of polymer molecules and carbon nanotubes in matrix-assisted pulsed laser evaporation, *Appl. Phys. A* **105**, 529–546, 2011.
22. Volkov, A. N., Tucker, O. J., Erwin, J. T., Johnson, R. E., Kinetic simulations of thermal escape from a single component atmosphere, *Phys. Fluids* **23**, 066601, 2011.
23. Volkov, A. N., Johnson, R. E., Tucker, O. J., Erwin, J. T., Thermally-driven atmospheric escape: Transition from hydrodynamic to Jeans escape, *Astrophys. J. Lett.* **729**, L24 (5pp), 2011.
24. Volkov, A. N., Zhigilei, L. V., Structural stability of carbon nanotube films: The role of bending buckling, *ACS Nano* **4**, 6187-6195, 2010.
25. Volkov, A. N., Zhigilei, L. V., Scaling laws and mesoscopic modeling of thermal conductivity in carbon nanotube materials, *Phys. Rev. Lett.* **104**, 215902, 2010.
26. Volkov, A. N., Zhigilei, L. V., Mesoscopic interaction potential for carbon nanotubes of arbitrary length and orientation, *J. Phys. Chem. C* **114**, 5513-5531, 2010.
27. Volkov, A. N., Aerodynamic coefficients of a spinning sphere in a rarefied gas flow, *Fluid Dynamics* **44**, 141-157, 2009.
28. Volkov, A. N., Lukyanov, G. A., Thermal state and gas production rate of rotating cometary nuclei, *Solar System Research* **42**, 209-225, 2008.
29. Ivanov, D. S., Volkov, A. N., O'Connor, G. M., Glynn, T. J., Zhigilei, L. V., The mechanism of nanobump formation in femtosecond pulse laser nanostructuring of thin metal films, *Appl. Phys. A* **92**, 791-796, 2008.
30. Volkov, A. N., O'Connor, G. M., Glynn, T. J., Lukyanov, G. A., Expansion of a laser plume from a silicon wafer in a wide range of ambient gas pressures, *Appl. Phys. A* **92**, 927-932, 2008.
31. Volkov, A. N., Sevilla, C., Zhigilei, L. V., Numerical modeling of short pulse laser interaction with Au nanoparticle surrounded by water, *Appl. Surf. Sci.* **253**, 6394-6399, 2007.
32. Volkov, A. N., Zhigilei, L. V., Hydrodynamic multi-phase model for simulation of laser-induced non-equilibrium phase transformations, *J. Phys.: Conference Series* **59**, 640-645, 2007.
33. Lukyanov, G. A., Volkov, A. N., Y. Khang, Kozyrev, S. V., Leshchev, D. V., Bykov, N. Y., Vakulova, O. I., Numerical modeling of pulsed laser ablation of carbon particles in an aerosol, *J. Phys.: Conference Series* **59**, 164-168, 2007.
34. Lukyanov, G. A., Khang, Y., Leshchev, D. V., Kozyrev, S. V., Volkov, A. N., Bykov, N. Y., Vakulova, O. I., Modeling of processes of cluster formation under pulsed laser ablation of carbon particles in an aerosol, *Fullerenes, Nanotubes, and Carbon Nanostructures* **14**, 507-512, 2006.
35. Volkov, A. N., Tsirkunov, Y. M., Oesterle, B., Numerical simulation of a supersonic gas-solid flow over a blunt body: The role of inter-particle collisions and two-way coupling effects, *Int. J. Multiphase Flow* **31**, 1244-1275, 2005.
36. Volkov, A. N., Tsirkunov, Y. M., Effect of a dispersed admixture on the flow pattern and heat transfer in a supersonic dusty-gas flow around a cylinder. *Fluid Dynamics* **40**, 561-574, 2005.
37. Volkov, A. N., Numerical modeling of evaporation of solid particles into vacuum, *Matematicheskoe modelirovanie (Numerical modeling)* **17**, 5-14, 2005 (in Russian).
38. Volkov, A. N., Tsirkunov, Y. M., Semionov, V. V., Influence of mono- and poly-dispersed particles on the flow and heat transfer in the supersonic two-phase gas-solid particles flows over blunt bodies. *Matematicheskoe modelirovanie (Numerical modeling)* **16**, 6-12, 2004 (in Russian).
39. Volkov, A. N., Tsirkunov, Y. M., Influence of dispersed particles on the flow structure in the two-phase wake behind a cylinder at a moderate Reynolds number, *Matematicheskoe Modelirovanie (Numerical modeling)* **15**, 98-110, 2003 (in Russian).
40. Volkov, A. N., Tsirkunov, Y. M., Kinetic model of collisional admixture in dusty gas and its application to calculating flow past bodies, *Fluid Dynamics* **35**, 380-392, 2000.
41. Tsirkunov, Y. M., Tarasova, N. V., Volkov, A. N., Boundary layer effects in the dusty gas flow over a blunt body. *Estonian Acad. Sci. Phys. Math.* **43**, 250–262, 1994.

#### Papers in the conference proceedings

1. Ranjbar, O.A., Volkov, A. N., Kinetic and hydrodynamic simulations of laser-induced plume expansion, Proc. Sixteenth Annual Early Career Technical Conference ECTC 2016, November 5 - 6, 2016, Birmingham, Alabama USA, **2016**.
2. Shah, D., Volkov, A. N., Calculation of effective thermal conductivity of powder bed systems using smoothed particle hydrodynamics method, Proc. Sixteenth Annual Early Career Technical Conference ECTC 2016, November 5 - 6, 2016, Birmingham, Alabama USA, **2016**.

3. Sharipov, F., Volkov, A.N., Direct simulation Monte Carlo modelling of rarefied gas flow past a circular cylinder based on ab initio interatomic potentials, *Proc. of the 2nd European Conference on Non-equilibrium Gas Flows - NEGF15*, December 9-11, 2015, Eindhoven, Netherlands, **2015**.
4. Oesterle, B., Volkov, A. N., Tsirkunov, Y. M., Numerical investigation of two-phase flow structure and heat transfer in a supersonic dusty gas flow over a blunt body, *Progress in Flight Physics 5 (Proc. 4th European Conference for Aero-Space Sciences, Saint Petersburg, Russia, July 4 - 8, 2011)*, P. Reijasse, D. D. Knight, M. S. Ivanov, and I. I. Lipatov (Eds.), pp. 441-456 (EDP Press, 2013).
5. Tucker, O. J., Erwin, J. T., Johnson, R. E., Volkov, A. N., Cassidy, T. A., Fluid/kinetic hybrid simulation of atmospheric escape: Pluto, *AIP Conf. Proc. 1333 (Proc. 27-th International Symposium on Rarefied Gas Dynamics, Pacific Grove, USA, 2010)*, D. A. Levin, I. J. Wyson, and A. L. Garcia (Eds.), 1145-1150, 2011.
6. Volkov, A. N., Zhigilei, L. V., Massively parallel mesoscopic simulations of gas permeability of thin films composed of carbon nanotubes, in *Computational Fluid Dynamics 2010 (Proc. of the 6<sup>th</sup> Int. Conf. on Computational Fluid Dynamics, St. Petersburg, Russia, 2010)*, A. Kuzmin (Ed.) (Springer, London, 2011), 823-831.
7. Volkov, A. N., O'Connor, G. M., Parallel Direct Simulation Monte Carlo of two-phase gas-droplet laser plume expansion from the bottom of a cylindrical cavity into an ambient gas, in *Computational Fluid Dynamics 2010 (Proc. of the 6<sup>th</sup> Int. Conf. on Computational Fluid Dynamics, St. Petersburg, Russia, 2010)* A. Kuzmin (Ed.) (Springer, London, 2011), 105-112.
8. Volkov, A. N., Simov, K. R., Zhigilei, L. V., Mesoscopic simulation of self-assembly of carbon nanotubes into a network of bundles, *Proc. of the 47<sup>th</sup> AIAA Aerospace Sciences Meeting*, AIAA paper 2009-154, 9 p., 2009.
9. Volkov, A. N., Lukyanov, G. A., O'Connor, G. M., Laser-induced plume expansion from a silicon wafer in a wide range of ambient gas pressure, in *Fundamentals of Laser Assisted Micro- and Nanotechnologies*, Vadim P. Veiko (Ed.), *Proc. of SPIE 6985*, 69850P (12 p.), 2008.
10. Volkov, A. N., Simov, K. R., Zhigilei, L. V., Mesoscopic model for simulation of CNT-based materials, *Proc. of the ASME International Mechanical Engineering Congress and Exposition*, ASME paper IMECE2008-68021, 11 p., 2008.
11. Volkov, A. N., The aerodynamic and heat properties of a spinning spherical particle in transitional flow, *Proc. 6<sup>th</sup> International Conference on Multiphase Flow, Congress Center Leipzig, Germany, 9-13 July 2007*. CD-ROM, Paper S2\_Mon\_C\_6, 13 p., 2007.
12. Semionov, V. V., Volkov, A. N., Effect of solid particles on flow structure of supersonic two-phase gas-solid particles impact jet in the self-oscillation regime, *Proc. 6<sup>th</sup> International Conference on Multiphase Flow, Congress Center Leipzig, Germany, 9-13 July 2007*. CD-ROM, Paper S3\_Fri\_B\_67, 14 p., 2007.
13. Volkov, A. N., Lukyanov, G. A., 3D numerical modelling of rarefied gas flow in the nearby atmosphere around a rotating cometary nucleus, in *Proc. 25-th International Symposium on Rarefied Gas Dynamics, Saint Petersburg, 2006*, M. Ivanov and A. Rebrov (Eds.), (Publishing House of the Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia, 2007), 1203-1208.
14. Volkov, A. N., Numerical modelling of the Magnus force and the aerodynamic torque on a spinning sphere in transitional flow, in *Proc. 25-th International Symposium on Rarefied Gas Dynamics, Saint Petersburg, 2006* M. Ivanov and A. Rebrov (Eds.), (Publishing House of the Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia, 2007), 771-776.
15. Volkov, A. N., Lukyanov, G. A., Numerical modeling of complex heat transfer and evaporation of rotating comet nuclei. *Proc. Fourth Russian Heat Transfer Conf., Moscow, October 23 – 27, 2006. V. 7. Radiation and complex heat transfer* (Moscow, MPEI Publisher, 2006), 41-44 (in Russian).
16. Volkov, A., Tsirkunov, Y. , Oesterle, Two-phase gas-particle flow structure and heat transfer in high speed flow over a blunt body, *Proc. 3<sup>rd</sup> International Symposium on Two-Phase Flow Modelling and Experimentation, 2004. Pisa, 22-24 Sept. 2004*. CD-ROM. Paper jb04, 8 p., 2004.
17. Volkov, A. N., Ablation of carbon particle under sort pulses of laser radiation. *Proc. Fourth Int. Seminar "Intra Chamber Processes, Combustion and Gas Dynamics of Dispersed Systems", St. Petersburg, Russia, June 27 – July 3, 2004. V. 1.* (St. Petersburg, Baltic State Technical University, 2004), 193-196 (in Russian).
18. Volkov, A. N., Ablation of solid dispersed particles under short pulse of laser radiation. *Ann. Lobatchevsky's Mathematical Center 27, Models of continuum mechanics. Proc. XVII Session of Int. School on Models of Continuum Mechanics, Kazan, Russia, July 4 – 10, 2004* (Kazan, Kazan Mathematical Society, 2004), 69-77 (in Russian).
19. Volkov, A. N., Tsirkunov, Y. M., Numerical investigation of the shock layer structure and heat transfer at the surface of a body in a supersonic dusty gas flow, *Proc. Fifth World Congress on Computational Mechanics, July 7–12, 2002, Vienna, Austria*, H.A. Mang, F.G. Rammerstorfer, and J. Eberhardsteiner (Eds.), Paper No. 80339, 11 p., 2002.

20. Volkov, A. N., Tsirkunov, Y. M., Aerodynamic interference of two cylinders in the flow at a moderate free stream Reynolds number, *Proc. Fifth World Congress on Computational Mechanics, July 7–12, 2002, Vienna, Austria*, H.A. Mang, F.G. Rammerstorfer, and J. Eberhardsteiner (Eds.), Paper No. 80424, 12 p., 2002.
21. Volkov, A. N., Tsirkunov, Y. M., CFD / Monte Carlo simulation of collision-dominated gas–particle flows over bodies, *Proc. ASME Fluids Engineering Division Summer Meeting, 14–18 July 2002, Montreal, Canada*. CD-ROM FEDSM'02, Paper No. 31222, 14 p., 2002.
22. Tsirkunov, Y. M., Volkov, A. N., Tarasova, N. V., Full Lagrangian approach to the calculation of dilute dispersed phase flows: advantages and applications, *Proc. ASME Fluids Engineering Division Summer Meeting, 14–18 July 2002, Montreal, Canada*. CD-ROM FEDSM'02, Paper No. 31224, 14 p., 2002.
23. Volkov, A. N., Semionov, V. V., Tsirkunov, Y. M., Two-phase boundary layer at a blunt body in the spatially inhomogeneous dusty gas flow. *Ann. Lobachevsky's Mathematical Center* **16**, *Models of continuum mechanics. Proc. XVI Session of Int. School on Models of Continuum Mechanics, Kazan, Russia, June 27 – July 3, 2002* (Kazan, Kazan Mathematical Society, 2002), 127-137 (in Russian).
24. Volkov, A. N., Aerodynamic interference of two cylinders in gas-solid particle flow. *Proc. Third Russian Heat Transfer Conf., Moscow, October 21 – 25, 2002. V. 5. Two-Phase Flows. Dispersed Flows and Porous Media* (Moscow, MPEI Publisher, 2002), 179-182 (in Russian).
25. Volkov, A. N., Semionov, V. V., Tsirkunov, Y. M., Effect of a large dust cloud on flow structure and heat transfer in the shock layer on a blunt body. *Proc. Third Russian Heat Transfer Conf., Moscow, October 21 – 25, 2002. V. 5. Two-Phase Flows. Dispersed Flows and Porous Media* (Moscow, MPEI Publisher, 2002), 183-186 (in Russian).
26. Volkov, A. N., Semionov, V. V., Effect of a cloud of solid particles on the flow of viscous gas in the shock layer on a cylinder. *Proc. XIII School-Seminar of Young Scientists and Specialists under the Leadership of the Academician, Professor A.I.Leontiev "Physical Principles of Experimental and Mathematical Simulation of Heat and Mass Transfer and Gas Dynamics in Power Plants», St. Petersburg, Russia, May 20 – 25, 2001. Vol. 2* (Moscow, MPEI Publisher, 2001), 58-61 (in Russian).
27. Volkov, A. N., Tsirkunov, Y. M., Computational simulation of viscous two-phase flows of a dense gas-particle mixture over bodies, *European Congress on Computational Methods in Applied Sciences and Engineering, 11-14 September 2000, Barcelona, Spain. CD-ROM Proceedings ECCOMAS'2000* (CIMNE, Barcelona, Spain, 2000), Paper No 309, 20 p.
28. Volkov, A. N., Semionov, V. V., Effect of a cloud of solid particles on the flow in the shock layer on a blunt body. *Proc. Int. Workshop "Unsteady Combustion and Interior Ballistics," St. Petersburg, Russia, June 26 – 30, 2000* (Izhevsk, Institute of Applied Mechanics of Ural Branch of Russian Academy of Science, 2000), 188-189 (in Russian).
29. Volkov, A. N., Prokofiev, P. N., Gas-solid particle flow in the vertical duct with accounting of gravity force. *Proc. Int. Workshop "Unsteady Combustion and Interior Ballistics," St. Petersburg, Russia, June 26 – 30, 2000* (Izhevsk, Institute of Applied Mechanics of Ural Branch of Russian Academy of Science, 2000), 195-197 (in Russian).
30. Volkov, A. N., Tsirkunov, Y. M., Monte-Carlo modelling of dusty gas flows over bodies, *Proc. Fourth European Computational Fluid Dynamics Conference, 7–11 September 1998, Athens, Greece, Part I* (Eds. K.D.Papailiou, D.Tsahalis, J.Periaux, C.Hirsch, M.Pandolfi) (Wiley, 1998), 169–174.
31. Volkov, A. N., Tsirkunov, Y. M., Kinetic model of collisional admixture and its application to the modeling of dusty gas flows. *Proc. XIV Session of Int. School on models of continuum mechanics, Zhukovsky, Moscow region, Russia, August 17 – 24, 1997* (Moscow, Moscow Institute of Technical Physics, 1998), 26–32 (in Russian).
32. Volkov, A. N., Tsirkunov, Y. M., Two phase gas-solid particle flow over a cylinder: Effects of particle radius and collisions between particles. *Proc. Second Int. Seminar "Intra-Chamber Processes, Combustion and Gas Dynamics of Dispersed Systems", St. Petersburg, Russia, June 30 – July 5, 1997* (St. Petersburg, Baltic State Technical University, 1997), 97-100 (in Russian).
33. Volkov, A. N., Tsirkunov, Y. M., Direct simulation Monte-Carlo modelling of two-phase gas-solid particle flows with inelastic particle-particle collisions, *Proc. Third ECCOMAS Computational Fluid Dynamics Conference, 9–13 September 1996, Paris, France* (Wiley, 1996), 662–668.
34. Tsirkunov, Y. M., Volkov, A. N., Panfilov, S. V., Motion of solid particles and surface erosion in the flows of dilute gas-particles mixture over bodies. *Proc. XIII Session of Int. School on Models of Continuum Mechanics, St. Petersburg, June 27 – July 3, 1995* (St. Petersburg, St. Petersburg State University, 1996), 109–116 (in Russian).
35. Volkov, A. N., Tsirkunov, Y. M., Application of Direct Simulation Monte Carlo method to the modeling of gas-solid particles flows with inelastic particle-particle collisions. *Proc. XIII Session of Int. School on Models of Continuum Mechanics, St. Petersburg, June 27 – July 3, 1995* (St. Petersburg, St. Petersburg State University, 1996), 133–140 (in Russian).

36. Volkov, A. N., Tsirkunov, Y. M., Modeling of gas-particle flows with inelastic particle-particle collisions. Proc. Int. Seminar "Intra-Chamber Processes, Combustion and Gas Dynamics of Dispersed Systems," St. Petersburg, Russia, June 20–24, 1995 (St. Petersburg, Baltic State Technical University, 1995), 80–83 (in Russian).
37. Tsirkunov, Y. M., Tarasova, N. V., Volkov, A. N., Influence of surface temperature on the motion and mass transfer of an admixture in the gas-solid particles flow over a blunt body. Dispersed Flows and Porous Media: Proc. First Russian Heat Transfer Conference, Moscow, November 21-25, 1993, V. 7 (Moscow, MPEI Publisher, 1994), 222–226 (in Russian).

## PRESENTATIONS

1. Volkov, A.N., Banna, M. A. H., Mesoscopic simulations of structural and mechanical properties of carbon nanotube aerogels, *2017 Material Research Society Spring Meeting and Exhibit*, Phoenix, AZ, USA, April 17 - 21, 2017.
2. Volkov, A. N., Mesomechanics and plasticity of carbon nanotube network materials, International conference on plasticity, damage, and fracture 2017 (Plasticity 2017), Puerto Vallarta, Mexico, January 3-9, **2017 (key-note lecture)**.
3. Zhigilei, L. V., Volkov, A. N., Mesoscopic modeling of the mechanical and thermal transport properties of CNT materials, *2016 Early Stage Innovations (ESI) Continuation Review Meeting*, NASA Langley Research Center, Hampton VA, November 7, **2016**.
4. Volkov, A. N., Direct comparison of hydrodynamic and kinetic models for thermal escape problems, *83rd Annual Meeting of the Southeastern Section of the American Physical Society*, Charlottesville, VA, USA, November 10-12, **2016**.
5. Volkov, A. N., Mesoscopic modelling of mechanical and thermal transport properties of carbon nanotube films, *83rd Annual Meeting of the Southeastern Section of the American Physical Society*, Charlottesville, VA, USA, November 10-12, **2016 (invited)**.
6. Ranjbar, O. A., Volkov, A. N., Kinetic and hydrodynamic simulations of laser-induced plume expansion, *Sixteenth Annual Early Career Technical Conference ECTC 2016*, November 5-6, 2016, Birmingham, Alabama USA, **2016** (student presentation).
7. Shah, D., Volkov, A. N., Calculation of effective thermal conductivity of powder bed systems using smoothed particle hydrodynamics method, *Sixteenth Annual Early Career Technical Conference ECTC 2016*, November 5 - 6, 2016, Birmingham, Alabama USA, **2016** (student presentation).
8. Volkov, A. N., Mesoscopic simulations of laser-material interaction: Bridging the gap between nano- and macro-scale phenomena, *Research Meeting at the Electro Scientific Industries*, Portland, OR, July 18 **2016 (invited)**.
9. Volkov, A. N., Comparison of hydrodynamic and kinetic models of thermal escape from planetary atmospheres, *30th International Symposium on Rarefied Gas Dynamics*, Victoria BC Canada, July 10-15 **2016**.
10. Zhigilei, L. V., Volkov, A. N., Mesoscopic modeling of the mechanical and thermal transport properties of CNT materials, *Structural CNT Working Group Meeting*, NASA Langley Research Center, Hampton VA, April 28-29, **2016**.
11. Johnson, R. E., Volkov, A.N., Usefulness and limitations of energy limited escape: Titan and other planetary atmospheres, *2015 DPS Meeting*, Washington D.C., November 8-13, **2015**.
12. Sharipov, F., Volkov, A.N., Direct simulation Monte Carlo modelling of rarefied gas flow past a circular cylinder based on *ab initio* interatomic potentials, *2nd European Conference on Non-equilibrium Gas Flows - NEGF15*, Eindhoven, Netherlands, December 9-11, **2015**.
13. Volkov A.N., Shah, D., Mesoscopic simulations of heat transport in carbon nanotube-based nanocomposite materials, *ASME International Mechanical Engineering Congress and Exposition 2015 IMECE*, Houston, Texas, USA, November, 13-19, **2015** (student presentation).
14. Shah, D., Volkov, A.N., Simulations of Selective Laser Melting of metallic powder particles with the Smoothed Particle Hydrodynamics method, *ASME International Mechanical Engineering Congress and Exposition 2015 IMECE*, Houston, Texas, USA, November, 13-19, **2015**.
15. Volkov, A.N., Wittmaack, B. K., Zhigilei, L. V., Mesoscopic simulations of mechanical loading of carbon nanotube films and forests, *ASME International Mechanical Engineering Congress and Exposition 2015 IMECE*, Houston, Texas, USA, November, 13-19, **2015**.
16. Sharipov, F., Volkov, A.N., Direct Simulation Monte Carlo modelling of rarefied gas flow past a circular cylinder based on *ab initio* interatomic potential, *The 7<sup>th</sup> DSMC Workshop DSMC15*, Kapaa, Kauai, Hawaii, USA, September 13-17, **2015 (invited)**.
17. Volkov, A.N., Ranjbar, O., Silverstein, G., A DSMC-based method for kinetic simulations of laser-induced plasma plume expansion, *The 7<sup>th</sup> DSMC Workshop DSMC15*, Kapaa, Kauai, Hawaii, USA, September 13-17, **2015**.
18. Volkov, A. N., Silverstein, G., Ranjbar, O., Lin Z., Non-equilibrium effects in laser-induced plasma plumes, *The 13th Conference on Laser Ablation (COLA-2015)*, Cairns, Australia, 31 August – 4 September, **2015**.

19. Lin, Z., Matsumoto, H., Kleinert, J., Concina, S., Otto, A., Vázquez, R. G., Bielak, R., Tatra, S., Volkov, A. N., Silverstein, G., Ranjbar, O., Experimental and Numerical Studies of Nanosecond Laser Processing in Industrial Micromachining Applications, *The 13th Conference on Laser Ablation (COLA-2015)*, Cairns, Australia, 31 August – 4 September, **2015**.
20. Volkov, A.N., Laser-induced thermomechanical processes around metal nanoparticles in a transparent medium, *Progress In Electromagnetics Research Symposium PIERS 2015*, Prague, Czech Republic, 6-9 July, **2015 (invited)**.
21. Volkov, A.N., Silverstein, G., Ranjbar, O., Comparison of kinetic and continuum model for simulations of laser-induced plasma plumes, *Progress In Electromagnetics Research Symposium PIERS 2015*, Prague, Czech Republic, 6-9 July, **2015**.
22. Volkov, A. N., Wittmaack, B. K., Zhigilei, L. V., Mesoscopic modeling of high strain rate deformations and stress relaxation in carbon nanotube films and forests, *21<sup>st</sup> International Symposium on Plasticity*, Montego Bay, Jamaica, January 4-9, **2015 (invited)**.
23. Volkov, A. N., Zhigilei, L. V., Multiphase modeling of continuous wave laser ablation: Contributions of the recoil vapor pressure, Marangoni effect, and external gas flow, *ASME International Mechanical Engineering Congress and Exposition*, Montreal, Canada, November 14 – 20, **2014**.
24. Volkov, A. N., Wittmaack, B. K., Salaway, R., Zhigilei, L. V., Mesoscopic simulations of heat transport in carbon nanotube aerogels, films, and forests, *ASME International Mechanical Engineering Congress and Exposition*, Montreal, Canada, November 14 – 20, **2014**.
25. Johnson, R. E., Oza, A., Young, L.A., Volkov, A., Schmidt, C., Volatile loss from Kuiper belt objects, *2014 DPS Meeting*, Tucson, AZ, USA, November 9-14, **2014**.
26. Volkov, A. N., Wittmaack, B. K., Salaway, R., Zhigilei, L. V., Theoretical investigation and mesoscopic modelling of thermal conductivity of carbon nanotube materials, *NanoBio Summit 2014*, Tuscaloosa, AL, October 23-24, **2014**.
27. Volkov, A. N., Monte-Carlo and mesoscopic simulations in rarefied gas dynamics and multi-phase flows, *Seminar of the Department of Physics at the Federal University of Parana, Curitiba*, Parana, Brazil, July 17, **2014 (invited)**.
28. Volkov, A. N., Zhigilei, L. V., Melt dynamics and melt-through time in continuous wave laser ablation: Comparative analysis of contributions from the recoil vapor pressure and Marangoni effect, *2014 International High Power Laser Ablation and Beamed Energy Propulsion (2014 HPLA/BEP)*, Santa Fe, NM, USA, April 21-25, **2014 (invited)**.
29. Perram, G., Marciniak, M., Gross, K., Chelliah, H., Zhigilei, L., Volkov, A. Merging hyperspectral imagery and multi-scale modeling for laser material interactions, *HEL JTO MRI 2014 Review meeting*, Albuquerque, NM, USA, May 2, **2014**.
30. Wittmaack, B. K., Volkov, A. N., Zhigilei, L. V., Mesoscopic dynamic modeling of structural, thermal, and impact resistance properties of vertically aligned carbon nanotube (VACNT) forests, *2013 Material Research Society Fall Meeting and Exhibit*, Boston, MA, USA, December 1-6, **2013**.
31. Volkov, A. N., Johnson, R. E., Kinetic simulations of transition from blow-off to Jeans-like thermal escape in planetary atmospheres, *DSMC13 Workshop*, Santa Fe, MN, USA, October 20-23, **2013**.
32. Perram, G., Marciniak, M., Gross, K., Chelliah, H., Zhigilei, L., Volkov, A. Merging hyperspectral imagery and multi-scale modeling for laser material interactions, *HEL JTO MRI FY2010 Review meeting*, Albuquerque, NM, USA, May 6 – 10, **2013**.
33. Volkov, A. N., Wittmaack, B. K., Salaway, R., N., Zhigilei, L. V., Effect of conductivity of individual nanotubes and structural parameters of nanotube networks on the heat transfer in carbon nanotube films and vertically aligned arrays, *2013 Material Research Society Spring Meeting and Exhibit*, San Francisco, CA, USA, April 1 - 5, **2013**.
34. Salaway, R., N., Volkov, A. N., Zhigilei, L. V., The effects of local structure on thermal transport in carbon nanotube materials, *2013 Material Research Society Spring Meeting and Exhibit*, San Francisco, CA, USA, April 1 - 5, **2013**.
35. Salaway, R., N., Volkov, A. N., Zhigilei, L. V., Molecular dynamics simulations of thermal transport in carbon nanotube structures: Effect of computational procedures and parameters, *2013 Material Research Society Spring Meeting and Exhibit*, San Francisco, CA, USA, April 1 - 5, **2013**.
36. Volkov, A.N., Zhigilei, L.V., Melt expulsion in continuous wave laser ablation: Contributions of the recoil vapor pressure, Marangoni effect, and external gas flow, *International Symposium "Fundamentals of Laser Assisted Micro & Nanotechnologies" (FLAMN-13)*, Saint Petersburg, Russia, June 24-28, **2013 (invited)**.
37. Volkov, A.N., Bennett-Jackson, A., Helvajian, H., Zhigilei, L.V., Continuum modeling of target damage in multipulse and CW laser heating, *International Workshop on Acoustic Activation of Surface Processes*, Breckenridge, CO, USA, January 9-12, **2013**.
38. Tucker, O. J., Johnson, R. E., Deighan, J. I., Volkov, A. N., Tenishev, V., Diffusion and thermal escape of H<sub>2</sub> from Titan's atmosphere: Kinetic Monte Carlo simulations, *American Geophysical Union's 45th annual Fall Meeting*, San Francisco, CA, USA, December 3 - 7, **2012**.
39. Zhigilei, L. V., Volkov, A. N., Salaway, R., Wittmaack, B., Mesoscopic modeling of carbon nanotube materials: Computational model and applications to structural, thermal and mechanical properties, *64th Southeastern Regional Meeting of the American Chemical Society (SERMACS 2012)*, Raleigh, NC, USA, November 14-17, **2012 (invited)**.

40. Salaway, R., Volkov, A. N., Zhigilei, L. V., Thermal conductance at carbon nanotube junctions and the effects of local structure, *ASME International Mechanical Engineering Congress and Exposition*, Houston, TX, USA, November 9 – 15, **2012**.
41. Johnson, R. E., Volkov, A., Erwin, J., Tucker, O., Hydrodynamic vs. evaporative escape: Exoplanets and the ex-planet, 44th annual meeting of the Division for Planetary Sciences of the American Astronomical Society, October 14 - October 19, **2012**, Reno, NV, USA.
42. Volkov, A. N., Zhigilei, L. V., Simulations of the melt expulsion in continuous wave laser ablation of aluminum films: Effects of the recoil vapor pressure and external gas flow, *8th International Conference on Photo-Excited Processes and Applications*, Rochester NY USA August 12-17, **2012**.
43. Volkov, A. N., Zhigilei, L. V., Kinetic simulations of burning of Al vapor in high-power CW laser ablation of an aluminum target in a shear air flow, *8th International Conference on Photo-Excited Processes and Applications*, Rochester NY USA August 12-17, **2012**.
44. Volkov, A. N., Direct simulation Monte Carlo of aerodynamic interaction between spherical particles in rarefied gas flow, *ASME 2012 Fluid Engineering Summer Meeting*, Rio Mar Beach Resort, Puerto Rico, USA, July 8-12, **2012**.
45. Volkov, A. N., Zhigilei, L. V., Mesoscopic simulations and scaling laws of heat transfer in carbon nanotube materials: Effect of conductivity of individual nanotubes, *ASME 2012 Summer Heat Transfer Conference*, Rio Mar Beach Resort, Puerto Rico, USA, July 8-12, **2012**.
46. Salaway, R., Volkov, A. N., Zhigilei, L. V., Thermal conductance at CNT-CNT contacts: Influence of contact density and local structure, *ASME 2012 Summer Heat Transfer Conference*, Rio Mar Beach Resort, Puerto Rico, USA, July 8-12, **2012**.
47. Volkov, A. N., DSMC modeling of thermal escape, *Modeling Atmospheric Escape Workshop*, Charlottesville, Virginia, February 27-28, **2012**.
48. Salaway, R., Volkov, A., Zhigilei, L., Divergence in NEMD carbon nanotube conductivity and the effect of system parameters, *Computational Material Science for Energy Generation and Conversion PASI 2012 - CMS4E*, Pan-American Advanced Studies Institute, Santiago, Chile - Pontificia Universidad Católica de Chile, January 9-20, **2012**.
49. Zhigilei, L. V., Volkov, A. N., Salaway, R., Jacobs, W. M., Nicholson, D. A., Zemer, H., Computational study of thermal transport in carbon nanotube materials, *NSF 2012 CBET Grantee Conference*, Baltimore, Maryland, June 6-8, **2012**.
50. Tsirkunov, Y. M., Volkov, A. N., Panfilov, S. V., Romanyuk, D. A., Fluid dynamics and heat transfer in dusty gas flow over bodies: *Modelling and role of random effects*, *16th International Conference on the Methods of Aerophysical ICMAR 2012*, Kazan, Russia, August 20–26, **2012 (invited)**.
51. Volkov, A. N., Zhigilei, L. V., Marciniak, M. A., Perram, G. P., Computational study of the role of oxidation in CW laser ablation of an aluminum target in a shear gas flow, *11<sup>th</sup> International Conference on Laser Ablation COLA 2011*, Playa del Carmen México, Cancun, Mexico, November 13-19, **2011**.
52. Zhigilei, L. V., Volkov, A. N., Tabetah, M., Steiner, M. A., Fitz-Gerald, J. M., Computational study of the effect of the target structure and composition on the performance of matrix-assisted pulsed laser deposition, *11<sup>th</sup> International Conference on Laser Ablation COLA 2011*, Playa del Carmen México, Cancun, Mexico, November 13-19, **2011**.
53. Salaway, R., Nicholson, D., Volkov, A., Zhigilei, L., Thermal properties of carbon nanotubes and the effects of interacting neighbors, *ASME International Mechanical Engineering Congress and Exposition*, Denver, CO, USA, November 11 – 17, 2011.
54. Volkov, A. N., Three-dimensional asymptotic thermal model of a rotating comet nucleus, *EPSC-DPS Joint Meeting 2011*, La Cité Internationale des Congrès Nantes Métropole, Nantes, France, October 02 – 07, **2011**.
55. Volkov, A. N., Johnson, R. E., Tucker, O. J., A kinetic study of thermal escape of major atmospheric species, *EPSC-DPS Joint Meeting 2011*, La Cité Internationale des Congrès Nantes Métropole, Nantes, France, October 02 – 07, **2011**.
56. Volkov, A. N., Zhigilei, L. V., Kinetic model of oxidation of aluminum vapor in air and its application for simulations of laser evaporation of an aluminum target in supersonic shear air flow, *International workshop "DSMC: Theory, Methods and Applications"*, Santa Fe, New Mexico, USA, September 26 - 28, **2011**.
57. Volkov, A. N., Tsirkunov, Y. M., Semenov, V. V., DSMC method for simulations of multiphase gas-solid particle flows, *International workshop "DSMC: Theory, Methods and Applications"*, Santa Fe, New Mexico, USA, September 26 – 28, **2011**.
58. Zhigilei, L. V., Volkov, A. N., Salaway, R., Nicholson, D., Jacobs, W., Thermal conductivity of carbon nanotube materials: Atomic-level simulations, mesoscopic modeling and scaling laws, *AFOSR Thermal Sciences Grantees' Meeting*, Arlington, Virginia, 26-28 September, **2011**.
59. Salaway, R., Volkov, A. N., Zhigilei, L. V., Thermal conductivity of carbon nanotubes: The effect of inter-nanotube interactions, *AFOSR Thermal Sciences Grantees' Meeting*, Arlington, Virginia, 26-28 September, **2011**.
60. Oesterle, B., Volkov, A. N., Tsirkunov, Y. M., Numerical investigation of two-phase flow structure and heat transfer in a supersonic dusty gas flow over a blunt body, *4th European Conference for Aerospace Sciences*, Saint Petersburg, Russia, July 4 - 8, **2011**.

61. Zhigilei, L. V., Volkov, A. N., Jacobs, W., Nicholson, D., Salaway, R., Multiscale computational study of carbon nanotube materials, *2011 Joint Annual conference of the National Society of Black Physicists and National Society of Hispanic Physicists*, Austin, Texas, 21-24 September, **2011**.
62. Volkov, A. N., Salaway, R., Nicholson, D., Jacobs, W., Zhigilei, L. V., Thermal conductivity of carbon nanotube materials: Mesoscopic modeling and scaling laws, *2011 Material Research Society Spring Meeting and Exhibit*, San Francisco, CA, USA, April 25 - 29, **2011**.
63. Johnson, R. E., Volkov, A., Tucker, O. J., Erwin, J. T., Thermally-driven escape from an atmosphere: Transition from Jeans to hydrodynamic escape, *42nd annual meeting of the Division for Planetary Sciences of the American Astronomical Society*, Pasadena, CA, October 3 – 8, **2010**.
64. Tucker, O. J., Volkov, A., Erwin, J. T., Johnson, R. E., DSMC simulations of thermally driven atmospheric escape of N<sub>2</sub>, H<sub>2</sub> and CH<sub>4</sub> from Titan's atmosphere, *The 27<sup>th</sup> International Symposium on Rarefied Gas Dynamics*, Pacific Grove, CA, USA, July 10 – 15, **2010**.
65. Volkov, A. N., Numerical simulation of gas-solid particle flows: Effects of rarefaction and particle-particle collisions, *All-Russian seminar on fundamental studies in aerodynamics*, St. Petersburg State Polytechnical University, Russia, September 10, **2010 (invited)**.
66. Volkov, A. N., Zhigilei, L. V., Massively parallel mesoscopic simulations of gas permeability of thin films composed of carbon nanotubes, *The 6<sup>th</sup> International Conference on Computational Fluid Dynamics (ICCFD 2010)*, St. Petersburg, Russia, July 12 – 16, **2010**.
67. Volkov, A. N., O'Connor, G. M., Parallel Direct Simulation Monte Carlo of two-phase gas-droplet laser plume expansion from the bottom of a cylindrical cavity into an ambient gas, *The 6<sup>th</sup> International Conference on Computational Fluid Dynamics (ICCFD 2010)*, St. Petersburg, Russia, July 12 – 16, **2010**.
68. Volkov, A. N., Jacobs, W., Nicholson, D., Zhigilei, L. V., Mesoscopic modeling of collective phenomena in molecular systems and carbon nanotube materials, *International Conference on Computational & Experimental Engineering and Sciences (ICCES'10)*, Las Vegas, NV, USA, March 28 – April 1, **2010 (invited/theme)**.
69. Volkov, A. N., Numerical simulation of gas-solid particle flows: Effects of rarefaction and particle-particle collisions, *Seminar on fluid and gas dynamics*, Baltic State Technical University, Russia, September 28, **2010 (invited)**.
70. Jacobs, W., Volkov, A. N., Nicholson, D., Zhigilei, L. V., Mesoscopic dynamic modeling of impact resistance of carbon nanotube materials, *Material Research Society Spring Meeting 2010*, San Francisco, CA, USA, April 5 – 9, **2010**.
71. Volkov, A. N., Jacobs, W., Zhigilei, L. V., Mesoscopic simulations of carbon nanotube films and nanocomposite materials: Connections between the microscopic structure and mechanical properties, *ASME International Mechanical Engineering Congress and Exposition*, Lake Buena Vista, FL, USA, November 13 – 19, **2009**.
72. Volkov, A. N., Jacobs, W., Zhigilei, L. V., From a single carbon nanotube to an entangled network of bundles: Mesoscopic simulations of CNT films and nanocomposite materials, *Nanotech 2009, Clean Technology 2009 and TechConnect Summit 2009*, Houston, TX, USA, May 3 – 7, **2009 (selected for the special session sponsored by Lockheed Martin)**.
73. Volkov, A. N., Simov, K. R., Zhigilei, L. V., Mesoscopic simulation of self-assembly of carbon nanotubes into a network of bundles, *47<sup>th</sup> AIAA Aerospace Sciences Meeting*, Orlando, FL, USA, January 5 – 8, **2009**.
74. Volkov, A. N., Simov, K. R., Zhigilei, L. V., Mesoscopic model for simulation of CNT-based materials, *ASME International Mechanical Engineering Congress and Exposition 2008*, Boston, MA, USA, October 31 – November 6, **2008**.
75. Volkov, A., Simov, K., Zhigilei, L., Mesoscopic model for CNT-based materials, *American Physical Society March Meeting 2008*, New Orleans, LA, USA, March 10 – 14, **2008**.
76. Simov, K., Leveugle, E., Volkov, A., Zhigilei, L., Makeev, M. A., Srivastava, D., Mesoscopic model for simulations of carbon nanotube nanocomposites, *2007 Material Research Society Fall Meeting and Exhibit*, Boston, MA, USA, November 26 - 30, **2007**.
77. Zhigilei, L. V., Lin, Z., Volkov, A., Ivanov, D. S., Atomic-level computer modeling of laser-induced plasticity, structural transformations, and ablation of metal targets, *The 9<sup>th</sup> International Conference on Laser Ablation COLA 2007*, Tenerife, Spain, September 24 – 28, **2007 (invited)**.
78. Ivanov, D. S., Rethfeld, B., O'Connor, G. M., Glynn, T. J., Volkov, A. N., Zhigilei, L. V., The atomistic-continuum modeling of surface modification and nanostructuring on metals and semiconductors by a short laser pulse, *The 9<sup>th</sup> International Conference on Laser Ablation COLA 2007*, Tenerife, Spain, September 24 – 28, **2007**.
79. Kudzma, S., Volkov, A. N., O'Connor, G. M., Glynn, T. J., Numerical modeling of nanosecond laser ablation at atmospheric surroundings: Comparison of hydrodynamics and kinetic approaches, *The 9<sup>th</sup> International Conference on Laser Ablation COLA 2007*, Tenerife, Spain, September 24 – 28, **2007**.
80. Volkov, A. N., O'Connor, G. M., Glynn, T. J., Expansion of a laser plume from a silicon wafer in a wide range of ambient gas pressure, *The 9<sup>th</sup> International Conference on Laser Ablation COLA 2007*, Tenerife, Spain, September 24 – 28, **2007**.



81. Volkov, A. N., O'Connor, G. M., Glynn, T. J., Numerical modeling of plume expansion and motion of droplets of ablated material in a cavity during laser drilling of a silicon wafer, *The 9<sup>th</sup> International Conference on Laser Ablation COLA 2007*, Tenerife, Spain, September 24 – 28, **2007**.
82. Volkov, A. N., The aerodynamic and heat properties of a spinning spherical particle in transitional flow, *The 6<sup>th</sup> International Conference on Multiphase Flow ICMF 2007*, Congress Center Leipzig, Germany, July 9 – 13, **2007**.
83. Semionov, V. V., Volkov, A. N., Effect of solid particles on flow structure of supersonic two-phase gas-solid particles impact jet in the self-oscillation regime, *The 6<sup>th</sup> International Conference on Multiphase Flow ICMF 2007*, Congress Center Leipzig, Germany, July 9 – 13, **2007**.
84. Volkov, A. N., O'Connor, G. M., Glynn, T. J., Lukyanov, G. A., Laser-induced plume expansion from a silicon wafer in a wide range of ambient gas pressure, *International Conference "Fundamentals of Laser Assisted Micro- & Nanotechnologies"*, St. Petersburg - Pushkin, Russia, June 25 – 28, **2007**.
85. Volkov, A. N., Aerodynamics of a spinning sphere in the free molecular, transitional, and continuum flow regimes, *The 7<sup>th</sup> International Seminar "Models and Methods of Aerodynamics"*, Eupatoria, Ukraine, June 5 – 14, **2007**.
86. Volkov, A. N., Flow of ablation products from a silicon target irradiated by short laser pulses on in a wide range of ambient gas pressure, *The 7<sup>th</sup> International Seminar "Models and Methods of Aerodynamics"*, Eupatoria, Ukraine, June 5 – 14, **2007**.
87. Ivanov, D. S., Volkov, A. N., O'Connor, G. M., Zhigilei, L. V., Computer modeling of short pulse laser nanostructuring of metal surfaces, *The 5<sup>th</sup> International Conference on Photo-Excited Processes and Applications*, Charlottesville, Virginia, USA, September 3 – 7, **2006**.
88. Volkov, A. N., Sevilla, C., Zhigilei, L. V., Numerical modeling of processes induced by the pulse laser heating of a metal nanoparticle surrounded by a transparent liquid, *The 5<sup>th</sup> International Conference on Photo-Excited Processes and Applications*, Charlottesville, Virginia, USA, September 3 – 7, **2006**.
89. Volkov, A. N., Zhigilei, L. V., Continuum and atomistic modeling of laser spallation of metal targets, *The 5<sup>th</sup> International Conference on Photo-Excited Processes and Applications*, Charlottesville, Virginia, USA, September 3 – 7, **2006**.
90. Volkov, A. N., Lukyanov, G. A., 3D numerical modelling of rarefied gas flow in the nearby atmosphere around a rotating cometary nucleus, *The 25<sup>th</sup> International Symposium on Rarefied Gas Dynamics*, St. Petersburg, Russia, July 21-28, **2006**.
91. Volkov, A. N., Numerical modelling of the Magnus force and the aerodynamic torque on a spinning sphere in transitional flow, *The 25<sup>th</sup> International Symposium on Rarefied Gas Dynamics*, St. Petersburg, Russia, July 21-28, **2006**.
92. Semionov, V. V., Volkov, A. N., Numerical modeling of interaction of supersonic dusty gas jet with an obstacle in steady-state and non-stationary regimes, *The VI International Conference on Non-Equilibrium Processes in Nozzles and Jets*, St. Petersburg, June 26 – July 1, **2006**.
93. Volkov, A. N., Lukyanov, G. A., Numerical modeling of complex heat transfer and evaporation of rotating comet nuclei, *The 4<sup>th</sup> Russian National Conference on Heat Transfer*, Moscow, Russia, October 23 – 27, **2006**.
94. Lukyanov, G. A., Khang, Y., Leshchev, D. V., Kozyrev, S. V., Volkov, A. N., Bykov, N. Y., Vakulova, O. I., Modeling of processes of cluster formation under pulsed laser ablation of carbon particles in an aerosol, *The 7<sup>th</sup> Biennial International Workshop "Fullerenes and atomic clusters"*, St. Petersburg, Russia, June 27 – July 1, **2005**.
95. Volkov, A. N., Zhigilei, L. V., Hydrodynamic multi-phase model for simulation of laser-induced non-equilibrium phase transformations, *The 8<sup>th</sup> International Conference on Laser Ablation COLA 2005*, Banff, Canada, September 11 – 16, **2005**.
96. Lukyanov, G. A., Kozyrev, S. V., Leshchev, D. V., Bykov, N. Y., Vakulova, O. I., Volkov, A. N., Numerical modeling of pulsed laser ablation of carbon particles in an aerosol, *The 8<sup>th</sup> International Conference on Laser Ablation COLA 2005*, Banff, Canada, September 11 – 16, **2005**.
97. Volkov, A. N., Tsirkunov, Y. M., Oesterle, B., Some fundamental problems of numerical modeling of heat transfer in supersonic dusty gas flows over blunt bodies, *International Scientific Conference "High-speed flow fundamental problems"*, Zhukovsky, Russia, September 21-24, **2004**.
98. Volkov, A. N., Modeling of gas dynamics and heat transfer during vaporization of a dispersed particle into vacuum under pulsed laser heating, *International Scientific Conference "High-speed flow fundamental problems"*, Zhukovsky, Russia, September 21-24, **2004**.
99. Volkov, A. N., Tsirkunov, Y. M., Oesterle, B., Two-phase gas-particle flow structure and heat transfer in high speed flow over a blunt body, *The 3<sup>rd</sup> International Symposium on two-phase flow modeling and experimentation*, Pisa, Italy, September 22 – 25, **2004**.
100. Volkov, A. N., Ablation of solid dispersed particles under short pulse of laser radiation, *The XVII Session of International School on Models of Continuum Mechanics*, Kazan, Russia, July 4 – 10, **2004**.
101. Volkov, A. N., Numerical modeling of evaporation of a solid dispersed particle in vacuum, *The V International Conference on Non-Equilibrium Processes in Nozzles and Jets*, Samara, Russia, July 5 – 10, **2004**.
102. Semionov, V. V., Volkov, A. N., Dynamics of solid dispersed particles in a supersonic dusty gas jet interacting with an obstacle, *The V International Conference on Non-Equilibrium Processes in Nozzles and Jets*, Samara, Russia, July 5 – 10, **2004**.

103. Volkov, A. N., Numerical modeling of gas dynamics and heat transfer under evaporation of a spherical carbon particle into vacuum, *The XX Jubilee International Seminar on Jet, Separated and Non-Stationary Flows*, St. Petersburg, Russia, July 1 – 3, **2004**.
104. Volkov, A. N., Effect of dispersed admixture on the aerodynamic interference of a pair of circular cylinders at moderate Reynolds numbers, *The XX Jubilee International Seminar on Jet, Separated and Non-Stationary Flows*, St. Petersburg, Russia, July 1 – 3, **2004**.
105. Semionov, V. V., Volkov, A. N., Numerical modeling of interaction of a supersonic jet with a flat obstacle, *The XX Jubilee International Seminar on Jet, Separated and Non-Stationary Flows*, St. Petersburg, Russia, July 1 – 3, **2004**.
106. Volkov, A. N., Ablation of carbon particle under sort pulses of laser radiation, *The 4<sup>th</sup> International Seminar “Intra-Chamber Processes, Combustion and Gas Dynamics of Dispersed Systems,”* St. Petersburg, Russia, June 27 – July 3, **2004**.
107. Volkov, A. N., Numerical modeling of ablation of dispersed particles under pulsed laser irradiation, *The 4<sup>th</sup> International Seminar “Models and Methods of Aerodynamics,”* Eupatoria, Ukraine, June 7 – 16, **2004**.
108. Volkov, A. N., Semionov, V. V., Tsirkunov, Y. M., Effect of mono- and poly-sized admixture on the flow and heat transfer in supersonic dusty gas flow over a blunt body, *The XII International Conference on Computational Mechanics and Modern Applied Software Systems*, Vladimir, Russia, June 30 June – 5 July, **2003**.
109. Semionov, V. V., Volkov, A. N., Numerical modeling of supersonic two-phase gas –solid particle jet with an obstacle, *The XII International Conference on Computational Mechanics and Modern Applied Software Systems*, Vladimir, Russia, June 30 June – 5 July, **2003**.
110. Volkov, A. N., Yuldashev, T. R., Direct simulation Monte Carlo of aerodynamics and hear transfer of a rotating spherical particles in rarefied gas flow, *The XII International Conference on Computational Mechanics and Modern Applied Software Systems*, Vladimir, Russia, June 30 June – 5 July, **2003**.
111. Volkov, A. N., Tsirkunov, Y. M., Effect of dispersed admixture on the heat transfer in supersonic flows over a blunt body, *Russian Conference Dedicated to 80<sup>th</sup> Anniversary of Academician G.G.Chernuy “Aerodynamics and Gas Dynamics in XXI Century,”* Moscow, Russia, January 27 – 30, **2003**.
112. Volkov, A. N., Semionov, V. V., Tsirkunov, Y. M., Effect of the size distribution of particles on the structure of boundary layer and heat transfer in unsteady supersonic dusty gas flow over blunt bodies, *The 3<sup>rd</sup> Polyakhov’s Readings: International Conference on Mechanics*, St. Petersburg, February 4 – 6, **2003**.
113. Volkov, A. N., Aerodynamic interference of cylinders in cobbressible gas flowsa at moderate Reynolds numbers, *The 3<sup>rd</sup> Polyakhov’s Readings: International Conference on Mechanics*, St. Petersburg, February 4 – 6, **2003**.
114. Volkov, A. N., Tsirkunov, Y. M., CFD / Monte Carlo simulation of collision-dominated gas–particle flows over bodies, *2002 Joint US ASME-European Fluids Engineering Division Summer Meeting*, Montreal, Canada, July 14 – 18, **2002**.
115. Tsirkunov, Y. M., Volkov, A. N., Tarasova, N. V., Full Lagrangian approach to the calculation of dilute dispersed phase flows: advantages and applications, *2002 Joint US ASME-European Fluids Engineering Division Summer Meeting*, Montreal, Canada, July 14 – 18, **2002**.
116. Volkov, A. N., Tsirkunov, Y. M., Numerical investigation of the shock layer structure and heat transfer at the surface of a body in a supersonic dusty gas flow, *V World Congress on Computational Mechanics*, Vienna, Austria, July 7 – 12, **2002**.
117. Volkov, A. N., Tsirkunov, Y. M., Aerodynamic interference of two cylinders in the flow at a moderate free stream Reynolds number, *V World Congress on Computational Mechanics*, Vienna, Austria, July 7 – 12, **2002**.
118. Volkov, A. N., Aerodynamic interference of two cylinders in gas-solid particle flow, *The 3<sup>rd</sup> Russian Heat Transfer Conference*, Moscow, October 21 – 25, **2002**.
119. Volkov, A. N., Semionov, V. V., Tsirkunov, Y. M., Effect of a large dust cloud on flow structure and heat transfer in the shock layer on a blunt body, *The 3<sup>rd</sup> Russian Heat Transfer Conference*, Moscow, October 21 – 25, **2002**.
120. Volkov, A. N., Transverse flow of viscous gas with admixture of solid particles over two cylinders at moderate Reynolds numbers, *The 2<sup>nd</sup> International Science and Engineering Conference of Young Scientists “Modern problems of aerospace science and technology,”* Zhukovsky, Russia, October 8 – 12, **2002**.
121. Volkov, A. N., Tsirkunov, Y. M., Effect of solid particles on the heat transfer of a surface in a supersonic flow of viscous gas, *The 2<sup>nd</sup> International Science and Engineering Conference of Young Scientists “Modern problems of aerospace science and technology,”* Zhukovsky, Russia, October 8 – 12, **2002**.
122. Volkov, A. N., Semionov, V. V., Tsirkunov, Y. M., Two-phase boundary layer at a blunt body in the spatially inhomogeneous dusty gas flow, *The XVI Session of International School on Models of Continuum Mechanics*, Kazan, Russia, June 27 – July 3, **2002**.
123. Volkov, A. N., Tsirkunov, Y. M., Effect of dispersed admixture on the structure of unsteady two-phase wake behing a cylinder in cross flow, *The IV International Conference on Non-Equilibrium Processes in Nozzles and Jets, The XIX International Seminar on Jet, Separated and Non-Stationary Flows*, St. Petersburg, June 24 – 28, **2002**.

124. Tsirkunov, Y. M., Volkov, A. N., One-way and two-way coupled gas-particle flows over a blunt body: the role of particle-particle collisions and the shielding effect, *EUROMECH Colloquium 421 "Strongly Coupled Dispersed Two-Phase Flows,"* Grenoble, France, September 10 – 12, **2001**.
125. Volkov, A. N., Panfilov, S. V., Tsirkunov, Y. M., Numerical modeling of gas-solid particle flows over bodies, *The VIII Russian Congress on Theoretical and Applied Mechanics*, Perm, Russia, August 23 – 29, **2001**.
126. Volkov, A. N., Tsirkunov, Y. M., Numerical modeling of unsteady separated two-phase gas-solid particle flow over two cylinders in tandem, *The XI International Conference on Computational Mechanics and Modern Applied Software*, Istra – Moscow, Russia, July 2 – 6, 2001, *The XI International Conference on Computational Mechanics and Modern Applied Software*, Istra – Moscow, Russia, July 2 – 6, **2001**.
127. Volkov, A. N., Semionov, V. V., Tsirkunov, Y. M., Effects of dispersed admixture on the shock layer structure in the flow of a viscous gas with solid particles over a blunt body: Role of collisions between particles, *The XI International Conference on Computational Mechanics and Modern Applied Software*, Istra – Moscow, Russia, July 2 – 6, 2001, *The XI International Conference on Computational Mechanics and Modern Applied Software*, Istra – Moscow, Russia, July 2 – 6, **2001**.
128. Volkov, A. N., Semionov, V. V., Effect of a cloud of solid particles on the flow of viscous gas in the shock layer on a cylinder, *The XIII School-Seminar of Young Scientists and Specialists under the Leadership of the Academician, Professor A.I. Leontiev "Physical Principles of Experimental and Mathematical Simulation of Heat and Mass Transfer and Gas Dynamics in Power Plants,"* St. Petersburg, Russia, May 20 – 25, **2001**.
129. Tsirkunov, Y. M., Volkov, A. N., Panfilov, S. V., Numerical modeling of dilute and dense gas-particle mixture flows over bodies, *International Conference on Multiphase Systems'2000*, Ufa, Russia, June 15 – 17, **2000**.
130. Tsirkunov, Y. M., Volkov, A. N., Behaviour of particles in the large-scale vortical gas motions behind a cylinder at moderate flow Reynolds number, *International Conference on Multiphase Systems'2000*, Ufa, Russia, June 15 – 17, **2000**.
131. Tsirkunov, Y. M., Panfilov, S. V., Volkov, A. N., Effect of the particles' scattering in particle-wall collisions on dilute and dense gas-particle flows over obstacles, *The 4<sup>th</sup> EUROMECH Fluid Mechanics Conference*, Eindhoven, Netherlands, November 19 – 23, **2000**.
132. Volkov, A. N., Tsirkunov, Y. M., Computational simulation of viscous two-phase flows of a dense gas-particle mixture over bodies, *European Congress on Computational Methods in Applied Sciences and Engineering*, Barcelona, Spain, September 11 – 14, **2000**.
133. Volkov, A. N., Semionov, V. V., Effect of a cloud of solid particles on the flow in the shock layer on a blunt body, *International Workshop "Unsteady Combustion and Interior Ballistics,"* St. Petersburg, Russia, June 26 – 30, **2000**.
134. Volkov, A. N., Prokofiev, P. N., Gas-solid particle flow in the vertical duct with accounting of gravity force, *International Workshop "Unsteady Combustion and Interior Ballistics,"* St. Petersburg, Russia, June 26 – 30, **2000**.
135. Volkov, A. N., Tsirkunov, Y. M., Dynamics of solid particles in the wake behind a cylinder at moderate Reynolds numbers, *International Science and Engineering Conference of Young Scientists "Modern problems of aerospace science and technology,"* Zhukovsky - Moscow, Russia, May 23 – 26, **2000**.
136. Volkov, A. N., Tsirkunov, Y. M., Structure of two-phase gas-solid particle flow in the wake behind a high-drag body, *The 2<sup>nd</sup> Polyakhov's Readings: Russian Conference on Mechanics*, St. Petersburg, Russia, February 2 – 4, **2000**.
137. Volkov, A. N., Tsirkunov, Y. M., Effect of inelastic collisions between solid particles in dusty gas flows, *The 2<sup>nd</sup> Russian Science and Engineering Conference of Young Scientists*, Zhukovsky, Russia, May 26 – 28, **1999**.
138. Volkov, A. N., Tsirkunov, Y. M., Monte-Carlo modelling of dusty gas flows over bodies, *Fourth European Computational Fluid Dynamics Conference*, Athens, Greece, September 7 – 11, **1998**.
139. Tsirkunov, Y., Volkov, A., The role of particle-particle collisions and the effect of particle size distribution in dusty gas flows over bodies, *Third European Fluid Mechanics Conference*, Gottingen, Germany, September 15 – 18, **1997**.
140. Volkov, A. N., Tsirkunov, Y. M., Kinetic model of collisional admixture and its application to the modeling of dusty gas flows, *The XIV Session of the International School on Models of Continuum Mechanics*, Zhukovsky, Russia, August 17 – 24, **1997**.
141. Volkov, A. N., Tsirkunov, Y. M., Two phase gas-solid particle flow over a cylinder: Effects of particle radius and collisions between particles, *The 2<sup>nd</sup> International Seminar "Intra-Chamber Processes, Combustion and Gas Dynamics of Dispersed Systems,"* St. Petersburg, Russia, 30 June – 5 July, **1997**.
142. Volkov, A. N., Tsirkunov, Y. M., Direct simulation Monte-Carlo modelling of two-phase gas-solid particle flows with inelastic particle-particle collisions, *Third ECCOMAS Computational Fluid Dynamics Conference*, Paris, France, September 9 – 13, **1996**.
143. Volkov, A. N., Tsirkunov, Y. M., Dusty gas flows over bodies: Effects of particle size distribution and inelastic collisions between solid particles, *International conference "Science and technical problems in cosmonautics and rocket industry."* Kaliningrad, Russia, April 23–25, **1996**.

144. Tsirkunov, Y. M., Volkov, A. N., Panfilov, S. V., Motion of solid particles and surface erosion in the flows of dilute gas-particles mixture over bodies, *The XIII Session of International School on Models of Continuum Mechanics*, St. Petersburg, June 27 – July 3, **1995**.
145. A. N. Volkov, Tsirkunov, Y. M., Application of Direct Simulation Monte Carlo method to the modeling of gas-solid particles flows with inelastic particle-particle collisions, *The XIII Session of International School on Models of Continuum Mechanics*, St. Petersburg, June 27 – July 3, **1995**.
146. Volkov, A. N., Tsirkunov, Y. M., Modeling of gas-particle flows with inelastic particle-particle collisions, *International Seminar “Intra-Chamber Processes, Combustion and Gas Dynamics of Dispersed Systems,”* St. Petersburg, Russia, June 20 – 24, **1995**.
147. Tsirkunov, Y. M., Tarasova, N. V., Volkov, A. N., Boundary layer effects in the dusty gas flow over a blunt body, *EUROMECH Colloquium-319 “Theoretical and Experimental Aspects of Particle-Laden Flows,”* Tallinn, Estonia, May 17 – 20, **1994**.
148. Tsirkunov, Y. M., Tarasova, N. V., Volkov, A. N., Influence of surface temperature on the motion and mass transfer of an admixture in the gas-solid particles flow over a blunt body, *The 1<sup>st</sup> Russian Heat Transfer Conference, Moscow*, Russia, November 21 – 25, **1993**.
149. Volkov, A. N., Tsirkunov, Y. M., Supersonic dusty gas flow over a blunt body in the quasi-equilibrium regime and with rebound of solid particles from the body surface, *The 2<sup>nd</sup> Russian Seminar on Dynamics of Spatial and Non-Equilibrium Flows of Fluids and Gases*, Miass, Russia, October 5 – 7, **1993**.

## TECHNICAL SKILLS INCLUDING COMPUTING EXPIENCE

- Expertise in numerical models for continuum fluid and gas dynamics, kinetic theory of gases, and atomic-level (molecular dynamics) simulation in materials science.
- Programming in C/C++ and Fortran 90/95 for Windows and Linux (Visual C++, Compaq Fortran, GNU C++, GNU Fortran, PGI C++ and Fortran for Linux, Intel C++ and Fortran for Linux, IBM XL C++, and IBM XL Fortran).
- MPI parallel programming in C++ and Fortran.
- Administration and management of Linux clusters (Clusters of the Computational Materials Group in Department of Materials Science and Engineering of the University of Virginia) since 2008.

## Major developed computational codes

- Mesoscopic code for simulation of carbon nanotube-reinforced nanocomposites (serial/parallel, Fortran 90). Applications: structural, mechanical, and thermal properties of carbon nanotube-based materials including CNT-reinforced nanocomposites.
- Molecular dynamics code (serial/parallel, Fortran 90). Applications: Large-scale simulation of MAPLE.
- Three-dimensional Direct Simulation Monte Carlo code for multi-component unsteady and steady-state flows (parallel, C++). Applications: Rarefied gas flows over bodies; flows over evaporating particles in a rarefied gas, comet atmospheres; atmospheric escape; laser-induced plume expansion, rarefied jets in the cross-flow.
- General-purpose two-dimensional hydrodynamic code for simulations of incompressible fluid and multiphase flows in domains with moving interfaces. Applications: Expulsion of the molten material in CW and pulsed laser ablation.
- Code for simulations of two-dimensional heating and evaporation of non-spherical particles induced by laser heating (serial, C++). Application: Laser-induced non-homogeneous heating and evaporation of dispersed particles in aerosols; simulations of non-homogeneous thermal state of rotating comet nuclei.
- One-dimensional hydrodynamic code for simulations of non-equilibrium laser-induced phase transformation, mechanical and thermal processes in metals based on a complex multiphase equation of state (serial, Fortran 90).
- Code for simulations of two-dimensional sub/and supersonic gas-solid particle two-way coupled flows with collisions between solid particles (serial, C++). Applications: Supersonic two-phase flows over blunt bodies; subsonic two-phase wakes past blunt bodies; hydrodynamic interaction of bodies in two-phase flows; supersonic two-phase impinging jets.
- Visualization tools for scientific computations (based on Windows API and MFC library, C++).

## HONORS AND AWARDS

- |            |   |
|------------|---|
| 2016       | National Science Foundation CAREER Award.   |
| 2006, 2007 | Marie Curie Research fellowship from the European Community, Transfer of Knowledge Program.   |
| 2001, 2002 | Awards of the Federation of Cosmonautics of Russia for the best presentations at the 1 <sup>st</sup> and 2 <sup>nd</sup> International Science and Engineering Conferences “Modern problems of aerospace science and technology.” |

- 2001 Award for the best presentation at the XIII School-Seminar of Young Scientists and Specialists under the Leadership of the Academician Professor A.I. Leontiev “Physical Principles of Experimental and Mathematical Simulation of Heat and Mass Transfer and Gas Dynamics in Power Plants.”
- 1997 Award for the best presentation at XIV Session of International School on Models in Continuum Mechanics.
- 1995-1996 Science fellowship for outstanding young scientist from the Government of Russia.
- 1995-1996 Soros graduate student scholarship.

#### **AFFILIATIONS**

- American Society of Mechanical Engineering (since 2008)
- American Institute of Aeronautics and Astronautics (since 2008)
- Materials Research Society (since 2011)
- American Physical Society (2007-2012, 2016-)