

DANIIL ANDRIENKO

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EDUCATION

Wright State University, Dayton, OH

July 2014

Ph.D. in Mechanical and Materials Engineering

Major: Computational Design and Optimization

GPA: 4.00/4.00

Dissertation: Non-equilibrium models of reacting flows

Moscow Institute of Physics and Technology

Nov 2013

Ph.D. in Applied Physics and Mathematics

Major: Mechanics of Fluids and Plasma

GPA: 5.00/5.00

Dissertation: Numerical models of radiation gasdynamics of high temperature gas flows.

Moscow Institute of Physics and Technology

June 2010

M.Sc. in Applied Physics and Mathematics

GPA: 5.00/5.00

Thesis: The P_1 -approximation of Spherical Harmonics Method in two-dimensional axisymmetric geometry, formulated in curvilinear coordinates.

Moscow Institute of Physics and Technology

June 2008

B.Sc. in Applied Physics and Mathematics

GPA: 4.67/5.00

Project: Application of nonlinear iterational algorithm for two-dimensional heat transfer equation.

WORK EXPERIENCE

Texas A&M University

Jan 2018 - present

Assistant Professor

College Station, TX

- Establishing High Temperature Gas Dynamics Laboratory
- Conducting research and teaching

University of Michigan - project PSAAP

May 2016 - Dec 2017

Postdoctoral Research Fellow

Ann Arbor, MI

- Predictive Science Academic Alliance Program, NNSA agreement
- Simulated new generation of solar energy harvesters with turbulence-particle-radiation coupled interaction
- Studied radiation energy transfer in multi-phase flows
- Developed Monte-Carlo Ray-Tracing routing for high-fidelity, heavily parallel calculations
- Collaborated with Stanford University (Flow, Turbulence and Combustion laboratory)

University of Michigan - project ETNA

June 2014 - Dec 2017

Postdoctoral Research Fellow

Ann Arbor, MI

- Activity: Energy Transfer in Nonequilibrium Air, AFOSR BRI grant

- Developed models of energy transfer in high temperature nonequilibrium air using quasi-classical trajectory method
- Parallelized Monte-Carlo method for Unix cluster
- Calculated high-fidelity reaction rates in air oxygen-nitrogen mixture in shock waves
- Wrote program code and performed numerical solution of chemical species mass and energy conservation equations in shock conditions
- Proposed a model of energy exchange in dissociated oxygen
- Gave nearly 20 presentations to the audience of 15-40 people
- Mentored graduate and undergraduate students
- Collaborated with Georgia Institute of Technology, Stanford University and University of Texas at Austin

Wright State University

Graduate Research Assistant

Apr 2012 - May 2014
Dayton, OH

- Developed computer code intended to predict composition of chemically reacting flow by introducing advanced computing methods
- Revisited and improved numerical models of radiative heat transport
- Adapted numerical models of radiative heat transport for unstructured grids

Moscow Institute of Physics and Technology

Research scientist

Aug 2013 - Nov 2013
Moscow, Russia

- Simulated properties of non-equilibrium air plasma
- Accurately predicted an experimentally measured critical electron concentration in the vicinity of descent spacecraft in Earth atmosphere

Wright State University

Visiting Researcher

Aug 2011 - Apr 2012
Dayton, OH

- Developed computer models of hydrogen and hydrocarbons combustion
- Investigated mass and heat transfer in compressible counter-flowing jets
- Developed and implemented advanced numerical algorithms for flame front capturing and flame propagation in hydrogen and carbon fuels

Institute for Problems in Mechanics

Assistant Researcher

Sep 2007 - July 2011
Moscow, Russia

- Utilized CAD software (Fluent, Comsol) to build numerical model of supersonic flow in a shock tube
- Advanced of numerical methods for convective-diffusion type equations and implementation of unstructured grids for predicting the heating rates for complex shape bodies
- Developed a series of two and three dimensional program codes for numerical solution of Navier-Stokes equations and radiation transfer
- Revisited and predicted the convective and radiative heating rates to the surface of a number of spacecrafts: Apollo, Soyuz, Pathfinder, Orion, FIRE II

PEER-REVIEWED JOURNAL ARTICLES: CITATION COUNT = 172 AS OF JAN 2018

1. **D Andrienko** and ID Boyd "Vibrational energy transfer and dissociation in O₂-N₂ collisions at hyperthermal temperatures", Journal of Chemical Physics, under review, 2018
2. **D Andrienko** and ID Boyd "State-specific dissociation in O₂-O₂ collisions by quasiclassical trajectory method" Chemical Physics Vol. 491, No. 3, pp.74-81, 2017
3. K Neitzel, **D Andrienko**, ID Boyd, "Aerothermochemical Nonequilibrium Modeling for Oxygen Flows", Journal of Thermophysics and Heat Transfer, Vol. 31, No. 3, pp.634-645, 2017
4. **D Andrienko** and ID Boyd "Kinetic models of oxygen thermochemistry based on quasi-classical trajectory method", Journal of Thermophysics and Heat Transfer, in press, (**invited publication**).

5. **D Andrienko** and ID Boyd "Thermal relaxation of molecular oxygen in collisions with nitrogen atoms", Journal of Chemical Physics, Vol. 145 (1), 014309, 2016, [DOI](#)
6. I Ulusoy, **D Andrienko**, ID Boyd and R Hernandez "Quantum and quasi-classical collisional dynamics of O₂-Ar at high temperatures", Journal of Chemical Physics, Vol. 144 (23), 234311, 2016, [DOI](#)
7. **D Andrienko** and ID Boyd "Rovibrational energy transfer and dissociation in O₂-O collisions", Journal of Chemical Physics, Vol. 144 (10), 104301, 2016, [DOI](#)
8. **D Andrienko** and ID Boyd "High Fidelity Modeling of Thermal Relaxation and Dissociation of Oxygen", Physics of Fluids, Vol. 27, 116101, 2015, [DOI](#)
9. **D Andrienko** and ID Boyd "Master Equation Study of Vibrational and Rotational Relaxation of Oxygen", Journal of Thermophysics and Heat Transfer, Vol. 30 (3), pp. 533-552, 2016, [DOI](#)
10. **D Andrienko**, ST Surzhikov and JS Shang "View-factor approach as a radiation model for the re-entry flowfield", Journal of Spacecraft and Rockets, Vol. 53 (1), pp.74-83, 2016, [DOI](#).
11. **D Andrienko** and ID Boyd, "Investigation of Oxygen Vibrational Relaxation by Quasi-Classical Trajectory Method", Chemical Physics, Vol. 459, pp. 1-13, 2015, [DOI](#)
12. JS Shang, **D Andrienko**, PG Huang and ST Surzhikov "A computational approach for hypersonic nonequilibrium radiation utilizing space partition algorithm and Gauss quadrature", Journal of Computational Physics, Vol. 266, pp 121, 2014, [DOI](#)
13. **D Andrienko**, ST Surzhikov and JS Shang "Spherical Harmonics Method Applied to the Multi-Dimensional Radiation Transfer Equation", Journal of Computer Physics Communications, Vol. 184, No 10, pp.2287-2298, 2013, [DOI](#)
14. **D Andrienko** and ST Surzhikov "P₁ approximation applied to Radiative heating of Descent Spacecraft", Journal of Spacecraft and Rockets, Vol. 49, No. 6, pp. 1088-1098, 2012, [DOI](#)
15. **D Andrienko** and ST Surzhikov "The unstructured two-dimensional grid-based computation of selective thermal radiation in CO₂-N₂ mixture flows", Journal of High Temperature, Vol. 50, No. 4, pp.545-555, 2012, [DOI](#)
16. **D Andrienko** and ST Surzhikov "The heat transfer equation formulated through the P₁-approximation of spherical harmonics method for nonscattering media Physical and chemical kinetics, Vol. 9, 2010.
17. **D Andrienko** and ST Surzhikov, "Comparing the heat transfer equation solution, obtained by the spherical harmonics method and the ray-tracing method in the complex curvilinear geometry, BMSTU, Vol.3, 2010, pp.15-30.
18. **D Andrienko** "Applying the P₁-approximation of spherical harmonics method for heat transfer equation," Journal of Thermal Processes in Engineering, Vol. 11, No. 11, pp. 477-483, 2009.
19. **D Andrienko**, ST Surzhikov "Solving the two dimensional Poisson equation with nonlinear iterational method", Physical and chemical kinetics, Vol. 7, 2008.

TEACHING EXPERIENCE

- Instructor of graduate class "Molecular Gas Dynamics", University of Michigan, Spring 2017
- Mentored 4 undergraduate and graduate students
- Co-instructor of graduate class "Molecular Gas Dynamics", University of Michigan, Spring 2015
- Designed an introductory course "Aerodynamics and history of flight", outreach program for high school students
- Presented a guest lecture "Radiation transfer in Hypersonic Flights" in graduate class "Hypersonic Flows", University of Michigan, Fall 2015

INVITED TALKS AND SEMINARS

- "State Resolved Analyses of High Temperature Energy Transfer Processes in Oxygen", Society of Engineering Science 52nd Technical Meeting, Oct 26-28, 2015
- "High fidelity models of oxygen chemistry", FlowPAC Seminar Series, University of Notre Dame, Oct 15, 2015

PEER REVIEW EXPERIENCE

- Journal of Chemical Physics

- Chemical Physics
- Physics of Fluids
- Journal of Thermophysics and Heat Transfer
- Journal of Spacecraft and Rockets
- International Journal of Heat and Mass Transfer

EDITORIAL EXPERIENCE

- IOP Journal of Physics: Conference Series

CONFERENCE (ABSTRACT REVIEWED) PAPERS

1. **D Andrienko**, ID Boyd "State-resolved characterization of nitric oxide formation in shock flows", AIAA Paper 2018-1233, Jan 2018
2. **D Andrienko**, ID Boyd "Dissociation of oxygen and nitrogen in a bimolecular reaction at hypersonic temperatures", AIAA Paper 2018-0240, Jan 2018
3. D Yatsukhno, S Surzhikov, O Bessonov, **D Andrienko**, J Annaloro "Radiative Gas Dynamics of Exomars at Angle of Attack in view of Turbulent Heating", AIAA Paper 2018-0982
4. **D Andrienko**, ID Boyd, "Vibrational relaxation and dissociation in O₂-O mixtures", AIAA Paper 2016-4021, June 2016, [DOI](#)
5. **D Andrienko**, ID Boyd "Master equation simulation of O₂N₂ collisions on an ab-initio potential energy surface", AIAA Paper 2017-3163, June 2017
6. **D Andrienko**, ID Boyd "Simulation of Oxygen Dissociation on a Six-dimensional O₄ Potential Energy Surface", 2017-3487, June 2017
7. **D Andrienko**, ID Boyd "State-resolved O₂N₂ kinetic model at hypersonic temperatures" 2017-0659, Jan 2017
8. IS Ulusoy, **D Andrienko**, ID Boyd, R Hernandez "Quantal treatment of O₂Ar vibrational relaxation at hypersonic temperatures", 2017-0661, Jan 2017
9. K. Neitzel, **D Andrienko**, ID Boyd, "Thermochemical Nonequilibrium Modeling for Hypersonic Flows Containing Oxygen", AIAA Paper 2016-4023, June 2016, [DOI](#)
10. **D Andrienko**, ID Boyd, "High Fidelity Modeling of Thermal Relaxation and Dissociation of Oxygen", AIAA Paper 2016-0736, January 2016, [DOI](#)
11. **D Andrienko**, ID Boyd, "Simulation of O₂-N Collisions on ab-initio Potential Energy Surfaces", AIAA Paper 2016-1249, January 2016, [DOI](#)
12. **D Andrienko**, ID Boyd, "Master Equation Study of Vibrational and Rotational Relaxation of Oxygen," AIAA Paper 2015-3252, June 2015, [DOI](#)
13. **D Andrienko**, ID Boyd, "Vibrational Relaxation and Dissociation of Oxygen in Molecule-Atom Collisions," AIAA Paper 2015-3251, June 2015, [DOI](#)
14. K Neitzel, **D Andrienko**, ID Boyd, "Modeling Fidelity for Oxygen Nonequilibrium Thermochemistry in Reflected Shock Tube Flows", AIAA Paper 2015-2509, June 2015, [DOI](#)
15. JS Shang, **D Andrienko**, ST Surzhikov, and PG Huang An efficient computational approach to hypersonic nonequilibrium radiation utilizing Gaussian Quadrature and Space Partition AIAA paper 2013-2587, January 2013, [DOI](#)
16. **D Andrienko**, Shang JS, Huang PG, Katta V "Compressible counter-flowing hydrogen-air combustion," 51st AIAA paper 2013-293, January 2013, [DOI](#)
17. **D Andrienko**, Surzhikov ST, Shang JS "Three-dimensional Radiative Heating of Descent Space Vehicle Based on Spherical Harmonics Method with Unstructured Grids," 50th AIAA meeting, Nashville, TN, January 2012, [DOI](#)
18. **D Andrienko**, Surzhikov ST Models of spectral radiation heat transfer for Martian space vehicles, Proceedings of 7th International Planetary Probe Workshop (on CD), 2010, Barcelona, Spain, 12-18 June.
19. ST Surzhikov, **D Andrienko** Aerothermodynamics of descent space vehicles at strong coupled radiative-gasdynamic interaction, Proceedings of 7th International Planetary Probe Workshop (on CD), 2010, Barcelona, Spain, 12-18 June.

20. **D Andrienko** Solving the heat transfer equation in non-scattering media using spherical harmonics method, Proceedings of Problems of gasdynamic and heat transfer in aerospace technologies, 2009, Vol. 2, pp. 172-175.
21. **D Andrienko**, ST Surzhikov Two-dimensional radiation heat transfer to Martian space vehicle, Proceedings of the 3rd International Workshop on Radiation of High Temperature Gases in Atmospheric Entry (on CD), 2009, October 3-7, Iraklion, Greece.
22. **D Andrienko**, ST Surzhikov The heat transfer equation formulated through the p1-approximation of spherical harmonics method for non-scattering media, Proceedings of 2 nd scientific school-seminar Aerophysics and physical mechanics of classical and quantum systems, 2008, pp. 172-175.

PROJECTS

- NNSA "Predictive Science Academic Alliance Program", 2016–present
- AFOSR "Energy Transfer in Nonequilibrium Air", 2014–present
- European Community's Seventh Framework Programme (FP7/2007 – 2013)
- Development of Physical-Chemical Models in Hypersonic Flows (Russian Foundation of Fundamental Research), 2010 – 2011
- Membership in project of Science Department of Russian Federation Mechanics of System with Internal Degrees of Freedom MIPT - IMPeh RAS, 2009 – 2011
- Russian-Italian Agreement CNR - RAS. (M. Capitelly & S. Surzhikov), 2009 – 2010

SCHOLARSHIP AND AWARDS

- Final year Ph.D. student assistantship, \$15000 + full tuition, Wright State University, 2013 – 2014 year
- Tuition waiver academic award, Wright State University, 2012 – 2013
- Research associate, Universal Technology Corp., Subcontract agreement 12-5590-0004-C1 (Wright State University, Prof. J. S. Shang), 2011-2013.
- Radiation at Hypersonic Flow Conditions, Research Assistantship, Prof. J.S. Shang, Prof. P.G. Huang, Wright State University, Sep 2012 - July 2013.
- Grant no. 11-01-09201: Participation in the 49th AIAA conference, Russian Academy of Science, 2009-2010.
- Best Student Presentation (Central Institute of Airplane Engine Manufactory, Moscow, 2011)
- Annual student fellowship (Dynasty, Non-Profit Foundation, Moscow, 2010)
- Annual award: outstanding student contribution, Institute for problems in mechanics, Moscow, 2008, 2009, 2010