# CONFERENCE AGENDA

## Sunday, September 28, 2025

| | | |
|---|---|---|
| 11:00 am | 7:00 pm | Registration Desk |
| 1:00 pm | 5:00 pm | Short Courses |
| 5:30 pm | 8:30 pm | Welcome Reception |

## Monday, September 29, 2025

| | | |
|---|---|---|
| 7:00 am | 1:00 pm | Registration Desk |
| 7:00 am | 8:20 am | Breakfast |
| 8:20 am | 8:40 am | Welcome Address |
| 8:40 am | 9:40 am | Keynote Lecture |
| 9:40 am | 10:00 am | Break |
| 10:00 am | 11:40 am | Technical Presentations |
| 11:40 am | 1:00 pm | Lunch |
| 1:00 pm | 2:40 pm | Technical Presentations |
| 2:40 pm | 3:00 pm | Break |
| 3:00 pm | 4:40 pm | Technical Presentations |
| 4:40 pm | 5:00 pm | Break |
| 5:00 pm | 6:00 pm | SPARTA Users Meeting |

## Tuesday, September 30, 2025

| | | |
|---|---|---|
| 7:00 am | 1:00 pm | Registration Desk |
| 7:00 am | 8:00 am | Breakfast |
| 8:00 am | 10:00 am | Technical Presentations |
| 10:00 am | 10:20 am | Break |
| 10:20 am | 11:40 am | Technical Presentations |
| 11:40 am | 1:00 pm | Lunch |
| 1:00 pm | 3:00 pm | Technical Presentations |
| 3:00 pm | 3:20 pm | Break |
| 3:20 pm | 4:40 pm | Technical Presentations |
| 5:00 pm | 6:00 pm | RGD NextGen Social Hour |
| 6:30 pm | 9:00 pm | Banquet |

## Wednesday, October 1, 2025

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|---|---|---|
| 7:00 am | 1:00 pm | Registration Desk |
| 7:00 am | 8:00 am | Breakfast |
| 8:00 am | 10:00 am | Technical Presentations |
| 10:00 am | 10:20 am | Break |
| 10:40 am | 11:40 am | Technical Presentations |
| 11:40 am | 1:00 pm | Lunch |
| 1:00 pm | 2:00 pm | RGD NextGen Round Table |

# *Sunday, September 28, 2025*

## Session 1: Short Course

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|---|---|
| 1:00-3:00 | **DSMC and Beyond: Modeling Nonequilibrium Flow in Aerospace Applications**<br>E. Jun |
| 3:00-5:00 | **Quantum Mechanics To Aerothermodynamics: A High-Fidelity Approach for Reactive Flows**<br>M. Grover |
| 5:30-8:30 | **Welcome Reception** |

# *Monday, September 29, 2025*

## Session 2: Keynote Lecture

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|---|---|
| 8:20-8:40 | **Welcome**<br>B. Hassan |
| 8:40-9:40 | **Graeme A. Bird Keynote Lecture – Direct Molecular Simulation: How DSMC Has Improved CFD for Hypersonics**<br>T. Schwartzentruber |
| 9:40-10:00 | **Break** |

# *Monday, September 29, 2025*

## Session 3: Chemistry I

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|---|---|
| 10:00-10:20 | **DSMC Chemistry Models for Hypersonic Particle-Continuum Methods**<br>M. Wall, I.D. Boyd |
| 10:20-10:40 | **Reaction-Induced Departures from Continuum Navier-Stokes Turbulence**<br>C. T. Williams, R. M. McMullen, M. A. Gallis |
| 10:40-11:00 | **Direct Molecular Simulation of Oxygen Including Excited Electronic States of O and $O_2$**<br>E.C. Geistfeld |
| 11:00-11:20 | **Kinetic-Continuum Consistent Dissociation Model for DSMC**<br>M. D. Kroells, T. E. Schwartzentruber |
| 11:20-11:40 | **Guidelines for Use of the Ambipolar Diffusion Approximation in Rarefied Hypersonic Flows**<br>M. Petrusky, I.D. Boyd |
| 11:40-1:00 | **Lunch** |

# *Monday, September 29, 2025*

## Session 4: Plasmas and Turbulence

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|---|---|
| 1:00-1:40 | **Invited: Development and Application of Particle Methods at DLR Spacecraft Department**<br>M. Grabe, L. Basov, M. Ertl |
| 1:40 -2:00 | **Investigation of Thermochemical Effects on Hypersonic Flow Over a Double Cone**<br>S. Thirani, I. T. Karpuzcu, D. A. Levin |
| 2:00-2:20 | **Molecular-Level Simulations of Turbulent Couette Flow over a Thermal-Protection-System Material**<br>R. M. McMullen, A. Borner, M. A. Gallis |
| 2:20-2:40 | **Hybrid ℓDSMC-CRM-PIC Method for Simulations of Laser-Induced Plasma Plumes**<br>T. J. Tripoli, M. A. Stokes, A. N. Volkov |
| 2:40-3:00 | **Break** |

# *Monday, September 29, 2025*

## Session 5: Chemistry II

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| 3:00-3:20 | **Investigation of a Mach 15 Reactive Air Flow over a Blunt Wedge using Ab Initio Molecular Simulation: Effect of Wall Temperature**<br>P. Valentini, Z. Davis, M. S. Grover, N. J. Bisek |
| 3:20-3:40 | **Numerical Study on the Setup of an Atomic Oxygen Ground Testing Facility**<br>K. Ellenberger, R. Tietz, S. Fasoulas, M. Pfeiffer |
| 3:40-4:00 | **Multiple Relaxation Beyond Jean's Equation**<br>Z. Eckert, M. A. Gallis |
| 4:00-4:20 | **Does Sound Reciprocity Hold at Non-Continuum Conditions?**<br>A. Manela, Y. Ben-Ami |
| 4:20-4:40 | **Gas Dynamics Simulation and Measurement for Atomic Tritium in the Project 8 Neutrino Mass Experiment**<br>A. Lindman |
| 4:40-5:00 | **Break** |
| 5:00-6:00 | **SPARTA Users Meeting**<br>S. Moore,S. Plimpton |

# *Tuesday, September 30, 2025*

## Session 6: Gas-Surface Interactions

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| 8:00-8:40 | **Invited: Development of an Interface Coupling Method for DSMC**<br>S.J. Poovathingal, E. Huff, V. B. Mohan Ramu, A. Yassin |
| 8:40-9:00 | **Modeling Low-Density Parachute Broadcloth Permeability for Mars Supersonic Parachute Inflations**<br>S. D. Ghasimi, J. Rabinovitch |
| 9:00-9:20 | **Extending the Washboard-CLL Hybrid Approach for Realistic Gas-Surface Scattering**<br>W. Park, E. Jun |
| 9:20-9:40 | **Lift and Drag for Low Earth Orbit Satellites using Modified Washboard Model**<br>J. Thayer, M. D. Kroells, T. E. Schwartzentruber |
| 9:40-10:00 | **Control Systems for Stable Normal Shocks**<br>A. Vellucci, K. Hansson |
| 10:00-10:20 | **Break** |

# *Tuesday, September 30, 2025*

## Session 7: Verification & Validation

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|---|---|
| 10:20-10:40 | **Linking Gas–Grain Microphysics to Mie-Scattering Brightness via DSMC: Insights from Io's Tvashtar Plume**<br>A. O. Adeloye, L. M. Trafton, D. B. Goldstein, P. L. Varghese, A. Mahieux |
| 10:40-11:00 | **Experimental Verification of Ab Initio Based DSMC Parameters**<br>M. S. Grover, N. J. Bisek, P. Valentini |
| 11:00-11:20 | **Comparison between CFD and DSMC Analysis for a Deployable Mars Entry Vehicle**<br>F. Portis, D. D'Ambrosio, T. Schwartzentruber, A. Schettino, P. Vernillo |
| 11:20-11:40 | **Code-Verification Techniques for Computational Plasma Physics**<br>B. A. Freno, T. M. Smith, C. H. Moore, W. J. McDoniel, D. A. O. McGregor |
| 11:40-1:00 | **Lunch** |

# *Tuesday, September 30, 2025*

## Session 8: Non-Continuum Flows I

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|---|---|
| 1:00-1:40 | **Invited: …It's All in the Boundary Conditions**<br>D. Goldstein |
| 1:40-2:00 | **DSMC-Driven Exploration of Hypervelocity Sampling and Fractionation to Support the VATMOS-SR Mission Concept**<br>A. Borner, J. Rabinovitch, M. A. Gallis, G. Avice, R. Parai, M. P. Petkov, C. Sotin |
| 2:00-2:20 | **Comparison of Non-Equilibrium DSMC and CFD Predictions for Mach 21 Flow over Varda Space Industries Blunted Atmospheric Re-entry Vehicle**<br>J. D. Crespo, P. Valentini, Z. Davis, A. Rao, M. Kulakhmetov, R. Alviani |
| 2:20-2:40 | **Kinetic Linear Stability Analysis of Canonical Flows**<br>I. T. Karpuzcu, D. A. Levin |
| 2:40-3:00 | **Rarefied Re-entry Flow Simulation over a LEO Shuttle Configuration Using DSMC with Stability Analysis**<br>A. Klothakis, K. Dylewicz, I. K. Nikolos, V. Theofilis |
| 3:00-3:20 | **Break** |

# *Tuesday, September 30, 2025*

## Session 9: Hybrids

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|---|---|
| 3:20-3:40 | **A Hybrid ℓDSMC-CRM Method for Prediction of Non-Equilibrium Ionization and Excitation on Radiation Absorption in Plasma Plumes Induced by Ablation of Metal Targets with Nanosecond Laser Pulses**<br><br>M. A. Stokes, A. N. Volkov, S. A. Khairallah, Z. Lin |
| 3:40-4:00 | **Continuum Breakdown Including Thermochemical Nonequilibrium and Multicomponent Diffusion in CFD and DSMC**<br><br>S. R. Cranford, M. D. Kroells, T. E. Schwartzentruber |
| 4:00-4:20 | **Enhanced DSMC-GSI Modeling using Machine Learning-Derived Scattering Kernels from MD Simulations for VLEO Aerodynamics**<br><br>M. Schütte, S. Fasoulas, M. Pfeiffer |
| 4:20-4:40 | **Fokker–Planck-Based Kinetic Models for Rarefied Gas Flows: Extending to Diatomic Mixtures and Achieving Second-Order Accuracy**<br><br>J. Kim, E. Jun |
| 5:00-6:00 | **RGD NextGen Social Hour** |
| 6:30-9:00 | **Conference Banquet** |

# *Wednesday, October 1, 2025*

## Session 10: Methods

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|---|---|
| 8:00-8:40 | **Invited: Rarefied Mysteries of Water-Vapor Flows in Micropropulsion and Lyophilization**<br><br>A. Alexeenko, J. Meza-Galvan, E. Zabalegui Lopez, E. Vorozhbit |
| 8:40-9:00 | **Adventures with Variable-Weight Particles**<br><br>W. J. McDoniel, C. H. Moore |
| 9:00-9:20 | **SPARTA KOKKOS: Performance Portability Realized**<br><br>S. Moore |
| 9:20-9:40 | **Investigating Aerodynamically Induced Fracture of Cloud Ice in Hypersonic Environments**<br><br>E. H. Huff, C. E. Américo, H. Chen, S. J. Poovathingal |
| 9:40-10:00 | **Surrogate Modeling of DSMC Computations via Deep Neural Networks**<br><br>E. Roohi, A. Shojasani, S. K. Stefanov |
| 10:00-10:20 | **Break** |

# *Wednesday, October 1, 2025*

## Session 11: Non-Continuum Flows II

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|---|---|
| 10:20-10:40 | **Simulating Flexible Fuels for Electric Propulsion**<br>C. Hill, A. Smith, D. Bilyeu |
| 10:40-11:00 | **DSMC Simulations of Free Jets from a Sonic Orifice at One Atmosphere Stagnation Condition into a Vacuum with Comparison to Theory**<br>F. E. Lumpkin |
| 11:00-11:20 | **Assessment of the Stochastic Weighted Particle Method in SPARTA**<br>T. P. Koehler, A. Hong, M. A. Gallis |
| 11:20-11:40 | **Coupled Radiation Hydrodynamics and Molecular Simulations of High-Rate Thermal Decomposition of Polyethylene**<br>M.A. Gallis, N. W. Moore, G. Tipton, Z. S Eckert, T. P. Koehler |
| 11:40-1:00 | **Lunch** |
| 1:00-2:00 | **RGD NextGen Round Table Discussion** |