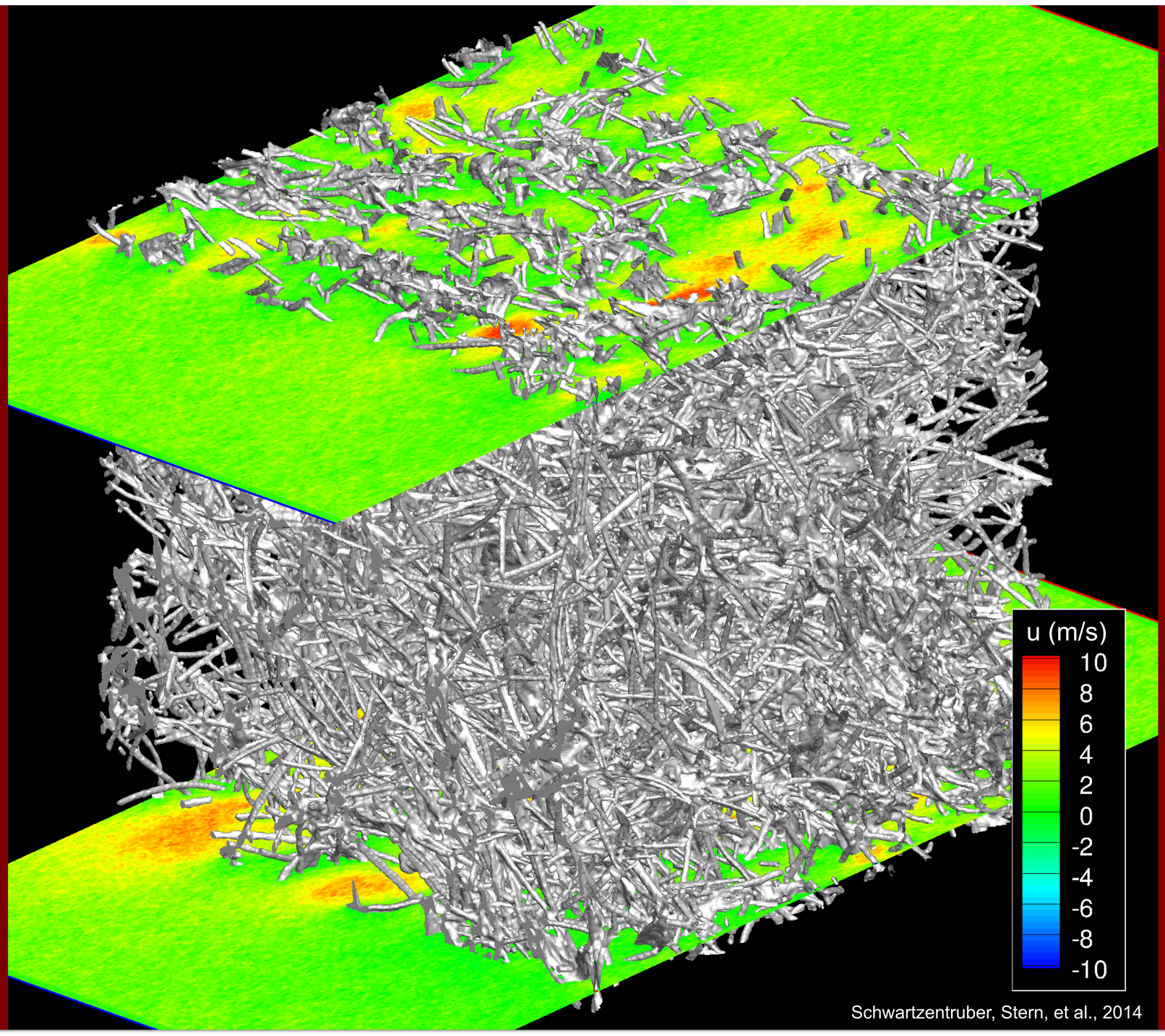
11th Ablation Workshop

September 16-17, 2019
Coffman Theater, Coffman Memorial Union, University of Minnesota
300 Washington Ave. S.E., Minneapolis, MN 55455
http://ablation2019.engr.uky.edu

Hosted and organized by

University of Minnesota

University of Kentucky



Steering organizations

Sandia National Laboratories

NASA

Agenda

Sponsored by

Sandia National Laboratories

University of Minnesota

NASA Minnesota Space Grant College Consortium — L'etoile du Nord

NASA Kentucky — Space Grant Consortium and EPSCoR Programs

Agenda

Monday September 16, 2019

Introduction/Overview
Chair: Alexandre Martin, University of Kentucky, USA

7:15 Registration, Breakfast and Coffee
8:00 Overview and welcome
Thomas Schwartzentruber, University of Minnesota, USA
8:15 Overview of NASA ablation activities
Michael Wright, NASA Ames Research Center, USA
8:25 MSR EEV TPS - Requirements, Options, and Trades - What is in, what is out, and challenges ahead
Ethiraj Venkatapathy, NASA Ames Research Center, USA
8:50 Overview of Sandia National Laboratories ablation activities
Derek Dinzl, Sandia National Laboratories, USA
9:15 Overview of ESA ablation activities
Gregory Pinaud, Ariane Group SAS, France
9:40 Overview of AFOSR ablation activities
Ivett Leyva, Air Force Office of Scientific Research, USA
9:50 Coffee Break

Technical Session #1: Micro-tomography based analysis
Chair: Thomas Schwartzentruber, University of Minnesota, USA

10:20 Microscopic imaging of carbon fiber oxidation in 4D
Francesco Panerai, University of Illinois - Urbana-Champaign, USA
10:40 Ablation of carbon fiber TPS samples in DSMC
Arnaud Borner, NASA Ames Research Center, USA
11:00 Image-based mesoscale ablation modeling
Lincoln Collins, Sandia National Lab, USA
11:20 Computation of fiber orientation in X-ray micro-tomography reconstructions
Frederico Semeraro, NASA Ames Research Center, USA
11:40 Applying multi scale computational materials science method to predict ablation of PICA
Michael Tonks, University of Florida, USA
12:00 Lunch - Graduate Hotel Pinnacle Ballroom (2nd floor of conference hotel)

Technical Session #2: Atomistic chemistry and Finite Rate Modeling
Chair: TBD

13:20 Molecular beam studies of carbon and silicon carbide ablation by O and N atoms
Timothy Minton, Montana State University, USA
13:40 Visualizing oxidative and ablation erosion of HOPG using supersonic beams of O2
Timothy Grabnic, University of Chicago, USA
14:00 Finite rate modeling of reactions between dissociated air and carbon at high temperature
Tom Schwartzentruber, University of Minnesota, USA
14:20 Kinetics model of graphite ablation rates as a function of microstructure
Erica Corral, University of Arizona, USA
14:40 An interface for coupling Icarus to the US3D flow solver
Vladimir Gidzak, GoHypersonic, Inc., Minneapolis, USA

Poster Session (see page 4)

15:30 Poster session - Graduate Hotel Pinnacle Ballroom (2nd floor of conference hotel)
17:00 Adjourn
18:00 Banquet - Campus Club West Wing

Agenda

Tuesday September 17, 2019

Technical Session #3: Material characterization
Chair: TBD

7:15 Registration, Breakfast and Coffee
8:00 Unraveling the mysteries of transport properties in porous media
Alexandre Martin, University of Kentucky, USA
8:20 Additive manufacturing of ultra-performance polymers for TPS
Joseph Koo, University of Texas at Austin, USA
8:40 Multi-scale thermal response modeling of an AVCOAT-like TPS material
Surabh Sawant, University of Illinois - Urbana-Champaign, USA
9:00 Phenolic polymer pyrolysis via reactive molecular dynamics simulation
Keith Jones, Sandia National Lab, USA
9:20 A coupled DSMC-SPH solver to study atmospheric entry ablation in the presence of a rarefied gas phase
Federico Bariselli, von Karman Institute (VKI) for Fluid Dynamics, Belgium
9:40 Coffee Break

Technical Session #4: Experimental measurements
Chair: TBD

10:10 TPS technology maturation and sustainment in support of in-situ science missions: HEET and PICA
Mairead Stackpoole, NASA Ames Research Center, USA
10:30 Airborne observation and X-ray analysis of the Hayabusa SRC heat shield and plan for Hayabusa 2
Tetsuya Yamada, Japan Aerospace Exploration Agency (JAXA), Japan
10:50 Analysis of the hypervelocity impact response of graphite and weather capabilities at NASA WSTF-RHTL
Ben Carmichael, Southern Research - Hypersonics Department, USA
11:10 Ablation chemistry under high-heat / high-flux solar testing
Bernadette Hernadez-Sanchez, Sandia National Lab, USA
11:30 An ultrasonic method for ablation rate measurement of silica-phenolic TPS material
Aleksander Zibitsker, Israel Institute of Technology (Technion), Haifa, Israel.
11:50 Analysis of the PICA-NuSil HyMETS Arc-Jet Campaign
Brody Bessire, NASA Ames Research Center, USA
12:10 Lunch - Graduate Hotel Pinnacle Ballroom (2nd floor of conference hotel)

Technical Session #5: ICP modeling and experiment
Chair: TBD

13:30 Recombination of nitrogen atoms in high-temperature graphite
Doug Fletcher, University of Vermont, USA
13:50 Investigation of thermochemical processes in inductively coupled plasma torches
Savio Poovathingal, University of Michigan, USA
14:10 Modeling of silicon carbide oxidation in coupled, reacting boundary layers
Samuel Chen, University of Michigan, USA
14:30 Surface catalyzed recombination on high-temperature carbonaceous fiber materials
Jason Meyers, University of Vermont, USA
14:50 Coffee Break
15:20 Material characterization and ablation experiments of the ZURAM carbon-phenolic ablation
Bernd Helber, von Karman Institute (VKI) for Fluid Dynamics, Belgium
15:40 Validation of carbon ablation models based on Plasmatron experiments
Thierry Magin, von Karman Institute (VKI) for Fluid Dynamics, Belgium

Technical Session #6: Non-TPS related research
Chair: TBD

16:00 Micro-tomography and modeling based reconstruction of meteoritic material in hight temperature air
Justin Haskins, NASA Ames Research Center, USA
16:20 Development of a melt flow boundary condition in the Icarus material response solver
Grant Palmer, NASA Ames Research Center, USA
16:40 Ablation test-case series: What about joining forces with the fire and biomass communities?
Gregory Pinaud, Ariane Group SAS, France
17:00 Conclusion/Adjourn

Posters

Numerical simulation of porous flow and ablative test case under supersonic flow conditions, *Umran Duzel, University of Kentucky*

A multiphysics phase-field tool to model PICA on atmosphere entry conditions, *Marina Sessim, University of Florida*

Video processing for evaluation of ablative behavior of meteorite samples tested in the IHF and HyMETS arc-jet facilities, *Aleksander Zibitsker, Technion, Israel*

Strain-dependent analysis of conductivity in fibrous insulation materials, *Christopher Barrow, University of Kentucky*

A finite-rate model for air-carbon ablation, *Sandeep Prata, University of Minnesota*

Decomposition of heat shield silicones under atomic oxygen bombardment, *David Chen, Montana State University*

Heatshield erosion due to dust particle impacts on the Schiaparelli capsule during Martian entry, *Grant Palmer, NASA Ames Research Center*

Overview of modeling micro-meteoroid and orbital debris impact cavity growth, *Olivia Schroeder, University of Minnesota*

Implementation and verification of a mesh motion scheme using radial basis functions in the Icarus material response code, *Olivia Schroeder, University of Minnesota*

Modeling bourbon barrels, *Alexandre Martin, University of Kentucky*

Numerical reconstruction of spalled particle trajectories in an arc-jet environment, *Raghava Davuluri, University of Kentucky*

Fully coupled material-environment simulation of a Simoun plasma wedge test on a conformable C/P with PATO, *Gregory Pinaud, Ariane Group SAS, France*

Computational analysis of thermal protection system with embedded vascular network, *Nate Skolnik, University of Illinois - Urbana-Champaign*

Modeling carbon fiber oxidation under high temperature by ReaxFF based molecular dynamics simulation, *Linyuan Shi, University of Florida*

Surface properties on thermal protection system microstructure at flight relevant conditions, *Sahadeo Ramjatan, University of Minnesota*

Bayesian inference and the effects of varying uncertainty models in charring ablation calibration and uncertainty quantification problems, *Przemyslaw Rostkowski, University of Illinois - Urbana-Champaign*

A testing and evaluation facilities framework to develop leading edge materials for application in high speed flows, *Erica Corral, University of Arizona*

Efficient sticking of crystalline nanospheres via phase-transition plasticity, *Traian Dumitrica, University of Minnesota*

Determination of aerothermal environment and ablation material response using inverse methods, *John Thornton, NASA Ames Research Center*

Micro-scale artificial weave generation capabilities for TPS material modeling, *Sander Visser, NASA Ames Research Center*

Progress towards modeling the ablation response of NuSil-coated PICA, *Jeremie Meurisse, NASA Ames Research Center*

Effect of out-gassing on the onset of transition in hypersonic boundary layers, *Mona Karimi, NASA Ames Research Center*

Determination and comparison of the characteristics of a new class of ablative materials, *Ozen Atak, University of Texas at Austin*

Microstructure investigation of elastomeric TPS char based on solid rocks motor experiments, *Ramin Shilav, Rafael, Ltd., Israel*

Model and characterization of ablative composite material based on cork and silicone rubber, *Noa Eizckoviz, Technion, Israel*

HyCUBE: A reconfigurable cubesat-like platform for hypersonic flight testing, *Alex Hayes, University of Minnesota*

Arc jet testing and evaluation of Mo-Si-B coated Mo and SiC-ZrB2 ceramics, *P.J. Ritt, University of Wisconsin*

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