## THWARTS 2019 DETAILED SCHEDULE

### MONDAY OCTOBER 14TH

7:30 – 8:00  Breakfast & Opening Remarks

Opening remarks by Franklin T. Lombardo

8:00 – 9:00  Keynote Lecture

Chasing Science: Reflections on 45 Years of Storm Intercept.

**Erik Rasmussen**  
Senior Research Scientist, VORTEX-SE Coordinating Scientist, CIMMS NSSL and the University of Oklahoma.

9:00 – 10:30  Technical Session #1: Numerical Model & Simulation

1.1  
Hindcasting the damage of Ottawa-Gatineau tornado outbreak of September 2018: a computational fluid and structural mechanics approach  
*Geleta, T.*¹, *Gairola, A.*¹, and *Bitsuamlak, G.T.*¹²  
¹Department of Civil and Environmental Engineering, and WindEEE Research Institute, UWO; ²Boundary Layer Wind Tunnel Laboratory, UWO.

1.2  
Amplitude of different frequencies in the turbulent wind using Fourier and wavelet analysis  
*R. Panneer Selvam*¹  
¹BELL 4190, University of Arkansas, Fayetteville, AR 72701, USA.

1.3  
Numerical simulation of a laboratory tornado simulator capable of translation  
*Ryan Honerkamp*¹ and *Guirong Yan*¹  
¹Missouri University of Science and Technology, Rolla, MO 65409, USA.

1.4  
High-resolution numerical simulations of the interactions of tornadoes with terrain and buildings  
*Anthony E. Reinhart*¹², *David J. Bodine*³, *Martín Satrio*³⁴, *Franklin T. Lombardo*⁵, and *Takashi Maruyama*⁶  
¹Cooperative Institute for Mesoscale Meteorological Studies, Norman, OK; ²National Severe Storms Laboratory, Norman, OK; ³Advanced Radar Research Center, Norman, OK; ⁴School of Meteorology, Norman, OK; ⁵University of Illinois at Urbana-Champaign, Urbana, IL; ⁶Kyoto University, Kyoto, Japan.

1.5  
Effect of few sine waves as inflow turbulence on building peak pressure  
*Zahra Mansouri*¹ and *R. Panneer Selvam*¹  
¹DR.BELL 4190 University of Arkansas, Fayetteville, AR 72701, USA.

1.6  
Comparison of tornado wind field with experiment and effect of chamber geometry on vortex touchdown  
*Sumit Verma*¹ and *R. Panneer Selvam*¹  
¹BELL 4190 University of Arkansas, Fayetteville, AR 72701, USA

10:30 – 10:45  Coffee break

10:45 – 12:15  Technical Session #2: Measurement & Observation

2.1  
Targeted observations by radar and UAS of supercells (TORUS) 2019: first look  
*Donald Burgess*¹  
¹University of Oklahoma CIMMS/NSSL, Norman, OK 73072.

2.2  
Statistical evaluation of the relationship between southern-end supercells and tornado production tendencies  
*Susan L. Beveridge*¹, *Jana Lesak Houser*¹, and *Sara R. Marzola*¹  
¹Ohio University, Athens, OH 45701, USA.

2.3  
What about the thermodynamics?  
*Karen Kosiba*¹ and *Josh Wurman*¹  
¹Center for Severe Weather Research, Boulder, Colorado 80305.
2.4 Radar observations of tornadic debris plumes

Ernest J. Ostuno*1

2.5 Close-range radar observations and high-resolution damage survey of a large, intense tornado in a forested area

Anthony W. Lyza1, Barrett T. Goudeau1, and Kevin R. Knupp1
1Department of Atmospheric Science, Severe Weather Institute - Radar and Lightning Laboratories, University of Alabama in Huntsville, Huntsville, AL 35805, USA.

2.6 Study of tornado vortex induced loads on attached canopies in low rise buildings

Rajesh Goyal1, Mohammed Moizuddin2, and Masahiro Matsui3
1National Institute of Construction Management and Research (NICMAR), Delhi NCR Campus, Bahadurgarh-124507, India; 2Civil Engineering Department, RIMT University, Mandi Gobindgarh-141411, India; 3Department of Architecture, Tokyo Polytechnic University, Kanagawa 243-0297, Japan.

12:15 – 13:45 Lunch


3.1 Finding every tornado in Canada – The Northern Tornadoes Project in 2019

David Sills1
1Faculty of Engineering, University of Western Ontario, London, ON, Canada.

3.2 Implementing advanced drone techniques on damage surveys

Connell Miller1, Gregory Kopp1, and David Sills1
1Northern Tornadoes Project, Western University, London, Ontario, Canada.

3.3 Semantic segmentation of aerial SFM point clouds for post windstorm damage assessment

Mohammad Ebrahim Mohammadi1, Richard L. Wood1, and Daniel P. Watson1
1University of Nebraska-Lincoln, Lincoln, NE 68588-0531, USA.

3.4 Discrete and distributed error assessment of aerial point clouds for post tornado three-dimensional scene reconstruction

Yijun Liao1 and Richard L. Wood1
1University of Nebraska-Lincoln, Lincoln, NE 68588, USA.

3.5 Accelerating post-event data collection and analysis using artificial intelligence

Ali Lenjani1, Shirley J. Dyke1, Ilias Bilionis1, Chul Min Yeum1, and Arindam Gan Chowdhury1
1School of Mechanical Engineering, Purdue University, West Lafayette, IN, USA; 2Lyles School of Civil Engineering, Purdue University, West Lafayette, IN, USA; 3Department of Civil and Environmental Engineering, University of Waterloo, ON, N2L 3G1, Canada; 4Department of Civil and Environmental Engineering, Florida International University, Miami, FL, USA.

3.6 Automated approach to mine remote sensing data to support building-level classification of tornado damage and pre-event building characteristics

P. Shane Crawford1, Alexander Hainen2, Pataya Scott1,3, Marc Levitan1, Judith Mitrani-Reiser1, and Andrew Graettinger4
1National Institute of Standards and Technology, Gaithersburg, MD 20899, USA; 2University of Alabama, Tuscaloosa, AL 35487, USA; 3Texas Tech University, Lubbock, TX 79409, USA; 4University of Wisconsin-Milwaukee, Milwaukee, WI 53211, USA.

15:15 – 15:30 Coffee break

15:30 – 16:30 Technical Session #4: Community Impact & Planning; Experimentation

4.1 Modeling behavioral response to tornado hazard messaging: an interdisciplinary application of behavioral economics

Brett W. Gelino1, Derek D. Reed1, Elaina J. Sutley1, and Franklin T. Lombardo2
1University of Kansas, Lawrence, KS 66045-7521, USA; 2University of Illinois at Urbana-Champaign, Urbana, IL 61801-2919, USA.

4.2 Evaluating the socio-technical interactions contributing to wind damage in an artificial neural network model

Stephanie F. Pilkington1 and Hussam N. Mahmoud2
1University of North Carolina at Charlotte, Charlotte, NC 28223, USA; 2Colorado State University, Fort Collins, CO 80523, USA.

*Presenting author

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4.3 Community-level resilience assessment of a simulated EF-5 tornado in Joplin using IN-CORE Beta
Lisa Wang*, John W. van de Lindt1, Nathanael Rosenheim2, Harvey Cutler3, Jong Sung Lee4, and Maria Koliou5
1Department of Civil and Environmental Engineering, Colorado State University, Fort Collins, CO 80521, USA; 2Hazard Reduction and Recovery Center, College of Architecture, Texas A&M University, College Station, Texas 77843, USA; 3Department of Economics, Colorado State University, Fort Collins, CO 80521, USA; 4National Center for Supercomputing Applications (NCSA), University of Illinois at Urbana-Champaign, Champaign 61801, USA; 5Zachry Department of Civil and Environmental Engineering, Texas A&M University, College Station, TX 77843, USA.

4.4 Which household emergency plans are more helpful in tornadoes? Through the lens of gerontology
Zhen Cong1 and Daan Liang*2
1Associate Professor, Associate Dean for Research and Faculty Affairs, School of Social Work, the University of Texas at Arlington, 211 S Cooper St, Arlington, TX 76019; 2Professor, Department of Civil, Construction and Environmental Engineering, The University of Alabama, 281 Hardaway Hall, Box 870205, Tuscaloosa, AL 35487.

16:30 – 17:00 Break and walk to facility tour

17:00 – 18:00 Facility tour: National Petascale Computing Facility

The tour to the National Petascale Computing Facility will depart from and return to the conference location (iHotel). The location is within walking distance from the iHotel.

19:00 Dinner at Maize at the Station (not included with registration)

We invite THWARTS 2019 attendees to join us for dinner at Maize at the Station (100 N Chestnut St, Champaign, IL 61820). This is an informal event to encourage interactions among attendees. The event is not included with the registration fees and every attendee must pay for their own (dinner at Maize is ~ $15). There will be ride share options from the iHotel which will be announced later, although there is no guarantee of finding a ride there, there are multiple options such as UBER, local taxi and bus. If you are planning to attend this event, please fill out the following google form such that we can know in advance the number of people to expect and reserve enough tables for us. Here is the link: https://forms.gle/Heht5d3NRXgNvkqM6

*Presenting author
TUESDAY OCTOBER 15TH

8:30 – 9:00  Breakfast

9:00 – 10:30  Roundtable discussion: "Promoting interdisciplinary tornado research"
Roundtable discussion of the entire community
Session chaired by David B. Roueche

10:30 – 10:45  Coffee break

10:45 – 12:15  Technical Session #5: Measurement & Observation; Community Impact & Planning

5.1 Damage indicators and wind speed estimation of tornadoes in rural areas
**Daniel M. Rhee**¹ and Franklin T. Lombardo¹
¹University of Illinois at Urbana-Champaign, Urbana, Illinois, USA.

5.2 Tornadoes and crop lodging
**Mark Sterling**² and **Chris Baker**³
²School of Engineering, University of Birmingham, Birmingham, United Kingdom B15 2TT.

5.3 Using deep neural networks to automate tree-fall pattern direction
**William Wang**¹, **Gregory Kopp**¹, **David Sills**¹, **Daniel Rhee**², **Mark Daley**¹, and **Emilio Hong**¹
¹Northern Tornadoes Project, Western University, London, Ontario, Canada; ²University of Illinois at Urbana-Champaign, Urbana, Illinois, USA.

5.4 Estimates of the range of wind speeds that cause tree fall failure for specific trees within the forest stands in Brazil and Georgia
**Chris J. Peterson**¹, **Jeffery B. Cannon**², and **Christopher M. Godfrey**³
¹Dept. of Plant Biology, University of Georgia, Athens, GA 30602, USA; ²Jones Ecological Research Center, Newton, GA 39870, USA; ³Dept. of Atmospheric Sciences, University of North Carolina at Asheville, Asheville, NC 28804, USA.

5.5 Effect of wind directionality in tornado design load
**Sudhan S. Banik**¹, **Peter J. Vickery**¹, and **Lawrence A. Twisdale**¹
¹Applied Research Associates, Inc. Raleigh, NC, USA.

5.6 Development of tornado load methodology and incorporation into the ASCE 7-22 standard for minimum design loads on buildings
**Marc Levitan**¹, **Long Phan**¹, and **Lawrence Twisdale**²
¹National Institute of Standards and Technology, Gaithersburg, MD 20899, USA; ²Applied Research Associates, Inc. Raleigh, N. C., USA.

12:15 – 13:45  Lunch

13:45 – 15:15  Technical Session #6: Community Impact & Planning; Measurement & Observation; ASCE Tornado Wind Speed Estimation

6.1 Garage door wind damage vulnerabilities for residential and Commercial Buildings
**J. Arn Womble**¹, **Tanya M. Brown-Giammanco**¹, **Murray J. Morrison**¹, **Rachel N. Kovar**², and **Franklin T. Lombardo**³
¹Insurance Institute for Business & Home Safety, Richburg, SC 29729, USA; ²Walsh Group, Chicago, IL 60607, USA; ³University of Illinois at Urbana-Champaign 61801, USA

6.2 A method for adding intensity information to NWS preliminary tornado damage paths
**Christopher Karstens**¹, **Bryan Smith**¹, **Rich Thompson**¹, and **Somer Erikson**²,³
¹NOAA/NWS/Storm Prediction Center, Norman, Oklahoma; ²DHS/FEMA, Washington, D.C.

6.3 Leveraging recent post-tornado damage findings to evaluate Kansas tornado vulnerability
**Elaina J. Sutley**¹, **Remy Lequesne**¹, **Jae Kim**¹, **William Kirkham**¹, and **Jared Clements**¹
¹University of Kansas, Lawrence, KS 66045, USA

6.4 Multi-Tier Analysis of the 3 March 2019 Beauregard, AL Tornado and Impacts on Structural Loading
**David B. Roueche**¹, **Brett M. Davis**¹, **William S. Gunter**², and **Chris J. Peterson**³
¹Auburn University, Auburn, AL, 36849; ²Columbus State University, Columbus, GA; ³University of Georgia, Athens, GA
6.5 Sticky issues with using vehicles as damage indicators and insights from new field data
Fred L. Haan*1 and David B. Rouche2
1Calvin University, Grand Rapids, MI, 49546, USA; 2Auburn University, Auburn, AL, 36849

6.6 Assessing the failure wind speeds of manufactured homes subjected to tornado winds
Brett M. Davis*1 and David B. Rouche1
1Calvin University, Grand Rapids, MI, 49546, USA; 2Auburn University, Auburn, AL, 36849

15:15 – 15:30 Coffee break

15:30 – 17:00 Technical Session #7: Numerical Modeling & Simulation

7.1 On the role of flow acceleration in defining tornado wind loads on a low rise building
Matthew S. Mason*1
1School of Civil Engineering, University of Queensland, Qld. 4072, Australia

7.2 High-resolution simulations of tornado-like vortices with fully-developed turbulence
Nathan A. Dahl1,2 and David S. Nolan1
1Cooperative Institute for Mesoscale Meteorological Studies, University of Oklahoma, Norman, OK 73072, USA; 2NOAA/National Weather Service/Storm Prediction Center, Norman, OK 73072, USA; 3Rosenstiel School of Marine and Atmospheric Science, University of Miami, Miami, FL 33149, USA.

7.3 Influence of swirl ratio and radial Reynolds number on wind characteristics of multi-vortex tornadoes
Yi Zhao1 and Guirong Yan*1
1Department of Civil, Architectural and Environmental Engineering, Missouri University of Science and Technology, Rolla, MO, USA.

7.4 Computation method in performance-based design for wind engineering: introduction and application
Ali Merhi*1 and Chris Letchford1
1Department of Civil and Environmental Engineering, Rensselaer Polytechnic Institute, Troy, NY 12180, USA.

7.5 An investigation of terrain-related effects on the vertical wind profiles in simulated tornadoes
Zachary Wienhoff*,1 Franklin T. Lombardo1, David J. Bodine1, Anthony E. Reinhart1,2, Martin Satrio1,5
1University of Illinois at Urbana-Champaign, Urbana, Illinois, USA; 2National Severe Storms Laboratory, Norman, OK; 3Cooperative Institute for Mesoscale Meteorological Studies, Norman, OK; 4Advanced Radar Research Center, Norman, OK; 5School of Meteorology, Norman, OK

7.6 Future of THWARTS and Interdisciplinary Tornado Collaboration
Franklin T. Lombardo*1
1University of Illinois at Urbana-Champaign, Urbana, Illinois, USA.

17:00 – 17:15 Refreshments & Closing Remarks

Closing remarks by Franklin T. Lombardo