

# Jeremy Alan Gibbs

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## Research

Focus Computational and theoretical studies of planetary boundary-layer flows, numerical weather prediction, parameterization of boundary-layer and surface-layer interactions

## Education

- 01/2009 **Ph.D.**, *Meteorology*, University of Oklahoma  
to 12/2012 *Downscaling techniques for retrieval of near-surface meteorological fields and turbulence parameters from atmospheric numerical model outputs*
- 08/2006 **M.S.**, *Meteorology*, University of Oklahoma  
to 12/2008 *Turbulent transport and surface interactions within inhomogeneous atmospheric environments: an evaluation of parameterization schemes in the Weather Research and Forecasting model*
- 08/2002 **B.S.**, *Meteorology*, University of Oklahoma  
to 05/2006 *Summertime wind and temperature fields over Oklahoma City*

## Experience

- 08/2020 **Research Meteorologist**, NOAA, *National Severe Storms Laboratory*  
to present *Duties: lead the Lab's PBL modeling initiative*
- 08/2019 **Research Scientist**, University of Oklahoma, *CIMMS / NOAA, NSSL*  
to 07/2020 *Duties: led the development of PBL schemes to advance modeling of CI and severe weather*
- 08/2015 **Research Assistant Professor**, *Dept. of Mech. Engineering*, University of Utah  
to 07/2019 *Duties: led independent research program related to planetary boundary-layer science*
- 01/2014 **Postdoctoral Research Associate**, *CIMMS*, University of Oklahoma  
to 07/2015 *Duties: led numerical studies of nocturnal low-level jets and stable planetary boundary layers*
- 01/2013 **Postdoctoral Research Fellow**, *ARRC*, University of Oklahoma  
to 12/2013 *Duties: led numerical studies of turbulence associated with stable planetary boundary layers*

## Teaching

- Spring 2017 **Environmental Fluid Dynamics**, *Graduate*, University of Utah  
**Weather Forecasting**, *Undergraduate*, University of Utah
- Fall 2016 **Large-Eddy Simulation of Turbulent Flows**, *Graduate*, University of Utah
- Spring 2015 **Mesoscale Meteorology**, *Undergraduate*, University of Oklahoma

## Awards

- 2011 Douglas Lilly Award for best peer-reviewed publication by a Ph.D. student
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- 2009 Outstanding Teaching Assistant Award

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## Publications

### Peer-reviewed: 20 publications

- 2021 Bozorgmehr, B., P. Willemsen, **J. A. Gibbs**, R. Stoll, J.-J. Kim, E. Pardyjak: Utilizing dynamic parallelism in CUDA to accelerate a 3D Red-Black Successive Over Relaxation wind-field solver. *Environ. Model Softw.*, 137, 104958.
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- 2020 R. Stoll, **J. A. Gibbs**, S. Salesky, M. Calaf, and W. Anderson: Review: Large-Eddy Simulation of the Atmospheric Boundary Layer. *Bound.-Layer Meteor.*, 177, 541–581.
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- Gibbs, J. A.** and E. Fedorovich: Velocity structure functions and parameters in numerically simulated atmospheric convective boundary layer flows. *J. Atmos. Sci.*, 77 (10), 3619–3630.
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- Gibbs, J. A.** and E. Fedorovich: On the evaluation of the proportionality coefficient between the turbulence temperature spectrum and structure parameter. *J. Atmos. Sci.*, 77 (8), 2761–2763.
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- McFarquhar, G. M., co-authors: Workshop on Current and Future Uses of Unmanned Aircraft Systems for Improved Forecasts/Warnings and Scientific Studies. *Bull. Amer. Meteor. Soc.*, 101 (8), E1322–E1328.
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- Potvin, C. K., P. S. Skinner, K. A. Hoogewind, M. C. Coniglio, **J. A. Gibbs**, A. J. Clark, M. L. Flora, A. E. Reinhart, J. R. Carley, and E. N. Smith: Assessing systematic impacts of PBL schemes in the NOAA Warn-on-Forecast System. *Mon. Wea. Rev.*, 148 (6), 2567–2590.
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- 2019 Smith, E. N., **J. A. Gibbs**, J. Gebauer, P. Klein, and E. Fedorovich: The Great Plains low-level jet during PECAN: observed and simulated characteristics. *Mon. Wea. Rev.*, 147, 1845–1869.
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- 2018 Smith, E. N., **J. A. Gibbs**, E. Fedorovich, and P. Klein: WRF model study of the great plains low-level jet: effects of grid spacing and boundary layer parameterization. *J. Appl. Meteor. Climatol.*, 57 (10), 2375–2397.
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- 2017 Van Heerwaarden, C. C., B. J. H van Stratum, T. Heus, **J. A. Gibbs**, and E. Fedorovich: MicroHH 1.0: a computational fluid dynamics code for direct and large-eddy simulation of atmospheric boundary layer flows. *Geosci. Model Dev.*, 10 (8), 3145–3165.
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- Fedorovich, E., **J. A. Gibbs**, and A. Shapiro: Numerical study of nocturnal low-level jets over gently sloping terrain. *J. Atmos. Sci.*, 74 (9), 2813–2834.
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- 2016 **Gibbs, J. A.** and E. Fedorovich: Sensitivity of Numerically Simulated Stable Boundary-Layer Flow Statistics to Parameters of the Deardorff Subgrid Turbulence Closure Model. *Q. J. Roy. Meteorol. Soc.*, 142 (698), 2205–2213.

Peer-reviewed, continued

2016 **Gibbs, J. A.**, E. Fedorovich, B. Maronga, C. E. Wainwright, and M. Dröse: Comparison of Direct and Spectral Methods for Evaluation of the Temperature Structure Parameter in Numerically Simulated Convective Boundary Layer Flows. *Mon. Wea. Rev.*, 144 (6), 2205-2214.

2015 Shapiro, A., E. Fedorovich, and **J. A. Gibbs**: An Analytical Verification Test for Numerically Simulated Convective Flow Above a Thermally Heterogeneous Surface. *Geosci. Model Dev.*, 8, 1809-1819.

Bonin, T. A., D. C. Goines, A. K. Scott, C. E. Wainwright, **J. A. Gibbs**, and P. B. Chilson: Measurements of the Temperature Structure-Function Parameters with a Small Unmanned Aerial System Compared with a Sodar. *Bound.-Layer Meteor.*, 155 (3), 417-434.

Wainwright, C., T. Bonin, P. Chilson, **J. A. Gibbs**, E. Fedorovich, and R. Palmer: Methods for Evaluating the Temperature Structure-Function Parameter Using Unmanned Aerial Systems and LES. *Bound.-Layer Meteor.*, 155 (2), 189-208.

**Gibbs, J. A.**, E. Fedorovich, and A. Shapiro: Revisiting Surface Heat-Flux and Temperature Boundary Conditions in Models of Stably Stratified Boundary-Layer Flows. *Bound.-Layer Meteor.*, 154 (2), 171-187.

2014 **Gibbs, J. A.** and E. Fedorovich: Effects of Temporal Discretization on Turbulence Statistics and Spectra in Numerically Simulated Convective Boundary Layers. *Bound.-Layer Meteor.*, 153 (1), 19-41.

Wainwright, C. E., P. M. Stepanian, E. Fedorovich, P. B. Chilson, R. D. Palmer, and **J. A. Gibbs**: A Time Series Sodar Simulator Based on Large-Eddy Simulation. *J. Atmos. Oceanic Technol.*, 31 (4), 876-889.

**Gibbs, J. A.** and E. Fedorovich: Comparison of Convective Boundary Layer Velocity Spectra Retrieved from Large-Eddy-Simulation and Weather Research and Forecasting Model Data. *J. Appl. Meteor. Climatol.*, 53 (2), 377-394.

2011 **Gibbs, J. A.**, E. Fedorovich, and A. M. J. van Eijk: Evaluating Weather Research and Forecasting (WRF) Model Predictions of Turbulent Flow Parameters in a Dry Convective Boundary Layer. *J. Appl. Meteor. Climatol.*, 50 (12), 2429-2444.

Submitted

2020 **J. A. Gibbs**, G. Torkelson, R. Stoll, E. Pardyjak: UtahLSM: A lightweight and robust land-surface model suitable for large-eddy simulation. *Geosci. Model Dev.*

**J. A. Gibbs**, G. Torkelson, R. Stoll, T. Harman: Momentum and buoyancy characteristics in stably stratified surface layers. *J. Fluid. Mech.*

**J. A. Gibbs**, G. Torkelson, R. Stoll, T. Harman: A priori tests of a new lower boundary condition suitable for heterogeneous surface layers. *J. Fluid. Mech.*

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## Grants

### Externally funded research, awarded (\$1,974,530 total)

- 2020 “Coastal Urban Boundary-layer Interactions with Convection (CUBIC)”  
*DOE, \$895,887, 10/2020–09/2023, Co-PI*
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- 2019 “Assessing scale-aware PBL parameterizations at WoF scales”  
*NOAA, \$96,479, 08/2019–07/2020, PI*
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- 2017 “Understanding and modeling the role of horizontal heterogeneity on the dynamics of the nocturnal boundary layer across scales”  
*NSF, \$724,164, 08/2017–07/2020, Co-PI*
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- “Establishment of an air quality prediction system in Korea”  
*Pukyong National University, \$255,000, 08/2017–04/2020, Co-PI*

### Computational support and equipment (39.25 million core-hours total)

- 2020–2021 “Understanding and Modeling the Role of Horizontal Heterogeneity on the Dynamics of the Nocturnal Boundary Layer Across Scales”  
*U.S. Department of Energy, Oak Ridge National Laboratory, 6,500,000 core-hours*
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- 2017–2020 “Understanding and modeling the role of horizontal heterogeneity on the dynamics of the nocturnal boundary layer across scales”  
*NCAR, Computational Information Systems Laboratory, 18,750,000 core-hours*
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- 2017 “Development of a GPU-based air quality prediction system”  
*NVIDIA Academic Programs Team, Titan XP GPU card (\$1200 value)*
- 
- 2015–2016 “Low-level Jets in the Nocturnal Stable Boundary Layer: Structure, Evolution, and Interactions with Mesoscale Atmospheric Disturbances”  
*NCAR, Computational Information Systems Laboratory, 14,000,000 core-hours*

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## Service

### Professional

- 2017– **Associate Editor**, *Monthly Weather Review*

### Diversity

- 2020– **Co-Chair**, *NSSL Outreach Committee*

### Graduate committees

- 2020–2022 **Dominic Candela** (Chair) *M.S., Meteorology*, University of Oklahoma
- 2018–2021 **Greg Torkelson** (Member) *Ph.D., Mechanical Engineering*, University of Utah
- 2017–2020 **Matthew Moody** (Member), *Ph.D., Mechanical Engineering*, University of Utah
- 2017–2020 **Behnam Bozorgmehr** (Co-Chair), *Ph.D., Mechanical Engineering*, University of Utah
- 2016–2019 **Tyler West** (Member), *Ph.D., Atmospheric Sciences*, University of Utah
- 2015–2018 **Elizabeth Smith** (Member), *Ph.D., Meteorology*, University of Oklahoma

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## Memberships

2006-Present American Meteorological Society, USA

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2011-Present American Geophysical Union, USA

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## Reviews

### Research proposals

2019 National Science Foundation (2)

2018 National Science Foundation (1)

### Scientific journals: 67 reviews, 12 journals

2020 Boundary-Layer Meteorology (2), Journal of the Atmospheric Sciences (3), Monthly Weather Review (1)

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2019 Boundary-Layer Meteorology (2), Journal of the Atmospheric Sciences (2), Monthly Weather Review (6)

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2018 Boundary-Layer Meteorology (1), Environmental Fluid Mechanics (2), Journal of the Atmospheric Sciences (4), Monthly Weather Review (6)

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2017 Boundary-Layer Meteorology (3), Environmental Fluid Mechanics (1), Journal of the Atmospheric Sciences (5), Journal of Meteorological Research (2), Meteorology and Atmospheric Physics (1), Monthly Weather Review (1)

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2016 Advances in Atmospheric Sciences (2), Atmosphere (1), Boundary-Layer Meteorology (4), Environmental Fluid Mechanics (1), Journal of Meteorological Research (1)

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2015 Computers and Fluids (1), Advances in Atmospheric Sciences (2), Geoscientific Model Development (1), Journal of Applied Meteorology and Climatology (1), Boundary-Layer Meteorology (4)

2014 Journal of Applied Meteorology and Climatology (2), Boundary-Layer Meteorology (2), Frontiers in Earth Science (1)

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2013 Journal of Applied Meteorology and Climatology (2)

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## Meetings

### Organization

2016 22nd Symposium on Boundary Layers and Turbulence  
American Meteorological Society, Salt Lake City, Utah

*Session Chair: Boundary Layer Processes Part I - Convective Boundary Layers*

*Session Chair: Recent Field Experiments PECAN I - Observations of BL Structure and Evolution*

### Invited talks

2016 Graduate Student Seminar Series  
Department of Atmospheric Sciences, University of Utah, Salt Lake City, Utah  
*Numerical study of idealized nocturnal low-level jets over gently sloping terrain*

### Invited talks, continued

- 2015 Boundary Layer, Urban Meteorology, and Land Surface Processes Seminar Series  
National Weather Center, Norman, Oklahoma  
*Sensitivity of turbulence statistics in the lower portion of a numerically simulated stable boundary layer to parameters of the Deardorff subgrid turbulence model*
- 
- 2015 Thermal, Fluids, and Energy Systems Seminar Series  
Department of Mechanical Engineering, University of Utah, Salt Lake City, Utah  
*An introduction, recent work in Oklahoma, future work in Utah*
- 
- 2010 Joint Meeting on Near-Surface Interactions  
Laboratoire de Mecanique de Fluides, Ecole Centrale de Nantes, Nantes, France  
*Sensitivity of Near-Surface Meteorological Fields in WRF to Boundary/Surface-Layer Parameterizations in Conjunction with Horizontal Grid Spacing.*
- 
- 2008 Environmental Effects on Sensor and Weapons Performance  
NL-MoD V509, TNO Defence, Security and Safety, The Hague, Netherlands  
*Sensor performance forecasting: the Weather Research and Forecasting (WRF) model.*
- 
- 2006 Boundary Layer, Urban Meteorology, and Land Surface Processes Seminar Series  
National Weather Center, Norman, Oklahoma.  
*Summertime wind and temperature fields over Oklahoma City: a WRF study.*

### Presentations

- 2020 100th American Meteorological Society Annual Meeting, Boston, Massachusetts  
*Including Advection in Boundary Condition Models of Momentum and Heat for Heterogeneous Stratified Boundary Layers*  
*A CUDA-based Implementation of a fast response urban wind model*
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- 2019 American Geophysical Society Annual Meeting, San Francisco, CA  
*QES-Fire: A Microscale Fast Response Wildfire Model*
- 
- Boundary Layer, Urban Meteorology, and Land Surface Processes Seminar Series  
National Weather Center, Norman, Oklahoma  
*Three Simple Ways to Add More Structure (Functions and Parameters) to Your Life*
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- 23rd Symposium on Boundary Layers and Turbulence  
American Meteorological Society, Oklahoma City, Oklahoma  
*The effects of horizontal heterogeneity on the dynamics of the NBL across scales*  
*Evaluating the spatial and temporal evolution of Great Plains low-level jets during PECAN using high-resolution observations and simulations*
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- 2018 98th American Meteorological Society Annual Meeting, Austin, Texas  
*The Great Plains LLJ during PECAN: Observed and Simulated Characteristics*

## Presentations, continued

- 2017 American Geophysical Union Annual Meeting, New Orleans, LA  
*Enhanced Representation of Turbulent Flow Phenomena in Large-Eddy Simulations of the Atmospheric Boundary Layer using Grid Refinement with Pseudo-Spectral Numerics*
- 
- 97th American Meteorological Society Annual Meeting  
Seattle, Washington  
*The Great Plains LLJ During PECAN: Initial Comparisons of Profiling Observations with WRF*
- 
- 2016 PECAN Science Workshop  
University of Oklahoma, Norman, Oklahoma  
*Effects of shallow slope on the evolution of numerically simulated nocturnal low-level jets.  
The Great Plains low-level jet during PECAN: initial comparisons*
- 
- The 2016 Nanjing University Symposium on Weather and Climate Research  
Nanjing University, Nanjing, China  
*Numerical simulations of nocturnal low-level jets over gently sloping terrain*
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- 17th Annual WRF User's Conference  
National Center for Atmospheric Research, Boulder, Colorado  
*Effects of PBL parameterizations on nocturnal low-level jets reproduced with the WRF model*
- 
- 22nd Symposium on Boundary Layers and Turbulence  
American Meteorological Society, Salt Lake City, Utah  
*Large-eddy simulations of the Great Plains nocturnal low-level jet using the WRF model  
Idealized numerical simulations of nocturnal low-level jets developing over gently sloping terrain*
- 
- 2015 16th Annual WRF User's Conference  
National Center for Atmospheric Research, Boulder, Colorado  
*Effects of numerical grid spacing on nocturnal low-level jets reproduced with the WRF model*
- 
- 2014 15th Annual WRF User's Conference  
National Center for Atmospheric Research, Boulder, Colorado  
*Investigation of WRF-LES using realistic convective boundary layer forcings*
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- 2013 14th Annual WRF User's Conference  
National Center for Atmospheric Research, Boulder, Colorado.
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- 2012 20th Symposium on Boundary Layers and Turbulence  
American Meteorological Society, Boston, Massachusetts  
*Comparison of CBL velocity spectra calculated from LES and WRF model data*
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- 13th Annual WRF User's Conference  
National Center for Atmospheric Research, Boulder, Colorado  
*Comparison of CBL velocity spectra calculated from LES and WRF model data*

## Presentations, continued

- 2012 Croatian - USA Workshop on Mesometeorology  
Ekopark Kraš Resort, Zagreb, Croatia  
*The effects of model numerics on convective boundary layer velocity spectra*
- 
- 2009 10th Annual WRF User's Conference  
National Center for Atmospheric Research, Boulder, Colorado  
*Sensitivity of near-surface meteorological fields in WRF to boundary/surface-layer parameterizations in conjunction with horizontal grid spacing*
- 
- Workshop on Advanced Concepts for Boundary Layer Parameterizations  
Deutscher Wetterdienst (DWD), Offenbach, Germany
- 
- 4th Asian Space Conference  
National Space Organization, Taipei, Taiwan  
*Turbulent transport and surface interactions within the CBL*
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- 2008 9th Annual WRF User's Conference  
National Center for Atmospheric Research, Boulder, Colorado  
*Turbulent transport and surface interactions within the CBL*

## Other participation

- 2008 89th American Meteorological Society Annual Meeting  
New Orleans, Louisiana
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- 2007 8th Annual WRF User's Conference  
National Center for Atmospheric Research, Boulder, Colorado

## Specialization

- 2019 Together Everyone Achieves More (TEAM), Diversity and Teamwork Seminar  
National Weather Center, Norman, Oklahoma  
Conveners: Dr. Robert Lemon, NSSL Diversity and Inclusion Committee
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- 2010 Eloquent Science Workshop  
National Weather Center, Norman, Oklahoma  
Conveners: David Schultz and J.J. Gourley
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- 2009 Sixth Annual Colloquium of the Teaching Scholars Initiative  
National Weather Center, Norman, Oklahoma  
Conveners: Alan Shapiro and Kelly Damphouse
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- 2008 FORMOSAT-3/COSMIC Student Workshop  
Taiwan National Central University, Taipei, Taiwan  
Conveners: Bill Kuo and Kim Prinzi Kimbro  
Sponsors: National Science Foundation (NSF), University of Corporation for Atmospheric Research (UCAR), Taiwan National Space Organization (NSPO), and Taiwan National Central University (NCO).



### Specialization, continued

- 2008 Workshop for Preparing for an Academic Career in the Geosciences  
National Weather Center, Norman, Oklahoma  
Conveners: R. Heather McDonald and Robyn Wright Dunbar  
Sponsors: National Association of Geoscience Teachers, National Science Foundation