

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 **Physical Scientist**, NOAA, *National Severe Storms Laboratory*
to present *Duties: PBL modeling initiatives*
- 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

- 2015,2022 **Mesoscale Meteorology**, *Undergraduate*, University of Oklahoma
- 2017 **Environmental Fluid Dynamics**, *Graduate*, University of Utah
- 2017 **Weather Forecasting**, *Undergraduate*, University of Utah
- 2016 **Large-Eddy Simulation of Turbulent Flows**, *Graduate*, University of Utah

Awards

- 2022 NOAA OAR EEO/Diversity Award for Exemplary Service
- 2011 Douglas Lilly Award for best peer-reviewed publication by a Ph.D. student
- 2009 Outstanding Teaching Assistant Award

Publications

- 2025 Bozorgmehr, B., P. Williamsen, **J. A. Gibbs**, R. Stoll, J. J. Kim, Z. Patterson, and E. R. Pardyjak: Improving the performance of a mass-consistent model for urban environments and complex terrain with a higher-order geometrical representation. *J. Adv. Model. Earth Syst.*, 17(5), 1–39.
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- Shapiro, A. and **J. A. Gibbs**: Revisiting the laminar plume. *Phys. Fluids*, 37(4), 1–13.
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- 2023 **Gibbs, J. A.**, R. Stoll, and S. Salesky: Inclination Angles of Turbulent Structures in Stably Stratified Boundary Layers. *Bound.-Layer Meteorol.*, 186, 27–41.
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- Labriola, J.D. and **Gibbs, J. A.**, L. Wicker: A method for generating a quasi-linear convective system suitable for observing system simulation experiments. *Geosci. Model Dev.*, 16(6), 1779–1799.
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- F. Margairaz, B. Singh, **J. A. Gibbs**, L. Atwood, E. R. Pardyjak, and R. Stoll: QES-Plume v1.0: A Lagrangian dispersion model.. *Geosci. Model Dev.*, 16(20), 5729–5754.
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- 2022 Moody, M. J., **J. A. Gibbs**, S. Krueger, D. Mallia, E. R. Pardyjak, A. K. Kochanski, B. N. Bailey, R. Stoll: QES-Fire: a dynamically coupled fast-response wildfire model. *Int J Wildland Fire*, 31(3), 306–325.
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- 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.

Publications, continued

- 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.
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- 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.
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- 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.
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- 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.
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- 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.
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- 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.
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- 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.

Peer-reviewed, continued

- 2014 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.

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)

- 2020–2022 "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)
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- 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

Service

Professional

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

Diversity

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

Graduate committees

2024-2026 **Dominic Candela** (Member) *Ph.D., Meteorology*, University of Oklahoma

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

Memberships

2006-Present American Meteorological Society, USA

2011-Present American Geophysical Union, USA

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

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.
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- 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
-
- 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
-
- 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
-
- 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

- 2016 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
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- 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
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- 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
-
- 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
-
- 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 BL/SL parameterizations, 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
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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).
- 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