

Jeremy Alan Gibbs

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Research

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

Tools DNS, LES, RANS, WRF, HPC, Python, Matlab, C++, CUDA, Fortran, Swift

Education

2009-2012 **Ph.D., Meteorology**, University of Oklahoma
Downscaling techniques for retrieval of near-surface meteorological fields and turbulence parameters from atmospheric numerical model outputs

2006-2008 **M.S., Meteorology**, University of Oklahoma
Turbulent transport and surface interactions within inhomogeneous atmospheric environments: an evaluation of parameterization schemes in the Weather Research and Forecasting model

2002-2006 **B.S., Meteorology**, University of Oklahoma
Summertime wind and temperature fields over Oklahoma City

Experience

2016- **Research Assistant Professor**, *Dept. of Mech. Engineering*, University of Utah

2015-2016 **Visiting Scientist**, *Dept. of Mech. Engineering*, University of Utah

2014-2015 **Postdoctoral Research Associate**, *CIMMS*, University of Oklahoma

2013-2014 **Postdoctoral Research Fellow**, *ARRC*, University of Oklahoma

2007-2012 **Graduate Research Assistant**, *School of Meteorology*, University of Oklahoma

2006-2008 **Graduate Teaching Assistant**, *School of Meteorology*, University of Oklahoma

Teaching

Spring 2017 **Environmental Fluid Dynamics**, *Graduate*, University of Utah
Instructor Evaluation: 5.5/6.0, Department Average: 5.07/6.0

Weather Forecasting, *Undergraduate*, University of Utah
Instructor Evaluation: 5.8/6.0, Department Average: 5.3/6.0

Fall 2016 **LES of Turbulent Flows**, *Graduate*, University of Utah
Instructor Evaluation: 5.6/6.0, Department Average: 5.1/6.0

Spring 2015 **Mesoscale Meteorology**, *Undergraduate*, University of Oklahoma
Instructor Evaluation: 4.3/5.0, Department Average: 4.3/5.0

2008-2009 **Weather and Climate, Lab**, *Undergraduate*, University of Oklahoma

Awards

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

2009 Outstanding Teaching Assistant Award

Publications

In preparation to submit

2019 **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.*, **to be submitted**.

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J. A. Gibbs, G. Torkelson, R. Stoll, T. Harman: A priori tests of a new lower boundary condition suitable for heterogeneous surface layers. *J. Atmos. Sci.*, **to be submitted**.

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Smith, E, J. G. Gebauer, E. Fedorovich, P. Klein, **J. A. Gibbs**: Buoyancy's role in spatially and temporally heterogeneous nocturnal low-level jets. *Mon. Wea. Rev.*, *to be submitted*

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B. Bozorgmehr, Z. Patterson, E. Pardyjak, **J. A. Gibbs**, P. Williamsen, R. Stoll: Utilizing dynamic parallelism in CUDA to accelerate 3D red-black successive over relaxation solver. *Env. Modeling and Software*, **to be submitted**.

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B. Bozorgmehr, Z. Patterson, E. Pardyjak, **J. A. Gibbs**, P. Williamsen, R. Stoll: Improving the performance of a mass-consistent model for complex terrain with higher-order geometrical representation. *Env. Modeling and Software*, **to be submitted**.

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M. Moody, **J. A. Gibbs**, R. Stoll, E. Pardyjak: A new high-resolution coupled flame propagation model. *Agric. For. Meteorol.*, **to be submitted**.

Peer-reviewed: 14 publications (6 as first author)

2019 Smith, E, **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.*, *accepted*

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2018 Smith, E, **J. A. Gibbs**, E. Fedorovich, and Petra 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 Manuel 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. E., T. A. Bonin, P. B. Chilson, **J. A. Gibbs**, E. Fedorovich, and R. D. Palmer: Methods for Evaluating the Temperature Structure-Function Parameter Using Unmanned Aerial Systems and Large-Eddy Simulation. *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.
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- 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.
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- 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.
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- 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.

Conference proceedings

- 2016 Smith, E.J. and **J. A. Gibbs** and E. Fedorovich: WRF Model Study of the Great Plains Low-Level Jet: Effects of Grid Spacing and Boundary Layer Parameterization *Abstr. 22nd Symp. on Boundary Layers and Turbulence*, 20-24 June 2016, Salt Lake City, UT.

Conference proceedings, continued

- 2014 Fedorovich, E. and **J. A. Gibbs**: Turbulent winds in numerically simulated atmospheric convective boundary-layer flows. *Abstr. Sixth International Conference on Computational Wind Engineering*, 42-43, 8-12 June 2014, Hamburg, Germany.

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Fedorovich, E. and **J. A. Gibbs**: Turbulence scale interactions in convective boundary-layer flows reproduced with compressible and incompressible large eddy simulation codes. *Geophys. Res. Abstr., Vol. 16. General Assembly of the European Geophysical Society (EGU2014-7573)*, 27 April-2 May 2014, Vienna, Austria.

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Chilson, P. B., C. E. Wainwright, T. A. Bonin, **J. A. Gibbs**, D. Goines, A. Scott, E. Fedorovich, and R. D. Palmer: Estimation of temperature structure functions in the atmospheric boundary layer using real and simulated data. *Abstr. 17th International Symposium for the Advancement of Boundary Layer Remote Sensing (ISARS 2014)*, 28-31 January 2014, Auckland, New Zealand.

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2013 Wainwright, C., P. Chilson, **J. A. Gibbs**, T. Bonin, E. Fedorovich, and R. Palmer: Methods for evaluating the structure function parameter for temperature using Unmanned Aerial Systems and Large Eddy Simulation. *3rd International Symposium on Earth-Science Challenges (ISEC)*, Kyoto University, Kyoto, Japan.

Grants

Externally funded research

- 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

- 2017, 2019 "Understanding and modeling the role of horizontal heterogeneity on the dynamics of the nocturnal boundary layer across scales"
NCAR, Computational Information Systems Laboratory, 8,750,000 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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2016 "Large-Eddy Simulations of Low-level Jets in the Nocturnal Stable Boundary Layer Using the Weather Research and Forecasting Model"
NCAR, Computational Information Systems Laboratory, 10,000,000 core-hours

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2015 "Low-level Jets in the Nocturnal Stable Boundary Layer: Structure, Evolution, and Interactions with Mesoscale Atmospheric Disturbances"
NCAR, Computational Information Systems Laboratory, 4,000,000 core-hours

Memberships

- 2006-Present American Meteorological Society, USA
2011-Present American Geophysical Union, USA

Service

Professional

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

Graduate committees

- 2019-2020 **Matthew Moody** (Member), *Ph.D., Mechanical Engineering*, University of Utah
2018-2021 **Greg Torkelson** (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

Reviews

Research proposals

- 2019 National Science Foundation (1)
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- 2018 National Science Foundation (1)

Scientific journals: 52 reviews, 12 journals

- 2019 Boundary-Layer Meteorology (1), *Monthly Weather Review* (1)
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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)
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- 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)

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
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- 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
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- 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
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- 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.
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- 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

- 2018 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
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- 98th American Meteorological Society Annual Meeting, Austin, Texas
The Great Plains LLJ during PECAN: Observed and Simulated Characteristics
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- 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

Presentations, continued

- 2017 97th American Meteorological Society Annual Meeting
Seattle, Washington
The Great Plains LLJ During PECAN: Initial Comparisons of Profiling Observations with WRF
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- 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
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- 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
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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
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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
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- Croatian - USA Workshop on Mesometeorology
Ekopark Kraš Resort, Zagreb, Croatia
The effects of model numerics on convective boundary layer velocity spectra

Presentations, continued

- 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

- 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

- 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).
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- 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