

PHYSICIST DR. JOSEPH WERNE - CURRICULUM VITAE

Contact

NorthWest Research Associates
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General Fields of Investigation

Theoretical and numerical turbulence process, dynamics, and transport studies in geophysical and astrophysical flows, specializing in accurate, high-resolution spectral algorithms and high-performance computing (HPC) on vector and massively parallel platforms at national supercomputing centers. Work includes stable and unstable stratification, with applications in the following research areas: high-Rayleigh-number convection, penetrative convection, rotating convection, stratified sheer turbulence, gravity-wave breaking, wave-wave interactions, multi-scale shear and wave dynamics, magnetohydrodynamic instability and turbulence processes, and optimal-perturbation theory.

Applications have included ocean- and atmosphere-dynamics modeling, aircraft and submarine wakes evolution, plasma dynamics for space-weather applications, solar-interior modeling, helioseismic analysis of the solar interior, and Bayesian-hierarchical turbulence-process modeling in the troposphere and stratosphere. A primary emphasis has been on efficient and accurate spectral numerical methods, large-scale, massively parallel computing on a wide range of architectures, starting with the Cray XMP and YMP vector machines, the modestly parallel Cray C90, and then larger-scale and massively parallel platforms, including the Cray T3D, T3E, XT3, XT4, XT5, XE6, XC40; IBM SP, P4+, P5+, P6; SGI O2k, O3k, Altix; Compaq SC40/45.

Positions Held

2003-present	Director on the Board, NorthWest Research Associates
2001-present	Senior Research Scientist, NorthWest Research Associates
1998-present	Affiliated Faculty, Department of Applied Mathematics, Univ. of Colorado
2006-18	Vice President, NorthWest Research Associates
2001-08	Assistant Division Manager, NorthWest Research Associates
1997-01	Research Scientist, NorthWest Research Associates
1995-96	Research Associate, Joint Institute for Laboratory Astrophysics & Laboratory for Atmospheric and Space Physics, Univ. of Colorado
1994-95	Visiting Scientist, National Center for Atmospheric Research
1992-94	Postdoctoral Fellow, Advanced Study Program, National Center for Atmospheric Research
1989-92	Research Assistant, Department of Astronomy and Astrophysics, The University of Chicago
1987-89	Teaching Assistant, Physics Department, The University of Chicago
1985-87	Engineering Co-op, Reactor Plant Planning Yard, Newport News Shipbuilding

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Education

Old Dominion University

B.S. (summa), Physics (1987)

B.S. (summa), Mech. Eng'g & Mechanics (1987)

The University of Chicago, Ph.D., Physics (1993)

Professional Societies

American Physical Society

American Astronomical Society

Software

Principal Architect & Author, *Practical Supercomputing Toolkit*, used by the Department of Defense (DoD) High Performance Computing and Modernization Program (HPCMP) to define a uniform command-line interface that streamlines use of disparate supercomputer platforms, high-speed networks, and archival data storage systems at all of the DoD HPC centers: <https://pstoolkit.nwra.com>. Principal Architect & Author, *Werne-NWRA Triple Code*, a highly accurate pseudo-spectral fluid-dynamics solver designed to run efficiently on modern massively parallel supercomputer platforms: <https://cora.nwra.com/~werne/triple/>.

Teaching

Instructor, Summer MCAT Program, The University of Chicago, Biological Sciences Division and the Pritzker School of Medicine (1989-92). Principal Lecturer, NCAR 2008 Summer School: Geophysical Turbulence. Instructor, University of Colorado at Boulder 2009 Supercomputing Workshop, Fluid Instabilities, Waves, and Turbulence, as part of Professor Juri Toomre's ASTR/ATOC 5410 Graduate Course

Awards

- A.D. Morgan Scholarship (1986-87);
- Faculty Award in Mechanical Engineering and Mechanics (1987);
- Outstanding Senior Award in Physics (1987);
- Gregor Wentzel Prize for Excellence as Graduate Student Tutor (1988).

Societies

Phi Kappa Phi; Pi Tau Sigma; Tau Beta Pi.

Business Development

Developed, analyzed, and helped implement the 2000 NWRA Business Model, which encourages Research Scientists to become Principal-Investigator (PI) Partners in a successful research-science company. This model is novel, maximizes PI compensation, minimizes corporate taxes, has proven to be an invaluable recruiting tool for NWRA, and has worked successfully since 2000.

Professional Activities & Presentations

- Gordon Conference on Modeling in Solar Terrestrial Physics (1990);
- Gordon Conference on Solar Plasma and MHD Processes (1991);

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- Army High Performance Computing Research Center, Workshop on Visualization and Statistical Analysis in Hard Turbulence (1992);
- The James Franck Institute, The University of Chicago, Turbulence Meeting (1993);
- Pittsburgh Supercomputing Center, Supercomputing Techniques: Parallel Processing/Cray T3D (1994); Woods Hole Oceanographic Institution Summer Program in Geophysical Fluid Dynamics (1995);
- NCAR Geophysical and Astrophysical Convection (1995);
- American Physical Society 43th, 44th, 46th, 47th, 48th, 58th, 60th & 66th Annual Meetings of the Division of Fluid Dynamics (1990-91, 1993-95, 2005, 2007, 2013);
- University of California 12th Annual Conference in Nonlinear Science (1996);
- National Center for Supercomputing Applications, Parallel Computing Workshop; SGI Origin (1997);
- DoD HPCMO User Group Conference (1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011);
- Global Grid Forum 2 and 3, Washington, D.C. (2001) and Frascati, Italy (2001);
- EUROMECH Workshop 428 "Transport by coherent structures in environmental and geophysical flows," Torino, Italy (2001); Department of Energy, Environmental Meteorology Program, "Vertical Transport and Mixing," Salt Lake City (2001, 2002);
- Center for Turbulence Research, "30 Years of Dynamic Modeling," Stanford University (2002);
- Invited Speaker, Center for Nonlinear Studies, Los Alamos National Laboratory (2003);
- Invited Speaker, "Helio- and Asteroseismology: Towards a Golden Future," Yale University, New Haven, Connecticut (2004);
- "Turbulence and Waves," Lighthill Institute of Mathematical Sciences, London, UK (2004);
- Visiting Scientist Colloquium, NASA Langley Research Center (2005);
- Invited Speaker, "Turbulent Mixing and Beyond," Trieste, Italy (2007);
- Co-organizer, NCAR 2008 Theme of the Year Workshop "Petascale Computing: Its Impact on Geophysical Modeling and Simulation" (2008).
- Invited Speaker, 20th DoD HPCMO User Group Conference, Schaumburg, IL (2010);
- Invited Speaker, "Turbulent Mixing and Beyond TMB-2011," Trieste, Italy (2011);
- Invited Speaker, Fundamental Aspects of Geophysical Turbulence II (2015);
- VIII International Symposium on Stratified Flows (2016);
- Invited Speaker, "McWilliams Symposium" National Center for Atmospheric Research, Boulder, CO (2016).

Publications

1. *Design of a Mars Oxygen Processor*: Ash, R., J. Werne and M. B. Haywood 1989, in *The Case for Mars III* edited by C. Stoker, AAS Science and Technology Series, **75**, 479-487.
2. *Numerical Simulations of Soft and Hard Turbulence: Preliminary Results for Two-Dimensional Convection*: DeLuca, E. E., J. Werne, R. Rosner, and F. Cattaneo 1990, Phys. Rev. Letters, **64(20)**, 2370-3.
3. *The Development of Hard-Turbulent Convection in Two Dimensions: Numerical Evidence*: Werne, J., E. E. DeLuca, R. Rosner and F. Cattaneo 1991, Phys. Rev. Letters, **67(25)**, 3519.
4. *The Structure of Hard-Turbulent Convection in Two Dimensions: Numerical Evidence*: Werne, J. 1993, Phys. Rev. E, **48**, 1020.

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5. *Plume Model for the Boundary-Layer Dynamics in Hard Turbulence* : Werne, J. 1994, Phys. Rev. E, **49**, 4072.
6. *Incompressibility and No-Slip Boundaries in the Chebyshev-Tau Approximation: Correction to Kleiser and Schumann's Influence-Matrix Solution*: Werne, J. 1995, J. Comput. Phys., **120**, 260.
7. *Penetrative Convection in Rapidly Rotating Flows: Preliminary Results from Numerical Simulation*: Julien, K., S. Legg, J. McWilliams, and J. Werne 1996, Dyn. Atmos. Oceans, **24**, 237.
8. *Turbulent Rotating Rayleigh-Benard Convection with Comments on 2/7*: Werne, J. 1995, Woods Hole Oceanog. Inst. Tech. Rept. WHOI-95-27.
9. *Hard turbulence in rotating Rayleigh-Benard convection*: Julien, K., S. Legg, J. McWilliams, and J. Werne 1996, Phys. Rev. E, **53**, 5557R.
10. *Rapidly Rotating Turbulent Rayleigh-Benard Convection*: Julien, K., S. Legg, J. McWilliams and J. Werne 1996, J. Fluid Mech., **322**, 243.
11. *Dynamics and Scaling in Quasi Two-Dimensional Turbulent Convection*: Bizon, C., A. A. Predtechensky, J. Werne, K. Julien, W. D. McCormick, J. B. Swift and H. Swinney 1997, Physica A., **239**, 204.
12. *Plume Dynamics in Quasi 2D Turbulent Convection*: Bizon, C., J. Werne, A. A. Predtechensky, K. Julien, W. D. McCormick, J. B. Swift and H. L. Swinney 1997, Chaos, **7**, 1.
13. *Turbulent convection: what has rotation taught us?*: Werne, J. 2000 in *Geophysical and Astrophysical Convection*, Eds. P. A. Fox and R. M. Kerr. Gordon and Breach Science Publishers, 221.
14. *The effects of rotation on the global dynamics of turbulent convection*: Julien, K., J. Werne, S. Legg and J. McWilliams 1997 in *SCORE'96: Solar Convection and Oscillations and their Relationship*. Eds. J. Christensen-Dalsgaard and F. P. Pijpers. Kluwer Academic Publ., 227-230.
15. *The effect of rotation on convective overshoot*: Julien, K., J. Werne, S. Legg and J. McWilliams 1996, in *SCORE'96: Solar Convection and Oscillations and their Relationships*. Eds. J. Christensen-Dalsgaard and F. P. Pijpers. Kluwer Academic Publ., 231-234.
16. *Comment on "There is no Error in the Kleiser-Schumann Influence-Matrix Method"*: Werne, J. 1998, J. Comput. Phys. **141**, 88.
17. *Turbulence in Stratified and Shear Fluids: T3E Simulations*: Werne, J. and D. C. Fritts 1998, 8th DoD HPC User Group Conference, Houston, TX.
18. *2-D Convection in Tall, Narrow Containers: Implications for Theories of Heat Transport in Hard Turbulence*: Werne, J. 1996, (in preparation).
19. *High Rayleigh number convective transport: testing theories by modifying boundary conditions*: Brummell, N., K. Julien, and J. Werne 1996, (in preparation).
20. *Plumes in rotating convection: Part I. Ensemble statistics and dynamical balances*: Julien, K., S. Legg, J. McWilliams, and J. Werne 1999, J. Fluid Mech. **391**, 151-187.
21. *Statistical Analysis of the Influence of Rotation in Rayleigh-Benard Convection*: Julien, K., S. Legg, J. McWilliams, and J. Werne 1996, (in preparation).
22. *On the linear stability of Hele-Shaw Convection*: Julien, K. and J. Werne 1996, Int. J. Heat and Mass Transfer, (to be submitted).
23. *A new class of equations for rotationally constrained flows*: Julien, K., E. Knobloch and J. Werne 1998, Theoret. and Comput. Fluid Dynamics, **11**, 251-261.

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24. *Reduced Equations for Rotationally Constrained Convection*: Julien, K., E. Knobloch and J. Werne 1999, In the International Symposium on Turbulence and Shear Flow Phenomena, v.1, pp. 101-106, Begel House.
25. *A Reduced Description for Rapidly Rotating Turbulent Convection*: Julien, K., E. Knobloch and J. Werne 1998, In Advances in Turbulence VII, Eds U. Frisch, pp. 472-482, Klumer Academic Publishers.
26. *Dynamics of counter-rotating vortex pairs in stratified and sheared environments*: Garten, J. F., S. Arendt, D. C. Fritts and J. Werne 1998, J. Fluid Mech. **361**, 189-236.
27. *Anisotropy in Stratified Shear Turbulence*: Werne, J. and D. C. Fritts 1999, 9th DoD HPC User Group Conference, Monterey, CA.
28. *Stratified shear turbulence: Evolution and statistics*: Werne, J. and D. C. Fritts 1999, Geophys. Res. Letters **26**, 439.
29. *Turbulence-induced fluctuations in ionization and application to PMSE*: Hill, R. J., D. Gibson-Wilde, J. Werne and D. C. Fritts 1999, Earth Planets Space, **51**, 499.
30. *Structure Functions in Stratified Shear Turbulence*: Werne, J. and D. C. Fritts 2000, 10th DoD HPC User Group Conference, Albuquerque, NM.
31. *Turbulence Dynamics and Mixing due to Gravity Waves in the Lower and Middle Atmosphere*: Fritts, D. C. and J. Werne 2000, in
Atmospheric Science across the Stratopause, Geophysical Monograph 123, American Geophys. Union, 143-159.
32. *Hierarchical Data Structuring: an MPP I/O How-to*: Werne, J., P. Adams and D. Sanders 2000, Scientific Computing at NPACI, June 14, Volume 4 Issue 12.
33. *Linear scaling during production runs: conquering the I/O bottleneck*: Werne, J., P. Adams and D. Sanders 2000, in
ARSC CRAY T3E Users' Group Newsletter **193**, April 14, eds. T. Baring & G. Robinson.
34. *Numerical modeling of turbulent zero momentum late wakes in density stratified fluids*: Gourlay, M. J., S.C. Arendt, D.C. Fritts, and J. Werne 2000, 10th DoD HPC User Group Conference, June 5-9, Albuquerque, NM.
35. *Numerical modeling of turbulent non-zero momentum late wakes in density stratified fluids*: Gourlay, M. J., S.C. Arendt, D.C. Fritts, and J. Werne 2000, Fifth International Symposium on Stratified Flows, July 10-13, Vancouver, Canada.
36. *Numerical modeling of initially turbulent wakes with net momentum*: Gourlay, M. J., S.C. Arendt, D.C. Fritts, and J. Werne 2001, Phys. Fluids **13**, 3783.
37. *Numerical simulation of late wakes in stratified and sheared flows*: Fritts, D., M. Gourlay, W. Orlando, C. Meyer, J. Werne, and T. Lund 2003, 13th DoD HPC User Group Conference, DOI:10.1109/DODUGC.2001.1253394
38. *Direct numerical simulation of VHF radar measurements of turbulence in the mesosphere*: Gibson-Wilde, D., J. Werne, D. C. Fritts and R. J. Hill 2000, Radio Science **35**, 783.
39. *Anisotropy in a stratified shear layer*: Werne, J. and D. C. Fritts 2001, Physics and Chemistry of the Earth, **26**, 263.
40. *Direct numerical simulations of the Crow instability and subsequent vortex reconnection in a stratified fluid*: Garten, J. F., J. Werne, D. C. Fritts, and S. Arendt 2001, J. Fluid Mech. **426**, 1.

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41. *Wave-breaking and shear turbulence simulations in support of the Airborne Laser*: Werne, J., C. Bizon, C. Meyer, and D. C. Fritts 2001, 11th DoD HPC User Group Conference, June, Biloxi, MS.
42. *Vertical transport by convection plumes: Modification by rotation*: Legg, S., K. Julien, J. McWilliams, and J. Werne 2001, Phys. Chem. of the Earth, B, 26 (4), 259-262.
43. *The Effects of Ambient Stratification on the Crow Instability and Subsequent Vortex Reconnection*: Garten, J. F., J. Werne, D. C. Fritts and S. Arendt 1999 in
European Series in Applied and Industrial Mathematics, ESAIM Proceedings, Third International Workshop on Vortex Flow and Related Numerical Methods, Vol 7 Eds: A. Giovannini, G. H. Cottet, Y. Gagnon, A. Ghoniem, E. Meiburg.
44. *Application of turbulence simulations to the mesosphere*: Gibson-Wilde, D., J. Werne, D. C. Fritts, and R. Hill 2000, Proc. MST 9 Radar Workshop, Toulouse, France.
45. *A new dynamical subgrid model for the planetary surface layer. I. The model and a priori tests*: Dubrulle, B., J.-P. Laval, P. P. Sullivan and J. Werne 2002, J. Atmos. Sci. **59**, 857.
46. *Entrainment-zone restratification and flow structures in stratified shear turbulence*: Pettersson-Reif, B.A., J. Werne, \O. Andreassen, C. Meyer, M. Davis-Mansour 2002, Studying Turbulence Using Numerical Simulation Databases -IX, Proceedings of the 2002 Summer Program, Center for Turbulence Research, ed. P. Bradshaw, 245-256.
47. *Layering accompanying turbulence generation due to shear instability and gravity wave breaking*: Fritts, D.C., C. Bizon, J.A. Werne, and C.K. Meyer 2003, J. Geophys. Res. **108**, D8, 8452, doi:10.1029/2002JD002406.
48. *The Need for Control Experiments in Local Helioseismology*: Werne, J., A. Birch, and K. Julien 2004, SOHO 14/GONG 2004, Helio- and Asteroseismology: Towards a Golden Future, New Haven, CT., Es. D. Danesy, European Space Agency SP-559.
49. *Visualization of the Energy-Containing Turbulent Scales*: Helgeland, A., \O. Andreassen, A. Ommundsen, B.A. Pettersson-Reif, J. Werne, T. Gaarder 2004, 2004 IEEE Symposium on Volume Visualization and Graphics (VV'04) 103-109., DOI:10.1109/SVVG.2004.15
50. *Persistence of a Kelvin-Helmholtz instability complex in the upper troposphere*: M.C. Kelley, C.Y. Chen, R.R. Beland, R. Woodman, J.L. Chau, and J. Werne 2005, J. Geophys. Res. **110**, D14, 106, doi:10.1029/2004JD005345.
51. *CAP Phase II Simulations for the Air Force HEL-JTO Project: Atmospheric Turbulence Simulations on NAVO's 3000-Processor IBM P4+ and ARL's 2000-Processor Intel Xeon EM64T Cluster*: Werne, J., T. Lund, B.A. Pettersson-Reif, P. Sullivan, and D.C. Fritts 2005, 15th DoD HPC User Group Conference, June, Nashville, TN., DOI:10.1109/DODUGC.2005.16
52. *Characterization of high altitude turbulence for Air Force platforms*: Ruggiero, F.H., J. Werne, T.S. Lund, D.C. Fritts, K. Wan, L. Wang, A. Mahalov, and B. Nichols 2005, 15th DoD HPC User Group Conference, June, Nashville, TN.
53. *Generalized quasi-geostrophy for spatially anisotropic rotationally constrained flows*: K. Julien, E. Knobloch, R. Milliff & J. Werne 2006, J. Fluid Mech., **555**, 233-274.
54. *Mean and variable forcing of the middle atmosphere by gravity waves*: Fritts, D.C., S.L. Vadas, K. Wan, and J. Werne 2006, J. Atmos. Solar-Terres. Phys., **68**, 247-265.
55. *Characterization of High Altitude Turbulence for Air Force Platforms*: Ruggiero, F.H., J. Werne, A. Mahalov, B. Nichols, and D.E. Wroblewski 2006, 16th DoD HPC User Group Conference, June, Denver, CO.

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56. *Numerical simulation of an asymptotically reduced system for rotationally constrained convection*: Sprague, M., K. Julien, E. Knobloch, and J. Werne 2006, *J. Fluid Mech.*, **551**, 141-174.
57. *Characterization of High Altitude Turbulence for Air Force Platforms*: Ruggiero, F.H., A. Mahalov, B. Nichols, J. Werne, and D.E. Wroblewski 2007, 17th DoD HPC User Group Conference, June, Pittsburgh, PA., DOI:10.1109/HPCMP-UGC.2007.15
58. *High-Resolution Simulations and Atmospheric Turbulence Forecasting*: Werne, J., D.C. Fritts, L. Wang, T. Lund, and K. Wan 2008, 18th DoD HPC User Group Conference, July, Seattle, WA.
59. *Gravity Wave Instability Dynamics at High Reynolds Numbers. Part II: Turbulence Evolution, Structure, and Anisotropy*: D.C. Fritts, L. Wang, J. Werne, T. Lund, and K. Wan 2009, *J. Atmos. Sci.*, DOI:10.1175/2008JAS2727.1
60. *Gravity wave instability dynamics at high Reynolds numbers, 1: Wave field evolution at large amplitudes and high frequencies*: Fritts, D.C., L. Wang, J. Werne, T. Lund, and K. Wan 2009, *J. Atmos. Sci.* **66**, 1126-1148, doi:10.1175/2008JAS2726.1.
61. *Gravity wave instability dynamics at high Reynolds numbers, 2: Turbulence evolution, structure, and anisotropy*: Fritts, D.C., L. Wang, J. Werne, T. Lund, and K. Wan 2009, *J. Atmos. Sci.* **66**1149-1171, doi:10.1175/2008JAS2727.1.
62. *High-Resolution Simulations of Internal Gravity-Wave Fine Structure Interactions and Implications for Atmospheric Turbulence Forecasting*: Werne, J., Fritts, D.C., L. Wang, T. Lund and K. Wan 2009, 19th DoD HPC User Group Conference, 15-19 June, San Diego, CA, DOI: 10.1109/HPCMP-UGC.2009.43
63. *Gravity wave fine-structure interactions: A reservoir of small-scale and large-scale turbulence energy*: Fritts, D.C., L. Wang and J. Werne 2009, *Geophys. Res. Lett.* **36**, L19805, doi:10.1029/2009GL039501.
64. *Numerical simulation of the linking of Kelvin-Helmholtz instabilities at adjacent shear layers*: Fritts, D.C., B. Laughman, J. Werne, D. Simkhada and M.J. Taylor 2009, *J. Geophys., Res.* (to be submitted).
65. *Numerical simulation of bore generation and morphology in thermal and Doppler ducts*: Laughman, B., D.C. Fritts, and J. Werne 2009, *Ann. Geophys.*, SpreadFEx special issue, **27**, 511-523.
66. *Atmospheric Turbulence Forecasts for Air Force and Missile Defense Applications*: Werne, J., D.C. Fritts, L. Wang, T. Lund, and K. Wan 2010, Invited Paper, 20th DoD HPC User Group Conference, 14-17 June, Schaumburg, IL, DOI:10.1109/HPCMP-UGC.2010.75
67. *Temperature and velocity structure functions in the upper troposphere and lower stratosphere from aircraft measurements (invited)*: Wroblewski, D.E., J. Werne, O. Cote, J. Hacker, and R. Dobosy 2010, *J. Geophys. Res.*, DOI:10.1029/2010JD014618
68. *Comparisons of predicted bore evolutions by the Benjamin-Davis-Ono and Navier-Stokes equations for idealized mesopause thermal ducts*: Laughman, B., D.C. Fritts, and J. Werne 2011, *J. Geophys., Res.*, DOI:10.1029/2010JD014409
69. *Computation of clear-air radar backscatter from numerical simulations of turbulence: 1. Numerical methods and evaluation biases*: Franke, P.M., S. Mahmoud, K. Raizada, K. Wan, D.C. Fritts, T. Lund, and J. Werne 2011, *J. Geophys. Res.*, DOI:10.1029/2011JD015895
70. *Computation of clear-air radar backscatter from numerical simulations of turbulence: 2. Backscatter moments throughout the lifecycle of a Kelvin-Helmholtz instability*: Fritts, D.C., P.M. Franke, K. Wan, T. Lund and J. Werne 2011, *J. Geophys. Res.*, DOI:10.1029/2010JD014618

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71. *Interpretation of apparent simultaneous occurrences of Kelvin-Helmholtz instability in two airglow layers: Observations:* Simkhada, D., B. Laughman, D.C. Fritts, J. Werne, and A. Liu 2013, J. Geophys. Res. (submitted).
72. *Kelvin-Helmholtz instability in two airglow layers: Observations:* Simkhada, D., B. Laughman, D.C. Fritts, J. Werne, and A. Liu 2013, J. Geophys. Res. (submitted).
73. *Modeling the implications of Kelvin-Helmholtz instability dynamics for airglow observations:* Fritts, D.C., K. Wan, J. Werne, T. Lund, J.H. Hecht 2014, J. Geophys. Res. Atmos., 119, 8858-8871. doi:10.1002/2014JD021737.
74. *Gravity Wave-Fine Structure Interactions. Part I: Influences of Fine Structure Form and Orientation on Flow Evolution and Instability:* Fritts, D.C., L. Wang, and J.A. Werne 2013, J. Atmos. Sci. 70:12, 3710-3734, DOI:10.1175/JAS-D-13-055.1
75. *Coupled small scale mesospheric dynamics in a dual shear environment over Hawaii II: Modeling and interpretation:* Laughman, B., D.C. Fritts, J. Werne, D.B. Simkhada, M.J. Taylor, and A.Z. Liu 2013, J. Geophys. Res. (submitted).
76. *Quantifying Kelvin-Helmholtz Instability Dynamics Observed in Noctilucent Clouds: 2. Modeling and Interpretation of Observations:* Fritts, D.C., G. Baumgarten, K. Wan, J. Werne, T. Lund 2014, J. Geophys. Res., 119, 9359-9375, doi:10.1002/2014JD021833
77. *Numerical Modeling of Multiscale Dynamics at a High Reynolds Number: Instabilities, Turbulence, and an Assessment of Ozmidov and Thorpe Scales:* Fritts, D.C., L. Wang, M.A. Geller, D.A. Lawrence, J. Werne, B.B. Balsley 2016, J. Atmos. Sci., 73(2), 555-578, doi:10.1175/JAS-D-14-0343.1
78. *Fine Structure, Instabilities, and Turbulence in the Lower Atmosphere: High-Resolution in Situ Slant-Path Measurements with the DataHawk UAV and Comparisons with Numerical Modeling* Balsley, B.B., D.A. Lawrence, D.C. Fritts, L. Wang, K. Wan, J. Werne, 2018, J. Atmos. and Oceanic Tech., 35(3), 619-642, doi:10.1175/JTECH-D-16-0037.1