

CURRICULUM VITAE

KEITH A. JULIEN

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EDUCATION

UNIVERSITY OF CAMBRIDGE, ENGLAND

PH.D. Applied Mathematics and Theoretical Physics, 1991,
Dissertation Title: Strong Spatial Resonances in Convection.
Part III. Mathematics Tripos, 1987.

KINGS COLLEGE, UNIVERSITY OF LONDON, ENGLAND

B.Sc. Joint Honors in Mathematics and Physics, 1986.
1ST Class Honors.

PROFESSIONAL EXPERIENCE

POSITIONS HELD

<i>May 1991 – Sept. 1994</i>	Postdoctoral Research Associate, Joint Institute for Laboratory Institute (JILA), Colorado, U.S.A.
<i>Oct, 1994 – Oct. 1996</i>	Advanced Study Postdoctoral Fellowship, National Center for Atmospheric Research (NCAR), Colorado, U.S.A.
<i>Jan, 1997 – Dec. 1997</i>	Instructor, Department of Applied Mathematics, University of 2008 Colorado, Boulder, Colorado, U.S.A.
<i>Jan, 1998 - June 2003</i>	Assistant Professor, Department of Applied Mathematics, University of Colorado, Boulder, Colorado, U.S.A.
<i>July 2003 - Present</i>	Associate Professor, Department of Applied Mathematics, University of Colorado, Boulder, Colorado, U.S.A.

GRADUATE AND POSTDOCTORAL ADVISORS

Professor Michael R. E. Proctor, Fellow of the Royal Society	Department of Applied Mathematics and Theoretical Physics, University of Cambridge, England
Professor James C. McWilliams, National Academy of Sciences	Institute of Geophysics and Planetary Physics and Department of Atmospheric Sciences, University of California at Los Angeles
Professor Juri Toomre,	JILA and Department of Astrophysical and Planetary Sciences, University of Colorado at Boulder

ACADEMIC HONORS

- 1988, J. T. Knight Prize, Department of Applied Mathematics and Theoretical Physics, University of Cambridge, England.
- 1998, Creative Research and Creative Works, Junior Faculty Development Award, University of Colorado at Boulder.
- 2004, Creative Research and Creative Works, Faculty Fellowship Award, University of Colorado at Boulder.
- 2007, Innovative Seed Grant, University of Colorado at Boulder.

RESEARCH INTERESTS

- Geophysical and Astrophysical Fluid Dynamics
- Physical Applied Mathematics
- Computational Fluid Dynamics
- Turbulent Fluid Convection
- Theory of Mixing and Transport
- Helioseismology
- Dynamical Systems Theory

PROFESSIONAL ACTIVITIES

CURRENT POSITIONS HELD

- | | |
|------------------------------|---|
| <i>Jan. 2007 – July 2008</i> | Theme-of-the-Year Co-Director, NCAR/IMAGE
(Institute for Mathematics Applied to the Geosciences),
Boulder, Colorado, U.S.A. |
| <i>June 2006 - Present</i> | Graduate Studies Chair, Department of Applied Mathematics,
University of Colorado, Boulder, Colorado, U.S.A. |

PROFESSIONAL SOCIETIES MEMBERSHIP

- American Physical Society (APS), 1991-Present
- Society of Industrial and Applied Mathematics (SIAM), 1996-Present

REVIEWER

- Chaos
- Dynamics of Atmospheres and Oceans
- Journal of Fluid Dynamics Research
- Journal of Fluid Mechanics
- Journal of Marine Research
- Journal of Physical Oceanography
- Journal of Theoretical and Computational Fluid Dynamics
- National Science Foundation
- National Aeronautics and Space Administration
- Physics of Fluids
- Proceedings of the Royal Society of London
- Solar Physics

PANELS

- Solar Research and Theory Program, National Aeronautics and Space Administration, Feb. 2000.
- Solar Heliospheric and Physics Program, National Aeronautics and Space Administration, Feb. 2004.

- High Performance Computing Acquisition Program for Track 2 system grants, National Science Foundation, April 25-27, 2006.
- Solar Heliospheric and Physics Program, National Aeronautics and Space Administration, April 2006.

SESSION CHAIR

- Solar Convection and Oscillations and Their Relationship, Aarhus, Denmark, May, 1994.
- International Conference on Nonlinear Waves, Integrable Systems and Applications, University of Colorado at Colorado Springs, June 2005
- Reduced Models for Geophysical Flows Minisymposium at Society for Industrial and Applied Mathematics Conference on Nonlinear Waves and Coherent Structures, Seattle, 2006.
- Rotating Flows session at the Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Salt Lake, November 20-22, 2007.

MEETING ORGANIZER

- Reduced Models for Geophysical Flows Mini-symposium at Society for Industrial and Applied Mathematics Conference on Nonlinear Waves and Coherent Structures, Seattle, 2006.
- NCAR/IMAGE 2008 Theme-Of-the-Year Workshop II on Geophysical Turbulent Phenomena; Theory and Modeling, Boulder, February 2008.
- NCAR/IMAGE 2008 Theme-Of-the-Year Workshop III on Geophysical Turbulent Phenomena; Towards Petascale Computing, Boulder, May 2008.
- CU & NCAR/IMAGE 2008 Theme-Of-the-Year Summer School on Geophysical Turbulent Phenomena, Boulder, July 2008 (Three weeks).

COMMITTEES

COLLEGE

- Engineering Excellence Fund, 1998-2002.
- Arts and Sciences Committee, 2002-Present.
- Arts and Sciences Budget Committee, 2002-Present.

DEPARTMENTAL

- Undergraduate Committee, 1998-2002.
- Faculty Search Committee, Dynamics, 2001-2002.
- Faculty Search Committee, Math/Bio, 2005.
- Departmental Computer and Integrated Technologies Committee, 2005.
- Ad-hoc Departmental Computer and Integrated Technologies Committee, 2005.
- Graduate Committee, 2005-present

FUNDED RESEARCH

EXTERNAL FUNDING

- Penetrative Convection in the Solar Interior (with Werne, J.), Principal Investigator, National Aeronautics and Space Administration, Solar Physics and Theory, Sun-Earth Connections Program, Grant No NAG5-4918, \$237,000, 1997-2000.
- Mathematical Sciences Scientific Research Environments (with Curry J.), Co-Principal Investigator, National Science Foundation, Division of Mathematical Sciences, Infrastructure Program, Grant No DMS-9870962, \$35,068, 1998-2000.
- Solar-Terrestrial and Convective Plume Dynamics, Stability, and Gravity Wave Excitation in the Solar Tachocline (with Fritts, D.), Co-Principal Investigator, National Science Foundation, Division of Atmospheric Sciences Program, Grant No ATM-9811938, \$35,593, 1998-2001.

EXTERNAL FUNDING (CONTINUED)

- Magneto-Hydrodynamic Instability and Turbulence in the Solar Tachocline (with Werne, J., Cattaneo, F.), Co-Principal Investigator, National Aeronautics and Space Administration, Solar Physics and Theory, Sun-Earth Connections Program, Grant No MASW-99026, \$35,593, 1999-2002.
- Rotationally Constrained Convection: Investigations of a New Class of Reduced Equations, Principal Investigator, National Science Foundation, Division of Ocean Sciences, Physical Oceanography Program, Grant No OCE-0137347, \$173,995, 2002-2005.
- Modeling Magneto-Inertial-Gravity Waves in the Lower Convection Zone (with Werne, J.), Principal Investigator, National Aeronautics and Space Administration, Solar Heliospheric and Physics Program, Grant No NNG05GD37G, \$400,226, 2005-2008.
- Community Hounds and Hares Exercises in Local Helioseismology (with Werne, J), Co-Principal Investigator, National Aeronautics and Space Administration, Living with a Star Guest Investigator Program, Grant No NNH04CC056, \$144,738, 2005-2008.
- Advanced Technology Platforms- Itanium2™ 2003 Academic Grant Initiative, Co-Principal Investigator (with Connors, D.), Hewlett Packard Gift No. 89932, \$153,310, 2003.
- EMSW21-MCTP: Colorado Advantage (with Curry J.H.), Co-Principal Investigator, National Science Foundation, Division of Mathematical Sciences, Workforce in the Mathematical Sciences Program, Grant No DMS-0602284, \$783,081, 2005-2008.
- Summer School on Geophysical Turbulent Phenomena, Principal Investigator, National Science Foundation, Division of Mathematical Sciences, Opportunities for Research Collaborations between the Mathematical Sciences and Geosciences, Grant No DMS-0724859, \$109,367, 2007-2008.

INTERNAL FUNDING

- Derivation and Investigations of a New Class of Equations for Rotationally Constrained Flows, Principal Investigator, University of Colorado, Creative Research and Creative Works, Junior Faculty Development Award, \$5,000, 1998.
- Reduced Modeling of Geophysical and Astrophysical Fluid Flows, Principal Investigator, University of Colorado, Creative Research and Creative Works, Faculty Fellowship Award, \$5,000, 2004.
- Multi-scale Modeling and Simulation in the Geosciences: Towards Petascale Computing, Principal Investigator, University of Colorado, Innovative Seed Grant, \$50,000, 2007.

FUNDED RESEARCH SUPERCOMPUTING RESOURCES

- Coherent Structures and Statistical Dynamics of Rotating, Stratified Turbulence at Large Reynolds Number, Co-Principal Investigator, National Science Foundation Metacenter Award, 1997-1998,
Allocation Amount: 188,900 SU's,
Supercomputers and Centers: Cray T3E, C90, and SGI Origin at Pittsburgh and San Diego
- Convective Plume Dynamics, Stability, and Gravity Wave Excitation in the Solar Tachocline, Co-Principal Investigator, National Science Foundation Metacenter Award, 1998-1999,
Allocation Amount: 30,000 SU's,
Supercomputers and Centers: Crays T3E and C90 at San Diego

- Penetrative Dynamics of the the Solar Interior, Principal Investigator, National Partnership for Advanced Computational Infrastructure, 1998-1999,
Allocation Amount: 25,000 SU's,
Supercomputers and Centers: Crays T3E at San Diego
- Magneto-hydrodynamic Instability and Turbulence in the Tachocline, Principal Investigator, National Partnership for Advanced Computational Infrastructure, 2001-2002,
Allocation Amount: 25,000 SU's,
Supercomputers and Centers: Crays T3E at San Diego
- Multi-Scale Modeling and Computation of Convective Geophysical Turbulence, Principal Investigator, National Aeronautics and Space Administration, Leadership Computer Systems, 2007-2008,
Allocation Amount: 1,250,000 SU's,
Supercomputers and Centers: SGI Altix at AMES Research Center

Note 1 Service Unit (SU) is equivalent to 1 CPU hour

EDUCATIONAL FUNDING

EXTERNAL FUNDING

- EMSW21-MCTP: Colorado Advantage (with Curry J.H.), Co-Principal Investigator, National Science Foundation, Division of Mathematical Sciences, Workforce in the Mathematical Sciences Program, Grant No DMS-0602284, \$783,081, 2005-2008.

INTERNAL FUNDING

- Computational and Mathematical Tools for Differential Equations on the World-Wide-Web, Principal Investigator, Engineering Excellence Fund, University of Colorado at Boulder, \$19,000, 1998.
- Enhancement of the Undergraduate Computational Environment in Applied Mathematics, Principal Investigator, Engineering Excellence Fund, University of Colorado at Boulder, \$20,000, 2003.
- Development of an Undergraduate Data Visualization Toolkit in Applied Mathematics, Principal Investigator, Engineering Excellence Fund, University of Colorado at Boulder, \$14,300, 2004.

REFEREED PUBLICATIONS

JOURNAL ARTICLES

1. Julien, K., "Strong Spatial Interactions with 1:1 Resonance: A Three-Layer Convection Problem," **Nonlinearity**, 7, 1655-1693, (1994).
2. Julien, K., Legg, S., McWilliams J., and J.Werne, "Penetrative Convection in Rapidly Rotating Flows: Preliminary Results from Numerical Simulation," **Dynamics of Atmospheres and Oceans**, 24, 237-249, (1995).
3. Julien, K., Legg, S., McWilliams J., and J.Werne, "Rapidly Rotating Turbulent Rayleigh-Bénard convection," **Journal of Fluid Mechanics**, 322, 243-273, (1996).
4. Julien, K., Legg, S., McWilliams J., and J.Werne, "Hard-Turbulence in Rotating Rayleigh-Bénard Convection: Preliminary Results from Numerical Simulation," **Physical Review E**, 53, R5557-5560, (1996).

5. Bizon, C. A., Werne, J., Predtechensky, A., Julien, K., Mc Cormick, W. D., Swift, J. B., and H. L. Swinney, "Dynamics and Scalings in Quasi Two-Dimensional Turbulent Convection," **Physica A**, 239, 204-210, (1997).
6. Bizon, C. A., Predtechensky, A., Werne, J., Julien, K., Mc Cormick, W. D., Swift, J. B., and H. L. Swinney, "Plume Dynamics in Quasi 2D Turbulent Convection," **Chaos**, 7 (1), 107-123, (1997).
7. Julien, K. and E. Knobloch, "Fully Nonlinear Oscillatory Convection in a Rotating Layer," **Physics of Fluids**, 9, 1906-1913, (1997).
8. Julien, K. and E. Knobloch, "Strongly Nonlinear Convection Cells in a Rapidly Rotating Fluid Layer: The Tilted f-plane," **Journal of Fluid Mechanics**, 360, 141-178, (1998).
9. Julien, K., Knobloch, E., and J. Werne, "A New Class of Equation for Rotationally Constrained Flows," **Journal of Theoretical and Computational Fluid Dynamics**, 11, 251-261, (1998).
10. Balmforth, N., Casti, A., and K. Julien, "Thermohaline Convection with Nonlinear Salt Profiles," **Physics of Fluids**, 10, 819-828, (1998).
11. Julien, K. and E. Knobloch, "Fully Nonlinear Three-Dimensional Convection in a Rapidly Rotating Layer," **Physics of Fluids**, 11, 1469-1483, (1999).
12. Julien, K., Legg, S., McWilliams J., and J. Werne, "Plumes in Rotating Convection. Part Ensemble Statistics and Dynamical Balances," **Journal of Fluid Mechanics**, 391, 151-187, (1999).
13. Julien K., Knobloch E. and S. M. Tobias, "Strongly Nonlinear Magnetoconvection in Three-Dimensions," **Physica D**, 128, 105-129, (1999).
14. Julien K., Knobloch E. and S. M. Tobias, "Nonlinear Magnetoconvection in the Presence of Strong Oblique Fields," **Journal of Fluid Mechanics**, 410, 285-322, (2000)
15. Rosenthal C.S. and K. Julien , "Numerical Modeling of the absorption and scattering of acoustic radiation by sunspots," **Astrophysical Journal**, 532:(2), 1230-1239, Part 1, (2000).
16. Abdulrahman A., Jones C.A., Proctor M.R.E., and K. Julien "Large wavenumber convection in the rotating annulus," **Geophysical and Astrophysical Fluid Dynamics**, 93: (3-4), 227-252, (2001).
17. Legg, S., Julien, K., McWilliams J., and J. Werne, "Vertical transport by convection plumes: Modification by rotation," **Physics and Chemistry of the Earth B**, 26, (4), 259-262, (2001).
18. Mullowney, P., Julien, K., and J.D. Meiss "Blinking rolls: Chaotic advection in a three-dimensional flow with an invariant," **Siam J. on Applied Dynamical Systems** 4, (1), 159-186 (2005).
19. Ablowitz M. J., Julien, K., Musslimani, Z. H., and M. I. Weinstein " Wave dynamics in optically modulated waveguide arrays," **Physical Review E**, 71, (055602) (4 pages) (2005)
20. Knobloch, E., and K. Julien. "Saturation of the Magnetorotational Instability" **Physics of Fluids**, 17 (9): Art. No. 094196 (6 pages) (2005).
21. Petersen, M., Julien, K. and J. Weiss. "Vortex Cores, Strain Cells, and Filaments in Quasi-Geostrophic Turbulence", **Physics of Fluids**, 18 (2): Art. No. 026601(11 pages) (2006).
22. Sprague*, M., Julien, K., Knobloch, E., and J. Werne. "Numerical simulations of an asymptotically reduced system for rotationally constrained convection," **Journal of Fluid Mechanics**, 551, 141-174, (2006).
23. Julien, K., Knobloch, E., R. Milliff and J. Werne. "Generalized Quasigeostrophy for Spatially Anisotropic Rotationally Constrained Flows" **Journal of Fluid Mechanics**, 555, 233-274, (2006).
24. Burrell, N., Julien, K., Petersen, M.R., and J.B. Weiss. "Merger and alignment in a reduced model for three-dimensional quasigeostrophic ellipsoidal vortices," **Physics of Fluids**, 18 (5): Art. No. 057101 (14 pages) (2006).

25. Julien, K. and E. Knobloch, "Saturation of the magnetorotational instability; Asymptotically exact theory," In *Stellar Fluid Dynamics and Numerical Simulations: From the Sun to Neutron Stars*, M. Rieutord and B. Dubrulle (eds), **EAS Publications Series**, 21, 81-104, (2006). **Invited article**.
26. Petersen, M., Julien, K. and G.R. Stewart. "Baroclinic vorticity production in protoplanetary disks. I. Vortex Formation", **Astrophysical Journal**, 658 (2), 1236-1251, Part I (2007).
27. Petersen, M., Stewart, G.R. and K. Julien, "Baroclinic vorticity production in protoplanetary disks. II. Vortex Growth and Longevity", **Astrophysical Journal**, 658 (2), 1252-1265, Part I (2007).
28. Julien, K. and E. Knobloch, "Reduced Models for Fluid flows with Strong Constraints," **Journal of Mathematical Physics**, 48 (6): Art No. 065405 (34 pages), (2007). **Invited article**.

(Underlined names denote graduate student, * denotes postdoctoral research associate)

BOOK CHAPTERS (INVITED)

1. Julien, K., Knobloch, E., and S. M. Tobias, "Highly Supercritical Convection in Strong Magnetic Fields," In *Advances in Nonlinear Dynamical Systems*, pp.195-223. Eds. Ferriz-Mas and M. Nunez, (**The Fluid Mechanics of Astrophysics and Geophysics Series**, Taylor and Francis), (2003).
2. Julien, K., Knobloch, E., and S. M. Tobias, "Nonlinear Magnetoconvection in the Presence of a Strong Oblique Field," Chapter 23 In *Stellar Astrophysical Fluid Dynamics*, Eds. Prof. Michael J. Thompson and Prof. Jorgen Christensen-Dalsgaard, (**Cambridge University Press**). (12 pages) (2003).
3. Julien, K., Knobloch, E., and S. M. Tobias, "Rotating Magnetoconvection with Magnetostrophic Balance," Chapter 5, pp-78-101, In *Dynamics and Bifurcation of Patterns in Dissipative Systems* Eds. G. Dangelmayr and I. Oprea, (**World Scientific Series on Nonlinear Science, Singapore**) 12, (2004).

DISSERTATION

1. Julien, K., "Strong Spatial Resonance in Convection," Ph.D. Thesis, Department of Applied Mathematics and Theoretical Physics, University of Cambridge, (1991).

WEB PUBLICATION (INVITED)

1. Julien, K., Werne, J., Bizon, C.A., Fritts, D. and M. Rast, "Making Waves in the Sun," **NPACI & SDSC Online**, www.npaci.edu/online/v4.19/julien.html, IV Issue 19, Sept. 20, (2000).

ACCEPTED PUBLICATIONS

1. Vasil, G., Brummell, N.H. and K. Julien, "A New Method for Fast Transforms in Parity-Mixed PDE's. Part I: Numerical Techniques and Analysis. *Journal of Computational Physics*.
2. Vasil, G., Brummell, N.H. and K. Julien, "A New Method for Fast Transforms in Parity-Mixed PDE's. Part II: Applications to Confined Rotating. *Journal of Computational Physics*.

PAPERS UNDER REVIEW

1. Julien, K., and M. Watson, "Efficient Multi-Dimensional Solutions of PDE's using Chebyshev Spectral Methods," submitted to the *Journal of Computational Physics*.
2. Jamroz, B., Julien, K., and E. Knobloch, "An Asymptotically Exact Reduced PDE Model for the Magnetorotational Instability: Derivation and Numerical Simulation," Status: **Invited article** submitted for special issue in *Physica Scripta on Topical issues in Turbulent Mixing and Beyond*.

3. Chini, G., Julien, K. and E. Knobloch, "An Asymptotically Reduced Model of Langmuir Turbulence," Status: **Invited article** submitted to Geophysical and Astrophysical Fluid Dynamics.
4. *Mullowney, P., Julien, K. and J.D. Meiss, "Chaotic Advection in the Kuppers-Lortz State," Status: Submitted to the Journal of Chaos.

(Underlined names denote current graduate student, * denotes former graduate student)

NON-REFEREED PUBLICATIONS

CONFERENCES AND WORKSHOPS

1. Julien, K.A., Gough, D.O., and J. Toomre, "Inversion for Background Inhomogeneity from Phase Distortions of Two-Dimensional Wave-Fields," Global Oscillation Network Group '94, Helio- and Astero-seismology from the Earth and Space (**Astronomical Society of the Pacific Conference Series**) 196-199, (1995).
2. Julien, K.A., Gough, D.O., and J. Toomre, "Analysis of Helioseismic Wave Fields to Examine Horizontal Structure," Proceedings of the 4th Annual SOHO Workshop on Helioseismology (**European Space Agency Publication Division**) 2, 155-160, (1995).
3. Julien, K., Werne, J., Legg, S., and J. McWilliams "The Effect of Rotation on Convective Overshoot," **In Solar Convection and Oscillations and Their Relationship**, J. Christensen-Dalsgaard and F. P. Pipjers eds., (Kluwer Academic Publishers), 227-230, (1997).
4. Julien, K., Werne, J., Legg, S., and J. McWilliams "The Effect of Rotation on the Global Dynamics of Convection," **In Solar Convection and Oscillations and Their Relationship**, J. Christensen-Dalsgaard and F. P. Pipjers eds., (Kluwer Academic Publishers), 231-234, (1997).
5. Julien, K., Knobloch, E., and J. Werne, "A Reduced Description of Rapidly Rotating Turbulent Convection," **In Advances in Turbulence VII**, U. Frisch ed., (Kluwer Academic Publishers), 479-482, (1998).
6. Julien, K., Knobloch, E., and S. M. Tobias, "Highly Supercritical Magnetoconvection," In Stellar Dynamics: Nonlinearity and Chaotic Flows, M. Nunez and A. Ferriz-Mas Eds., (**Astronomical Society of the Pacific Conference Series**) 178, 43-55, (1999).
7. Julien, K., Knobloch, E., and J. Werne, "Reduced Equations for Rotationally Constrained Convection," **In First International Symposium on Turbulence and Shear Flow Phenomena**, S. Banerjee and J. K. Eaton eds. (Begel House), 1, 101-106, (1999).
8. Werne J., Birch A., and K. Julien "The Need for Control Experiments in Local Helioseismology. Werne, J., Birch, A. and Julien, K. A.", In SOHO 14 Helio and Astero-seismology: Towards a Golden Future, D. Danesy ed., **European Space Agency SP-559**, 172, (10 pages) (2004).
9. Sprague M., Julien, K., Serre, E., Sanchez-Alvarez, J.J., and E. Crespo del Arco, "Pattern Formation in Rayleigh-B'enard Convection in a Rapidly Rotating Cylinder," **In the International Symposium on Turbulence and Shear Flow Phenomena**, (Begel House), (2005).

SUMMER SCHOOLS

1. Julien, K., "Turbulent Rayleigh-B'enard Convection," Summer Program in Geophysical Fluid Dynamics: (R. Salmon and G. Flierl, Directors) **Woods Hole Oceanographic Institute Technical Report** WHOI-95-09, 237-241, (1995).
2. Balmforth, N. and K. Julien, "The Takens-Bogdanov Bifurcation in an Extended System," Summer Program in Geophysical Fluid Dynamics: (S. Meacham, Director) **Woods Hole Oceanographic Institute Technical Report** WHOI-97-10, 311-318, (1996).

PUBLISHED ABSTRACTS

1. Julien, K. and N. Brummell, "Large Scale Shear Flows in Thermal Convection," **Bulletin of the American Physical Society**, 38, (1993).
2. Julien, K., Legg, S., McWilliams J., and J. Werne, "Rapidly Rotating Rayleigh-B' enard Convection," **Bulletin of the American Physical Society**, 39, (1994).
3. Julien, K., Werne, J., Legg, S., and J. McWilliams, "Transport and Mixing in Three-Dimensional and Constrained Three-Dimensional Rayleigh-B' enard Convection," **Bulletin of the American Physical Society**, 40, (1995).
4. Julien, K., "Weakly Nonlinear Convection I & II," 1997 Summer Program in Geophysical Fluid Dynamics: Double-Diffusive Processes, **Woods Hole Oceanographic Institute Technical Report WHOI-97-10**, Steve Meacham, Editor, (1997).
5. Rosenthal, C.S., and K. Julien, K., "Forward Problems in Sunspot Seismology," **Bulletin of the American Astronomical Society**, 29, <http://adsabs.harvard.edu/abs/1997SPD....28.0208R>, (1997).
6. Legg, S., McWilliams, J., Julien, K., and J. Werne, "Plume Ensembles in Rotating Convection," **Bulletin of the American Physical Society**, (1998). <http://adsabs.harvard.edu/abs/1998APS..DFD..DI07L>
7. Julien, K., Knobloch, E., and S. M. Tobias, "Highly Supercritical Magnetoconvection," in **20th International Congress of Theoretical and Applied Mechanics**, Univ. of Illinois at Urbana-Champaign, Technical Report No. 950 p6. (2000).
8. Julien, K., Knobloch, E., and S. M. Tobias, "Highly Supercritical Magnetoconvection," **Sixth SIAM Conference on Applications of Dynamical Systems**, Snowbird, Utah. p18, (2001)
9. Peacock, T., Bradley, E., Hertzberg, J., and K. Julien, "Micro-active control of a jet flow," **Bulletin of the American Physical Society**, (2001) <http://adsabs.harvard.edu/abs/2001APS..DFD.JQ009P>
10. Julien, K. "Rotating Convection," in 'Transport by Coherent Structures in Geophysical and Environmental Flows', **Euromech Workshop 428**, Turino Italy, (2001).
11. Julien, K., Knobloch, E., and J. Werne, "Rotationally Constrained Flows," **Seventh SIAM Conference on Applications of Dynamical Systems**, Snowbird, Utah. (2003).
12. Burrell N. H., Julien, K., and J. Weiss, "Merger and Alignment in Quasigeostrophic Flows," **Seventh SIAM Conference on Applications of Dynamical Systems**, Snowbird, Utah. (2003).
13. Sprague, M., Julien, K., Knobloch, E., Milliff, R., and J. Werne, "Numerical Simulation of a Reduced Set of Equations for Rapidly Rotating Convection on the Tilted f-Plane," **Bulletin of the American Physical Society**, 48, (2003).
14. Sprague, M., Julien, K., Knobloch, E., Milliff, R., and J. Werne, "Numerical Simulation of a Reduced Set of Equations for Rapidly Rotating Convection on the Tilted f-Plane," **American Geophysical Union Ocean Sciences Meeting**, Oregon, (2004).
15. Sprague, M., Julien, K., Knobloch, E., Milliff, R., and J. Werne, "Numerical Simulation of a Reduced Set of Equations for Rapidly Rotating Convection," **Bulletin of the American Physical Society**, 49, (2004).
16. Mullowney, P., Julien, K., and J. D. Meiss, "Mixing in the K'uppers-Lortz Mode," **Bulletin of the American Physical Society**, 49, (2004).
17. Julien, K., Knobloch, E., R. Milliff and J. Werne, "Reduced Equations for Rapidly Rotating Convection on a tilted f-plane," **Bulletin of the American Physical Society**, (2005) <http://adsabs.harvard.edu/abs/2005APS..DFD.NM004J>
18. Julien, K., Mullowney, P., and J. D. Meiss, "Mixing in the K'uppers-Lortz Mode," **Eighth SIAM Dynamical Systems Conference**, Snowbird, Utah May (2005).
19. Sprague, M., Julien, K., and E. Knobloch, "Reduced Equations for Rotating Convection in a Cylinder," **Bulletin of the American Physical Society**, (2005). <http://adsabs.harvard.edu/abs/2005APS..DFD.NM003S>

20. Julien, K., Knobloch, E., R. Milliff and J. Werne, "Generalized Quasi-geostrophy for Spatially Anisotropic Rotationally Constrained Flows," **SIAM Conference on Nonlinear Waves and Coherent Structures**: Minisymposium, (Julien, Knobloch organizers), Seattle, (2006).
21. Sprague, M., Julien, K., Knobloch, E., and J. Werne, "Numerical Simulation of an Asymptotically Reduced System for Rotationally Constrained Convection," **SIAM Conference on Nonlinear Waves and Coherent Structures**: Minisymposium, (Julien, Knobloch organizers), Seattle, (2006).
22. Julien, K., Knobloch, E., R. Milliff, M. Sprague and J. Werne, "Generalized Quasigeostrophy for Spatially Anisotropic Rotationally Constrained Flows," **UCLA/IPAM Workshop: Small Scales and Extreme Events: the Hurricane**, Los Angeles, (2007).

PRESENTATIONS

INVITED TALKS:

1. July 2008, NCAR/IMAGE Theme-Of-the-Year Summer School Geophysical Turbulent Phenomena, "Lecture Series on Reduced Models for Fluid Flows with Strong Constraints."
2. May 2008, NCAR/IMAGE Theme-Of-the-Year Geophysical Turbulent Phenomena. Workshop on Petascale Computing, "Numerical Simulations on Reduced Models for Fluid Flows with Strong Constraints."
3. Apr. 2008, University of California at Davis, "Reduced Models for Fluid Flows with Strong Constraints."
4. Feb. 2008, NCAR/IMAGE Theme-Of-the-Year Geophysical Turbulent Phenomena. Workshop on Theory and Modeling, "Rotationally Constrained Flows."
5. Mar. 2007, Los Alamos National Laboratory, Center for Nonlinear Science, NM, "Generalized QuasiGeostrophy for Spatially Anisotropic Rotationally Constrained Flows."
6. Feb. 2007, University of California at Los Alamos, Institute for Pure and Applied Mathematics, CA, "Generalized QuasiGeostrophy for Spatially Anisotropic Rotationally Constrained Flows."
7. Sept. 2006, SIAM Minisymposium on Reduced Models for Geophysical Flows, University of Washington, WA, "Generalized QuasiGeostrophy for Spatially Anisotropic Rotationally Constrained Flows."
8. June 2005, International Conference on Nonlinear Waves, Integrable Systems and Applications, University of Colorado at Colorado Springs, "Wave Dynamics in Optically Modulated Waveguide Arrays."
9. June 2005, SIAM Minisymposium on Patterns in Extended Systems, Snowbird UT, "Mixing in the Kuppers-Lortz Mode."
10. May 2005, Institute for Mathematics Applied to the Geosciences, National Center for Atmospheric Research, "Rotationally Constrained Rayleigh-Benard Convection."
11. Apr. 2005, University of Arizona, Applied Mathematics Program, "Rotationally Constrained Rayleigh-Benard Convection."
12. Mar. 2005. University of Colorado at Colorado Springs, "Rotationally Constrained Rayleigh-Benard Convection."
13. Oct. 2004, Department of Mathematics, Colorado State University, "An Investigation of the Reduced Set of Equations for Non-Hydrostatic Rotationally Constrained Flows."
14. Oct. 2004, SIAM meeting on Nonlinear Waves and Coherent Structures, University of Central Florida. Minisymposium, "An Investigation of the Reduced Set of Equations for Non-Hydrostatic Rotationally Constrained Flows."
15. Oct. 2004, Department of Mathematics, University of Central Florida, "Highly Supercritical Magnetoconvection,"
16. Apr. 2004, Nonlinear Dynamics and Astrophysics Seminar, Department of Applied Mathematics and Theoretical Physics, University of Cambridge, "An Investigation of the Reduced Set of Equations for Non-Hydrostatic Rotationally Constrained Flows."

17. Oct. 2003, Boulder, Colorado, American Mathematical Society, "Two-Dimensional Solitons in Optically Modulated Waveguide Arrays."
18. May 2003, Rocky Mountain Workshop on Pattern Formation, Colorado State University, "Stably-Stratified and Unstably-Stratified Quasigeostrophic Flows."
19. Apr. 2003 High Altitude Observatory, National Center for Atmospheric Research, "Longitude-Latitude Spectral Galerkin Methods on a Sphere: Applications to Elliptic Equations," (with Prof. Fornberg).
20. May 2002, Department of Mathematics, University of California at Irvine, "Reduced Hydrostatic and Non-Hydrostatic Descriptions for Rotationally Constrained Flows."
21. Sept. 2001, Turino, Italy, Euromech Workshop 428, "Rotating Convection."
22. June 2001, Condom, France, Stellar and Astrophysical Fluid Dynamics, "Magnetoconvection and Reduced Partial Differential Equation Descriptions."
23. Mar. 2000, Colorado State University, Fort Collins, Dynamical Systems Workshop, "Highly Supercritical Magnetoconvection."
24. Apr. 1999, University of Colorado, Boulder, Program in Atmospheric and Oceanic Sciences Seminar, "Rapidly Rotating Convection and a Reduced PDE Description for Rotationally Constrained Flows."
25. Apr. 1997, Colorado State University, Fort Collins, Applied Mathematics Seminar Series, "A New Class of Equations for Rotationally Constrained Flows."
26. July 1996, Woods Hole Oceanographic Institute, MA, Geophysical Fluid Dynamics Summer Program Principal Lecture Series, "Weakly Nonlinear Convection I & II."
27. July 1995, Woods Hole Oceanographic Institute, MA, Geophysical Fluid Dynamics Summer Program Lecture, "Turbulent Rotating Rayleigh-Bénard Convection."
28. Apr. 1995, Florida State University, Geophysical Fluid Dynamics Institute Seminar, "Rapidly Rotating Rayleigh-Bénard Convection."
29. Feb. 1995, University of California at Santa-Cruz, CA, Nonlinear Dynamics Seminar Series, "Rapidly Rotating Rayleigh-Bénard Convection."
30. Mar. 1992, National Center for Atmospheric Research, CO, Geophysical Turbulence Program, "Strong Spatial Interactions with 1:1 Resonance: A Three-layer Convection Problem."
31. Aug. 1991, Woods Hole Oceanographic Institute, MA, Geophysical Fluid Dynamics Summer Program Lecture, "Strong Spatial Interactions with 1:1 Resonance: A Three-layer Convection Problem."

PRESENTATIONS BY CATEGORY

DEPARTMENTAL SEMINARS/COLLOQUIA

1. Feb. 2008, University of Colorado Applied Mathematics Colloquium, "Reduced Models for Fluid Flows with Strong Constraints."
2. May. 2005, Applied Mathematics Dynamical Systems Seminar, "Problems in Dynamics."
3. Nov. 2001, Applied Mathematics Nonlinear Waves Seminar, "Reduced Hydrostatic and Non-Hydrostatic Descriptions for Rotating Stratified Flows."
4. Oct. 2001, Applied Mathematics Dynamical Systems Seminar, "Rotational Convection: Reduced Hydrostatic and Non-Hydrostatic Descriptions."
5. Mar. 2001, Applied Mathematics Dynamical Systems Seminar, "Codimension-2 Steady-State/Steady-State Interactions with $O(2)$ -Symmetry."
6. Feb, 2001, University of Colorado, Boulder, Applied Mathematics Colloquium, "Constrained Thermal Convection."
7. Nov. 1999, Applied Mathematics Fast Algorithms Seminar, "On the Double Fourier Poisson Solver on the Sphere."
8. Nov. 1999 Applied Mathematics Dynamical Systems Seminar, "Beta-Convection."

9. Feb. 1999, University of Colorado at Denver - University of Colorado at Boulder, Joint Seminars in Computational Mathematics, Boulder, "A Derivation and Investigation of Reduced PDE's for Rotating Convection."
10. Dec. 1998, Applied Mathematics Dynamical Systems Seminar, "A Numerical Investigation of Rapidly Rotating Thermal Convection."
11. Mar. 1997, Applied Mathematics Nonlinear Waves Seminar, "The Dynamics of Rotationally Constrained Convection."

SEMINARS AND COLLOQUIA

(*This list includes some duplication with invited talks)

1. Mar. 2007, Los Alamos National Laboratory, Center for Nonlinear Science, NM, "Generalized QuasiGeostrophy for Spatially Anisotropic Rotationally Constrained Flows."
2. Apr. 2005, University of Arizona, Applied Mathematics Program, "Rotationally Constrained Rayleigh-Benard Convection"
3. May 2005, Institute for Mathematics Applied to the Geosciences, National Center for Atmospheric Research, "Rotationally Constrained Rayleigh-Benard Convection"
4. Apr. 2004, Nonlinear Dynamics and Astrophysics Seminar, Department of Applied Mathematics and Theoretical Physics, University of Cambridge, "An Investigation of the Reduced Set of Equations for Non-Hydrostatic Rotationally Constrained Flows."
5. Oct. 2004, Department of Mathematics, Colorado State University, "An Investigation of the Reduced Set of Equations for Non-Hydrostatic Rotationally Constrained Flows."
6. Oct. 2004, Department of Mathematics, University of Central Florida, "Highly Supercritical Magnetoconvection,"
7. Apr. 2003 High Altitude Observatory, National Center for Atmospheric Research, "Longitude-Latitude Spectral Galerkin Methods on a Sphere: Applications to Elliptic Equations," (with Prof. Fornberg).
8. May 2002, Department of Mathematics, University of California at Irvine, "Reduced Hydrostatic and Non-Hydrostatic Descriptions for Rotationally Constrained Flows."
9. Sept. 2001, Turino, Italy, Euromech Workshop 428, "Rotating Convection."
10. Mar. 2000, Colorado State University, Fort Collins, Dynamical Systems Workshop, "Highly Supercritical Magnetoconvection,"
11. Apr. 1999, University of Colorado, Boulder, Program in Atmospheric and Oceanic Sciences Seminar, "Rapidly Rotating Convection and a Reduced PDE Description for Rotationally Constrained Flows."
12. Apr. 1997, Colorado State University, Fort Collins, Applied Mathematics Seminar Series, "A New Class of Equations for Rotationally Constrained Flows."
13. July 1996, Woods Hole Oceanographic Institute, MA, Geophysical Fluid Dynamics Summer Program Principal Lecture Series, "Weakly Nonlinear Convection I & II."
14. July 1995, Woods Hole Oceanographic Institute, MA, Geophysical Fluid Dynamics Summer Program Lecture, "Turbulent Rotating Rayleigh-B' enard Convection."
15. Apr. 1995, Florida State University, Geophysical Fluid Dynamics Institute Seminar, "Rapidly Rotating Rayleigh-B' enard Convection."
16. Feb. 1995, University of California at Santa-Cruz, CA, Nonlinear Dynamics Seminar Series, "Rapidly Rotating Rayleigh-B' enard Convection."
17. Mar. 1992, National Center for Atmospheric Research, CO, Geophysical Turbulence Program, "Strong Spatial Interactions with 1:1 Resonance: A Three-layer Convection Problem."
18. Aug. 1991, Woods Hole Oceanographic Institute, MA, Geophysical Fluid Dynamics Summer Program Lecture, "Strong Spatial Interactions with 1:1 Resonance: A Three-layer Convection Problem."

CONTRIBUTED PRESENTATIONS: ORAL

1. Nov. 2007, Salt Lake City, Utah, American Physical Society Annual Meeting of the Division of Fluid Dynamics, "Saturation of the Magneto-rotational Instability."
2. Mar. 2007, Santa Fe, New Mexico, Utah, SIAM Geosciences Meeting, "Generalized QuasiGeostrophy for Rotationally constrained Flows."
3. Nov. 2004, Seattle, Washington, American Physical Society-Division of Fluid Dynamics Meeting, "Mixing in the Koppers-Lortz Mode."
4. May 2003, Snowbird, Utah, Seventh Siam Conference on Applications of Dynamical Systems, "Rotationally Constrained Flows."
5. May 2001, Snowbird, Utah, Sixth Siam Conference on Applications of Dynamical Systems, "Highly Supercritical Magnetoconvection."
6. Aug. 2000, Chicago, Illinois, 20th International Congress of Theoretical and Applied Mechanics, "Highly Supercritical Magnetoconvection."
7. Sept. 1999, Santa Barbara, California, First International Symposium on Turbulence and Shear Flow Phenomena, "A Derivation of the Reduced Equations for Rotationally Constrained Convection."
8. Nov. 1995, Irvine, California, American Physical Society Annual Meeting of the Division of Fluid Dynamics, "Transport and Mixing in Three- Dimensional and Constrained Three-Dimensional Rayleigh-B'ernard Convection,"
9. Nov. 1994, Atlanta, Georgia, American Physical Society Annual Meeting of the Division of Fluid Dynamics, "Rapidly Rotating Rayleigh-B'ernard Convection."
10. July 1993, Jackson Hole, Wyoming, Geophysical and Astrophysical Fluid Dynamics meeting, "Travelling Waves in Large-Scale Flows."
11. Nov. 1993, Albuquerque, New Mexico, American Physical Society Annual Meeting of the Division of Fluid Dynamics, "Large Scale Shear Flows in Thermal Convection."

CONTRIBUTED PRESENTATIONS: POSTERS

- Jan. 2004, Portland, Oregon, American Geophysical Union Ocean Sciences Meeting, "Numerical Simulation of a Reduced Set of Equations for Rapidly Rotating Convection."
- Apr. 1996, Aarhus, Denmark, SCORE '96: Solar Convection and Oscillations and their Relationship, "The effect of rotation on convective overshoot."
- Apr. 1996, Aarhus, Denmark, SCORE '96: Solar Convection and Oscillations and their Relationship, "The effect of rotation on the global dynamics of convection."
- May 1994, Los Angeles, California, Global Oscillations Network Group '94: Helio- and Asteroseismology from the Earth and Space, "Inversion for Background Inhomogeneity from Phase Distortions of Two-Dimensional Wave-Fields."

CONFERENCES, MEETINGS, SEMINAR AND WORKSHOPS ACTIVITY SINCE 1998:

- July/Aug 2008 NCAR/IMAGe Theme-Of-the-Year Summer School, Boulder, Colorado
- May 2008 NCAR/IMAGe Theme-Of-the-Year Workshop 2, Boulder, Colorado
- April 2008 Colloquium, University of California at Davis.
- Feb. 2008 NCAR/IMAGe Theme-Of-the-Year Workshop 1, Boulder, Colorado
- Feb. 2008 Colloquium, Department of Applied Mathematics, Boulder, Colorado.
- Nov. 2007 American Physical Society, Division of Fluid Dynamics Meeting, Salt Lake, Utah.
- Mar. 2007 SIAM, Geosciences 07 Meeting, Sante Fe, New Mexico.
- Mar. 2007 Seminar, Center for Nonlinear Sciences, Los Alamos National Laboratories, New Mexico.
- Feb. 2007 Seminar, Institute for Pure and Applied Mathematics (IPAM), University of California at Los Angeles.
- Sept. 2006 SIAM, Conference on Nonlinear Waves and Coherent Structures, Seattle, Washington.
- June 2005 International Conference on Nonlinear Waves, Integrable Systems and Applications, University of Colorado at Colorado Springs.
- June 2005 SIAM Dynamical Systems Conference, Snowbird, Utah.
- May 2005 Seminar, NCAR IMAGe (Institute for Mathematics Applied to the Geosciences)
- Apr. 2005 Seminar, University of Arizona, Tucson, Arizona.
- Mar. 2005 Seminar, University of Colorado at Colorado Springs.
- Nov. 2004 American Physical Society, Division of Fluid Dynamics Meeting, Seattle, Washington.
- Oct. 2004 SIAM Nonlinear Waves and Coherent Structures, Orlando, Florida.
- Oct. 2004 Seminar, University of Central Florida.
- Oct. 2004 Seminar, Colorado State University.
- Apr. 2004 Seminar, Department of Applied Mathematics and Theoretical Physics, University of Cambridge, England.
- Oct. 2003 American Mathematical Society Meeting, Special Session on Nonlinear Waves, University of Colorado at Boulder.
- May 2003 Rocky Mountain Workshop on Pattern Formation, Colorado State University.
- May 2003 SIAM Dynamical Systems Conference, Snowbird, Utah.
- Apr. 2003 Seminar, NCAR HAO, High Altitude Observatory.
- May 2002 Seminar, University of California at Irvine.
- Sept. 2001 Euromech Workshop 438, Turino Italy.
- June 2001 Meeting on Stellar Astrophysical Fluid Dynamics, Condom, France.
- May 2001 SIAM Dynamical Systems Conference, Snowbird, Utah.
- Mar. 2001 Applied Mathematics Dynamical Systems Seminar.
- Feb. 2001 Colloquium, Department of Applied Mathematics, Boulder, Colorado.
- Aug. 2000 International Congress of Theoretical and Applied Mechanics, Chicago, Illinois.
- Mar. 2000 Seminar, Colorado State University.
- Sept. 1999 First International Symposium on Turbulence and Shear Flow Phenomena, Santa Barbara, California.
- Apr. 1999 Seminar, Program in Oceanic Sciences, University of Colorado at Boulder
- June 1998 Geophysical Fluid Dynamics Summer School, Woods Hole Oceanographic Institute.

COURSE INSTRUCTION AND DEVELOPMENT

DEVELOPMENT OF New CURRICULA, TOOLS AND INFRASTRUCTURE

APPM's Mathematical Visualization Toolkit.

Conceived, achieved funding for, and introduced first pilot online toolkit for solving and analyzing differential equations (In participation with James Curry, Anne Dougherty, Congming Li, and James Meiss). Original support for the project entitled "Computational and Mathematical Tools for Differential Equations on the World-Wide Web" was obtained through internal funds by Julien (PI) and Meiss (co-PI), see additional materials in 'Multiples Measures for Teaching'. This effort provided the foundation for a parallel effort funded by the Atlas Program in Calculus III (PI's Curry and Li). The current award-winning version of MVT is now an integral component of all APPM's lower division courses. This version was produced under the guidance of Professors Dougherty and Curry, Sun Microsystems and many talented students.

APPM's Computing Infrastructure

A lead participant in the redevelopment of APPM's computing infrastructure (2003-2005).

Computers and mathematical software tools are at the heart of APPM's research and teaching mission, both at the undergraduate and graduate level. Without remaining on the cutting edge of technology our curricula and mission would be greatly affected. That said, APPM's computing environment went through major changes in 2003-2005: The Newton Lab (our computing commons) was completely transformed from Solaris-based Sun machines to Linux-based machines. This is a transition being made by many science units because of the flexibility, speed and cost of Linux-based machines. However, this took dollars general not available in departmental operating budgets. The transformation now provides the core infrastructure utilized in APPM's upper divisional course. I also added a high-end computation component through a gift award from Hewlett-Packard. This enhanced our graduate and postdoctoral research effort. In house development of web-based mathematical software, particularly, the Mathematical Visualization Toolkit MVT, has played a primary role in APPM's lower division curricula.

Grants:

Development of an Undergraduate Data Visualization Toolkit in Applied Mathematics, Principal Investigator, Engineering Excellence Fund, University of Colorado at Boulder, \$14,300, 2004.

Advanced Technology Platforms- Itanium2™ 2003 Academic Grant Initiative, Co-Principal Investigator (with Connors, D.), Hewlett Packard Gift No. 89932, \$153,310, 2003.

Enhancement of the Undergraduate Computational Environment in Applied Mathematics, Principal Investigator, Engineering Excellence Fund, University of Colorado at Boulder, \$20,000, 2003.

Computational and Mathematical Tools for Differential Equations on the World-Wide-Web, Principal Investigator, Engineering Excellence Fund, University of Colorado at Boulder, \$19,000, 1998.

Introduction to Research (APPM 7400)

This course is designed to expose applied mathematics graduate students to the research environment, faculty, and opportunities at the university and local academic institutions.

MAJOR DEVELOPMENT OF EXISTING COURSES

Differential Equations and Linear Algebra (APPM 2360)

Completely redesigned syllabi from core focus from classical outlook towards a geometric and computer assisted outlook. (In assistance with Bengt Fornberg, James Meiss, and Rodney Halburd). This was a multi-year process with trials evolving through numerous textbooks.

Course Coordinator for Differential Equations and Linear Algebra (APPM 2360, APPM 2460)

Introduced laboratory and computational projects into this large undergraduate core class (see sample lab given in additional materials).

Graduate Sequence in Numerical Analysis (APPM 5600, 5610, 6610)

Completely redesigned these courses for our graduate program (in assistance with Faculty experts on Numerical Analysis: Gregory Beylkin, Bengt Fornberg, Thomas Manteuffel, and Steve McCormick). The process ultimately extended a two-semester sequence into an in-depth three-semester sequence.

COURSES

(Sample materials for the following are included in 'Multiple Measure of Teaching')

Introduction to Differential Equations and Linear Algebra (APPM 2360)

Semesters: Spring 1997 (2 Sections), 1998, 1999, 2002, 2006
Fall 1997 (2 Sections), 1998, 2001, 2007

Text: J. Farlow, J. E. Hall, J. M. McDill, and B. H. West. *Differential Equations and Linear Algebra*, Prentice Hall, Upper Saddle River, New Jersey, 2002.
P. Blanchard, R. L. Devaney, and G. R. Hall. *Differential Equations*. Brooks/Cole, Pacific Grove, California, 1998.
R. L. Borrelli and S. Coleman, *Differential Equations: A Modeling Perspective*. John Wiley & Sons, New York, 1998.
F. Diacu. *An Introduction to Differential Equations: Order and Chaos*. W. H. Freeman and Company, New York, 2000.

Development: Designing hands-on numerical projects is a key component of the semester, see sample project in additional materials.

Introduction to Differential Equations (APPM 2380)

Semesters: Spring 2003

Text: J. Farlow, J. E. Hall, J. M. McDill, and B. H. West. *Differential Equations and Linear Algebra*, Prentice Hall, Upper Saddle River, New Jersey, 2002.
P. Blanchard, R. L. Devaney, and G. R. Hall. *Differential Equations*. Brooks/Cole, Pacific Grove, California, 1998.
R. L. Borrelli and S. Coleman, *Differential Equations: A Modeling Perspective*. John Wiley & Sons, New York, 1998.
F. Diacu. *An Introduction to Differential Equations: Order and Chaos*. W. H. Freeman and Company, New York, 2000.

Development: Designing hands-on numerical projects is a key component of the semester, project were designed with aerospace emphasis.

Nonlinear Dynamics and Chaos (APPM 3010)

Semesters: Fall 1999, 2000

Text: Steven H. Strogatz, *Nonlinear Dynamics and Chaos: With Applications to Physics, Biology, Chemistry and Engineering*, Addison-Wesley, 1994.

Development: This course contains a significant amount of one-on-one advising on the terms modeling project. I have also included class-time computational projects.

Modeling in Applied Mathematics (APPM 4380)

Semesters: Fall 2001

Text: Course Notes.

This course contains a significant amount of one-on-one advising on term modeling project. Students are required to implement modeling techniques taught in class. For example, the MRI reconstruction process for 3D imaging as utilized in the field of medicine. It has also provides an excellent training ground for students wishing to compete in national math modeling competitions.

Intermediate Numerical (APPM 4650)

Semesters: Fall 2002

Text: Burden, R. L. and Faires, J. D., *Numerical Analysis*, 7th ed., Brooks/Cole Publ. Co., 2004.

Development: This course contains though assignments a significant component of algorithm design and implementation

Partial Differential and Integral Equations (APPM 5470)

Semesters: Fall 2006

Text: R. Guenther and J. Lee, *Partial Differential Equations of Mathematical Physics and Integral Equations*, Dover Publications, 1996.

Numerical Analysis I (APPM 5600)

Semesters: Fall 1999, 2003, 2005

Text: Kendall Atkinson, *An Introduction to Numerical Analysis*, 2nd ed., Wiley, 1988.

Development: This course contains projects developed to explore theoretical questions about algorithm-design and implementation.

Numerical Analysis II (APPM 5610)

Semesters: Spring 2000

Text: Kendall Atkinson, *An Introduction to Numerical Analysis*, 2nd ed., Wiley, 1988.

Development: This course contains projects developed to explore theoretical questions about algorithm-design and implementation.

Introduction to Research (APPM 7400)

Semesters: Spring 2008

Development: This course is designed to expose applied mathematics graduate students to the research environment, faculty, and opportunities at the university and local academic institutions.

ADVISING AND EDUCATIONAL SERVICE

POSTDOCTORAL ADVISOR

Michael Sprague, August 2003-July 2005

Present Position: Assistant Professor of Applied Mathematics, University of California at Merced.

DISSERTATION/THESIS ADVISOR

- Eric Wright, University of Colorado, (Ph.D., 2002), 1998-2002, Co-advised with C. Li,
Dissertation Title: Transport in Reaction-Diffusion Systems.
Present Position: Assistant Professor of Mathematics, University of Montana-Western.
- Matthew Tearle, University of Colorado, (Ph.D., 2004), 1999-2004, Co-advised with J. Werne,
Dissertation Title: Stratified Shear Flows.
Present Position: Instructor, University of Colorado
- Paul Mullaney, University of Colorado, (Ph.D., 2004), 2001-2004, Co-advised with J.D. Meiss,
Dissertation Title: Chaotic Advection and Transport.
Present Position: Staff Scientist, TechX Corporation, Boulder.
- Neil Martinsen-Burrell, University of Colorado, (Ph.D., 2004), 2001-2004, Co-advised with J. Weiss.
Dissertation Title: Merger and Alignment of Three-dimensional Quasigeostrophic Vortices.
Present Position: Assistant Professor of Mathematics, Wartburg College, Iowa.
- Mark Petersen, University of Colorado, (Ph.D., 2004), 2001-2004, Co-advised with G. Stewart and J. Weiss,
Dissertation Title: A Study of Geophysical and Astrophysical Turbulence using Reduced Equations.
Present Position: Staff Scientist, Los Alamos National Laboratory.
- Geoffrey Vasil, University of Colorado, (Ph.D., 2007), 2002-present, Co-advised with N.H. Brummell.
Dissertation Topic: Rotating Flows and Magnetic Buoyancy.
Present Position: Postdoctoral Research Associate, University of Colorado at Boulder.
- Benjamin Jamroz, University of Colorado, (Ph.D., expected 2008), 2006-present, Co-advised with N. Flyer.
Dissertation Topic: Magneto-rotational Instability and Coronal Magnetic Fields.
- Michael G. Watson, University of Colorado, (Ph.D., expected 2008), 2004-present.
Dissertation Topic: Reduced Model Investigations of Rotationally Constrained Flows in Annular Geometries.
Accepted Position: for Fall 2008: Staff Scientist, MIT Lincoln Laboratories.
- Ian Grooms, University of Colorado, (Ph.D., expected 2010), 2007-present.
Dissertation Topic: Quantitative Exploration of Low Rossby Number Convection.

UNDERGRADUATE RESEARCH ADVISOR

- Jocelyn Renner, University of Colorado, (BS, 2003), 2002-2003.
Topic: Transport in Rotating Flows.
Awards: **Astronaut Scholarship** (2002-2003),
College of Arts and Sciences Jacob Van Eck Award (2003),
College of Engineering and Applied Sciences Outstanding Graduate (2003).
Present Position: Ph.D Graduate Student, North-Western University.

- Michael Franklin, University of Colorado, (BS, 2005), 2004-2005.
Topic: Development of a Visualization Toolkit.
Present Position: M.S. Graduate Student, Claremont College.
- Patrick McBride, University of Colorado, (BS, 2005), 2004-2005.
Topic: Development of a Visualization Toolkit.
Present Position: Ph.D. Graduate Student, University of Colorado.
- Ashley Moore, University of Colorado, (BS, 2006), 2003-2005.
Topic: Spectral PDE Methods.
Award: **Astronaut Scholarship** (2004-2005)
Present Position: Ph.D Graduate Student, California Technical Institute.
- Lauren Anderson, University of Colorado, (BS, 2007), 2003-2005.
Topic: Spectral PDE Methods.
Present Position: Employee of Northrop Grumman.
- Benjamin Barrow, University of Colorado, (BS, expected 2008), 2005-2007.
Topic: Development of a Visualization Toolkit.
- Jonathan Steffan, University of Colorado, (BS, 2007), 2006-2007.
Topic: Reduced Model Investigations of Rotationally Constrained Flows (with M.G. Watson)
Present Position: Ph.D. Graduate Student, University of Tennessee.
- Marcus Waldman, University of Colorado, (BS, expected 2008), 2006-2007.
Topic: Reduced Model Investigations of Rotationally Constrained Flows (with M.G. Watson)
- Christopher Sprague, University of Colorado, (BS, expected 2008), 2007-present.
Topic: Investigation of Efficient Elliptic Solvers in Spherical Geometries (with M.G. Watson)
- Paul Joos, University of Colorado, (BS, expected 2010), 2007-present.
Topic: Efficient Eigensolvers for Problems with Nonseparable Dimensions (with M.G. Watson)

MEMBER OF DISSERTATION/THESIS COMMITTEE

- Travis Austin, University of Colorado, (APPM Ph.D. 2001).
 - Mark Piper, University of Colorado, (PAOS Ph.D. 2001).
 - Christina Perez, University of Colorado, (APPM Ph.D. 2002).
 - Charlson Kim, University of Colorado, (PHYS Ph.D. 2003).
 - Grady Wright, University of Colorado, (APPM Ph.D. 2003).
 - Kristian Sandberg, University of Colorado, (APPM Ph.D. 2003).
 - Eric Thaler, University of Colorado, (APPM Ph.D. 2004).
 - Darin Wysham, University of Colorado, (APPM Ph.D. 2005).
 - Srinath Vladnamani, University of Colorado, (APPM Ph.D. 2005).
 - Dmitri Veras, University of Colorado, (APS Ph.D. 2007).
 - Cory Ahrens, University of Colorado, (APPM Ph.D. 2006).
 - David Fillmore, University of Colorado, (ATOC Ph.D. 2006).
 - Mark Hofer, University of Colorado, (APPM Ph.D. 2006).
 - Lauren Anderson, University of Colorado, (APPM M.S. 2007).
 - Jin Chao, University of Colorado, (APPM Ph.D. 2007).
 - Jonathan Pietarila-Graham, University of Colorado, (APPM Ph.D. 2007).
 - Thaned Rojsiriphisal, University of Colorado, (APPM Ph.D. 2007).
 - Laura Waterbury, University of Colorado, (APPM M.S. 2007).
 - Julia Zuev, University of Colorado, (APPM Ph.D. 2007).
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- Seth Claudpierre, University of Colorado, (APPM Ph.D.) 2006-present.
 - Terry Haut, University of Colorado, (APPM Ph.D.) 2005-present.
 - Tyger Hovde, University of Colorado, (APPM Ph.D.) 2002-present.

- Vivek Kaila, University of Colorado, (ASEN Ph.D.) 2006-present.
- Christopher Kurcz, University of Colorado, (APPM Ph.D.) 2004-present.
- Michael Levy, University of Colorado, (APPM Ph.D.) 2004-present.
- Jinyu Li, University of Colorado, (APPM Ph.D.) 2003-present.
- Gregory Norgard, University of Colorado, (APPM Ph.D.) 2006-present.
- Maribeth Oscamou, University of Colorado, (APPM Ph.D.) 2005-present.
- David Simpson, University of Colorado, (APPM Ph.D.) 2005-present.

OTHER EDUCATION RELATED ACTIVITIES

- High Schools Honors Institute, Applied Mathematics Faculty Coordinator, July 2000, 2002.
- APPM Coordinator for Open Day in School of Engineering, (2001).
- Development Team for World Wide Web based Mathematical Visualization Toolkit (1.0) for Integration into Applied Mathematics undergraduate curriculum, 1998-2000
- Coordinator of Itanium Computing Environment, 2003-present.
- Faculty Coordinator for APPM VIGRE (Vertical Integration of Graduate Research and Educations) Dynamics Group (with Prof. J..D Meiss and Prof. J. H. Curry).
- Faculty Coordinator for APPM VIGRE Fast Algorithms Group (with Prof. G. Belykin and Prof. B. Fornberg).
- Principal Lecturer, Woods Hole Oceanographic Institute, MA, Geophysical Fluid Dynamics Summer Program. Annual NSF-funded program since 1959.