Benjamin Brown

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Arxiv page and on Google Scholar

Professional development

I received a B.S. (with high distinction) in Physics from Harvey Mudd College in Claremont, CA in 2003 and began graduate studies at the University of Colorado at Boulder later that year. There I received a M.S. in 2005 and a Ph.D. in 2009 from the Department of Astrophysical and Planetary Sciences. From October 2009 to September 2013, I was a National Science Foundation (NSF) Astronomy and Astrophysics Postdoctoral Fellow (AAPF) at the University of Wisconsin at Madison, and an associate specialist at the Kavli Institute for Theoretical Physics (KITP) in Santa Barbara, California from September 2013 to July 2014. Since August 2014, I have been an assistant (until July 2021) and then associate professor in the Department of Astrophysical and Planetary Sciences and the Laboratory for Atmospheric and Space Physics at University of Colorado, Boulder.

Research focus

My research focuses on astrophysical fluid dynamics and magnetohydrodynamics (MHD) of stellar interiors and planetary atmospheres. This research is conducted on national supercomputers using the open-source and massively parallel Dedalus pseudospectral framework; I am a core developer within that open-source project. My stellar research focuses especially on fundamental physical aspects of global-scale dynamo action and the properties of convection, studying how large-scale fields can be built in the convection zone of a star. Further research is exploring how such dynamos couple to the stably-stratified radiative interior through tachoclines of shear and penetrative convection, and has lead to improved treatments of gravity waves within anelastic and other low-mach number models. New research avenues are exploring the magnetorotational instability within the solar interior, and new treatments for radiative transfer that could enable radiative magnetohydrodynamic simulations from the core of a star to its surface. In planetary atmospheres, I study internal gravity wave driving and convective and wave-driven transport of chemical species, and how chemistry can itself drive and modify convection (e.g., via moisture and opacity effects). We have strong connections with the stellar structure modelling communities, including MESA and CESAM, and results from the our fluid dynamical models are being connected with astrophysical observations and laboratory based dynamo experiments.

Teaching focus

I teach primarily at three levels within the Department of Astrophysical and Planetary Sciences. At the undergraduate level, I teach large, non-major science classes (ASTR 1000: Solar system, typical enrollment 200 students). At the graduate level I teach extensively with the APS graduate core (ASTR 5400: Introduction to Fluids, ASTR 5540: Mathematical Methods, ASTR 5550: Observations and Statistics), and I also teach at the advanced graduate level both in APS (ASTR 5410: Fluid Instabilities, Wave and Turbulence) and in the Applied Math department (Geophysical/Astrophysical Fluid Dynamics Seminar). I am a member of Dedalus School, a project dedicated to creating opportunities for online learning of advanced numerical modelling techniques in astrophysics. I mentor students in research at the undergraduate and graduate level, including students outside of my core research group, and regularly participate in other departmental mentoring activities within the undergraduate student body.

Teaching and outreach experience

Teaching

Fall	2023	ASTR-5540: Mathematical Methods	graduate	(14 students; hybrid)	
Fall	2023	ASTR-1030: Solar System	undergraduate	(87 students)	
Spring	2023	ASTR-5400: Introduction to Fluid Dynamics	graduate	(25 students; hybrid)	
Spring	2022	ASTR-5400: Introduction to Fluid Dynamics	graduate	(15 students; hybrid)	
Spring	2022	APPM Joint Geophysical/Astrophysical Fluid Dynamics Seminar (co-organizer)	graduate	($\sim$ 15 students)	
Spring	2021	ASTR-5400: Introduction to Fluid Dynamics	graduate	(22 students; online)	
Spring	2020	ASTR-5400: Introduction to Fluid Dynamics	graduate	(24 students)	
Spring	2020	APPM Joint Geophysical/Astrophysical Fluid Dynamics Seminar (co-organizer)	graduate	($\sim$ 15 students)	
Fall	2019	ASTR-1000: Solar System (MWF)	undergraduate	(194 students)	
Fall	2019	ASTR-1000: Solar System (TuTh)	undergraduate	(195 students)	
Fall	2019	APPM Joint Geophysical/Astrophysical Fluid Dynamics Seminar (co-organizer)	graduate	($\sim$ 15 students)	
Spring	2019	ASTR-1030: Solar System (co-taught w/ Prof. Madigan)	undergraduate	(77 students)	
Spring	2019	ASTR-5550: Observations and Statistics	graduate	(11 students)	
Spring	2019	APPM Joint Geophysical/Astrophysical Fluid Dynamics Seminar (co-organizer)	graduate	($\sim$ 10 students)	
Fall	2018	ASTR-5410: Fluid Instabilities, Waves and Turbulence	graduate	(16 students)	
Fall	2018	APPM Joint Geophysical/Astrophysical Fluid Dynamics Seminar (co-organizer)	graduate	($\sim$ 10 students)	
Spring	2018	ASTR-5400: Introduction to Fluid Dynamics	graduate	(19 students)	
Fall	2017	ASTR-1000: Solar System (TuTh)	undergraduate	($\sim$ 200 students)	
Summer	2017	Lecturer in Fluid Dynamics at Other World Labs exoplanetary science summer school	graduate	($\sim$ 20 students)	UC Santa Cruz
Spring	2017	ASTR-5550: Observations and Statistics	graduate	(11 students)	
Fall	2016	ASTR-1000: Solar System (TuTh)	undergraduate	($\sim$ 200 students)	
Fall	2015	ASTR-5540: Mathematical Methods	graduate	(9 students)	
Fall	2014	ASTR-5540: Mathematical Methods	graduate	(10 students)	
		Prior to CU Boulder			
Spring	2013	Being a Professional Scientist: Career Skills in Astronomy & Astrophysics	graduate	($\sim$ 15 students)	UW Madison
Fall	2012	AST 310: Stellar Interiors (co-taught w/ Prof. Zweibel)	undergraduate	(27 students)	UW Madison
Spring	2011	Being a Professional Scientist: Career Skills in Astronomy & Astrophysics	graduate	($\sim$ 15 students)	UW Madison

Advising & Mentoring

Postdocs mentored through the Hale program

name	dates	current position
Jean-Francois Cossette	2014 – 2016	Scientist, Environment and Climate Change Canada
Fang Fang	2015 – 2017	Research Assistant Professor, West Virginia University
Alicia Aarnio	2016 – 2018	Assistant Professor, UNC Greensboro
Feng Chen	2017 – 2019	Nanjing University, China
Lydia Korre	2018 – 2021	Researcher, CU Applied Math
Benoit Tremblay	2019 – 2022	High Altitude Observatory
Illa Losada	2021 – 2022	McDonald Observatory, University of Texas
Juan Carlos Trelles-Arjona	2022 – present	current Hale Fellow
Adrian Fraser	2022 – present	current Hale Fellow
Thomas Gomez	2023 – present	current Hale Fellow

Student advising

graduate students: current PhD			
Imogen Cresswell	2019–present	APS	
Whitney Powers	2019–present	APS	
graduate students: completed Masters			
Ryan Orvedahl	2014–2016	APS	
Evan Anders	2014–2016	APS	
Jhett Bordwell	2014–2016	APS	
Ryan Diáz-Pérez	2017–2018	APS	
Gabriel Ortiz-Pena	2017–2019	APS	
Imogen Cresswell	2019–2021	APS	
Whitney Powers	2019–2021	APS	
graduate students: completed PhD			
Jhett Bordwell	2014–2019	APS	
Evan Anders	2014–2020	APS	
graduate students: co-advised			
Raven Larson	2018–2019	APS	
Jessica Roberts	2014–2016	APS	
undergraduate students: research and Undergraduate Research Opportunities Program (UROP)			
Tayler Quist	2015–2018	APS	UROP and research
Christopher Panella	2016–2017	Physics & Math	UROP and research
Yun Wen	2016–2018	Physics	UROP and research
Carlos Bicas	2018–2019	APS	UROP and research
Linnea Wolniewicz	2019–2022	APS	research
undergraduate students: honors thesis			
Annie O'Connor	2020–2021	APS	advisor

Students mentored prior to arriving at CU Boulder

Research mentor for five undergraduate students at U. Wisconsin: Jacob Swan, Elise Larson, Jesse Nims, Garrett Frankson, Kevin Meany (May 2010–2013). External mentor for two graduate students at U. Colorado: Kyle Augustson & Nicholas Nelson (May 2007–2013)

Exam committee service

undergraduate students

Justin Nicoski	2020	Honors Thesis	CU Physics	
Morgan Baxter	2020	Honors Thesis	Bates College Physics	
Alex Xialoe Jiang	2021	Honors Thesis	Bates College Physics	

graduate students: Masters

Hilary Egan	2015	Comps II	CU APS	non-advocate chair
Evan Anders	2016	Comps II	CU APS	research advisor
Jhett Bordwell	2016	Comps II	CU APS	research advisor
Piyush Agrawal	2016	Comps II	CU APS	
Daniel Everding	2016	Comps II	CU APS	
Tristan Weber	2016	Comps II	CU APS	
Ryan Orvedahl	2016	Comps II	CU APS	research advisor
Loren Matilsky	2017	Comps II	CU APS	non-advocate chair
Ryan Horton	2017	Comps II	CU APS	non-advocate chair
Aaron Stemo	2017	Comps II	CU APS	
Avery Schiff	2017	Comps II	CU APS	
Ryan Diáz-Pérez	2018	Comps II	CU APS	research advisor
Connor Bice	2018	Comps II	CU APS	non-advocate chair
Elizabeth Butler	2018	Comps II	CU APS	
Samantha Walker	2018	Comps II	CU APS	non-advocate chair
Gabriel Ortiz-Pena	2019	Comps II	CU APS	research advisor
Brian Alden	2019	Comps II	CU APS	
Neil Bassett	2020	Comps II	CU APS	non-advocate chair
Imogen Cresswell	2021	Comps II	CU APS	research advisor
Whitney Powers	2021	Comps II	CU APS	research advisor
Tyler Gorda	2016	Comps III	CU Physics	
Blair Seidlitz	2021	Comps III	CU Physics	
Tobias Oliver	2023	Comps III	CU Physics	
Ryan Lau	2024	Comps III	CU Physics	

graduate students: PhD

Jesse Lord	2014	PhD	CU APS	
Ben Greer	2015	PhD	CU APS	
Tyler Gorda	2016	PhD	CU Physics	
Erika Zetterlund	2018	PhD	CU APS	
Javier Orjuela Koop	2018	PhD	CU Physics	
Jhett Bordwell	2019	PhD	CU APS	research advisor
Kurt Hill	2020	PhD	CU Physics	
Evan Anders	2020	PhD	CU APS	research advisor
Avery Schiff	2020	PhD	CU APS	
Ryan Orvedahl	2020	PhD	CU APS	
Daniel Everding	2020	PhD	CU APS	
Sam VanKooten	2021	PhD	CU APS	
Jessica Roberts	2021	PhD	CU APS	
Blair Seidlitz	2021	PhD	CU Physics	
Ryan Hoffman	2024	PhD	CU APS	
Sruthy Das	2024	PhD	CU Physics	

Outreach

Interviewed for A View from Earth Podcast, "Episode 6: The Sun is a mass of incandescent gas", Fiske Planetarium, Jul 2020

Interviewed for Titanium Physicists Podcast, "Episode 84: Super stars look like zebras, with Ryan North", Jan 2020

Substantial collaboration on "Solar Superstorms" planetarium show, Fiske Planetarium, University of Colorado, 2014–2015.

Substantial collaboration on "Journey to the Stars" planetarium show, Hayden Planetarium, American Museum of Natural History. 2 min screen time (8% of show) in final cut (2009)

Author of content for Science on a Sphere (2007–2012)

Author/lecturer of modern "Birth of Stars and Planets" planetarium show, Fiske Planetarium, U. Colorado. Used for astronomy classes and public shows. 10+ presentations, 30–200 attendees/show (2006–present)

Experience acquiring external resources

Since arriving at CU Boulder as a faculty member in 2014, I have brought in approximately $1.5M in federally supported grants as PI. I am Co-I on approximately $3.7M in federally supported grants where the PI is a CU faculty member, and I am sole CU Co-I on $653k (CU portion) in federally supported grants where the PI is at an external institution. I am PI on significant NASA supported computing allocations ($\sim$ 30M cpu hour/yr), and we have been members of major DOE supercomputing awards ($\sim$ 0.5B cpu hour/yr). I am also Co-I on a Phase I and Phase II NSF Small Business Innovation Research (SBIR) grant ($\sim$ $1.25M) for a small business that I co-founded in 2018 (Skip Technology, Inc.). For that business, I have helped raise private funding from both accredited individuals and institutional investors ($\sim$ $2M, 2021–present). The activities with Skip Technology are independent of my university research or university duties.

Pending Grants

P-I NASA Heliophysics Theory, Modelling and Simulation
Simulating the rapidly rotating Sun:
synthetic observations and implications for the Solar dynamo
(under review, 2023–2026, $1,881,501)

Awarded Grants

Co-I NASA Heliophysics Supporting Research
Deep convection driven from the solar surface: Implications for the convective conundrum
(PI: Manek, LASP, 2024–2026, $881,461)

Co-I NASA Support for Open Source Tools, Frameworks, and Libraries
Supporting Dedalus, an open-source CFD framework with modern spectral methods
(PI: Burns, MIT, 2023–2025, $513,000)

Co-I NSF SBIR Phase II
High Energy-Density Hydrogen-Halogen Flow Batteries for Energy Storage
(PI: Gantner, Skip Technology, 2023–2024, $978,993)

Co-I NSF SBIR Phase I
High Energy-Density Hydrogen-Halogen Flow Batteries for Energy Storage
(PI: Gantner, Skip Technology, 2020, $224,863)

Co-I NASA Heliophysics Theory, Modelling and Simulation
Magneto-Rotational Instability in the Sun?
Global radiation-MHD simulations of the Near-Surface Shear Layer
(PI: Lecoanet, Northwestern, 2020–2023, $1,539,178; Brown portion $653,236)

Co-I NASA Heliophysics Living With a Star Focused Science Team
Processes shaping the solar meridional circulation
(PI: Featherstone, CU, 2020–2023, $885,390)

P-I NASA Future Investigators in NASA Earth and Space Science and Technology
Fundamental studies of rotating convection at the solar poles: can we see giant cells under the photospheric convective flows?,
(Student PI: Powers, CU, 2023–2026, $150,000)

P-I NASA Earth and Space Science Fellowship
Fundamental studies into the solar convective conundrum: Do giant cells exist?,
(Student PI: Anders, CU, 2018–2020, $90,000)

P-I NASA Solar System Workings
Atmospheric waves in giant planets: energy and chemical transport
(2018–2021, $442,774)

P-I NASA Solar System Workings, Covid augmentation
Atmospheric waves in giant planets: energy and chemical transport
(2021-2022, $58,000)

Co-I NASA Heliophysics Supporting Research grant
Seeking the deep origins of sunspots
(PI: Toomre, CU, 2018–2021, $742,405)

Co-I NSF Astronomy & Astrophysics Grant
Resolving the source of the solar acoustic oscillations: Preparing for the DKIST era
(PI: Rast, CU, 2016–2019, $651,725)

P-I NASA Living With a Star Focused Science Team
Stellar insights into solar magnetism:
Exploring fundamental dynamo physics across the lower main sequence
(2015–2020, $960,132)

Co-I NASA Astrophysical Theory Program grant
Tiny stars, strong fields: exploring the origin of intense magnetism in M stars
(PI: Toomre, CU, 2015–2020, $591,563)

Prior to CU Boulder

Co-I NASA Heliophysics Theory Program grant
Dynamic Origins of Cyclic Solar Activity
(PI: Toomre, CU, 2010–2015, $1,410,067)

P-I NSF Astronomy and Astrophysics Postdoctoral Fellowship
Magnetism in the habitable zone: simulations of dynamo activity in lower-mass stars
(2009–2013, $249,000)

P-I NASA Graduate Student Research Program
Role of Deep Solar Convection in Evolving Magnetism and SSW
(Student PI: Brown, 2006–2009, $72,000)

CU Boulder internal grants

Co-I CU Seed Grant
Exploring doubly-diffusive turbulence in extreme environments
(PI Keith Julien, Applied Math, $50,000)

Co-I CU IMPART Grant
Conversations in equity and inclusion in Astronomy and Astrophysics
(PIs Alicia Aarnio & Zach Berta-Thompson, 2018–2019, $4,000)

Co-I CU IMPART Grant
Conversations in equity and inclusion in Astronomy and Astrophysics
(PI Alicia Aarnio, 2017–2018, $4,000)

Co-I CU Diversity & Excellence Grant
Inclusive, culturally aware mentoring:
the most important thing we don't know how to do for our students
(PI Alicia Aarnio, 2017–2018, $3,000)

P-I CU ASSETT Development Award
Developing digital assets for teaching general astronomy courses at Fiske planetarium.
(2015-2016, $4000)

Other Competitive Resources

P-I awarded NASA HEC Planetary supercomputing allocation (2018–present, 10M cpu-hours/year)
P-I awarded NASA HEC Heliophysics supercomputing allocation (2015–present, 22M cpu-hours/year)
P-I awarded CU Research Computing supercomputing allocation (2015–present, 4M cpu-hours/year)
Co-I awarded DOE INCITE supercomputing allocation (2014–2017, $\sim$ 250M cpu-hours/year)
Co-I awarded NASA supercomputing allocation (2010–2017, $\sim$ 60M cpu-hours/year)
Co-I awarded NSF Teragrid supercomputing allocation (2010–2013, $\sim$ 14M cpu-hours/year)

Co-I massive star magnetic field program, Apache Point Observatory (6 half-nights)
P-I stellar flare program on South African Large Telescope (SALT/RSS, $\sim$ 60 hrs over 3 seasons)
Co-I stellar differential rotation program on Center for High Angular Resolution Astronomy interferometer (CHARA/VEGA)

Supercomputing experience

UK SAFE resource *Archer2* at Edinburgh (2023–present)
NASA resource *Pleiades* at Ames (2011–present)
CU Boulder resource *Summit* at CU (2016–2022)
CU Boulder resource *Janus* at CU (2008–2016)
NSF Teragrid resource *Kraken* at NICS (2008–2014)
NSF Teragrid resource *Stampede* at TACC (2013–2014)
NSF Teragrid resource *Ranger* at TACC (2008–2013)
NASA resource *Columbia* at Ames (2005–2013)
NSF Teragrid resource *Bigben* at PSC (2005-2010)
NSF Teragrid resource *Blue Gene/L* at SDSC (2004–2009)
NSF Teragrid resource *Datastar* at SDSC (2004–2008)
NSF Teragrid resource *Lemieux* at PSC (2003–2006)

Service

Core member development team, Dedalus open source community code (dedalus-project.org)

Chair of Diversity, Equity and Inclusion Committee, Arts and Sciences Faculty Senate (2023–present)
Director and **Search Committee Chair** of George Ellery Hale Postdoctoral Fellowship in Solar and Space Physics program within APS department at CU Boulder (2014–present)
Chair of Graduate Admissions Committee at CU Boulder (2017, 2021, 2022)
Chair of Welcome and Orientation Committee (2023, 2024)
Departmental representative Arts and Sciences Faculty Senate (2022–present)
Member Arts and Sciences Faculty Senate Diversity, Equity and Inclusion committee (2022–present)

Question author and grader APS department Comps Exam (2014–2020)
Faculty member of Graduate Admissions Committee at CU Boulder (2014–2019, 2021–2023)
Faculty member of Social and Welcoming Committee (2020, 2021, 2022)
Faculty member of Sommers-Bausch Observatory Oversight Committee at CU Boulder (2016–2017)
Faculty member of Fiske Planetarium Oversight Committee at CU Boulder (2014–2017)

Member of American Astronomical Society Employment Committee (2013–2018)
Member of Computational Infrastructure for Geodynamics: Geodynamo working group (2013–2017)
Theory group leader, Bcool stellar magnetism collaboration (2012–2016)

Lead author, 1 white paper for *Helio2010: A Decadal Strategy for Solar and Space Physics*
Contributing author, 2 white papers for *Helio2050: A Decadal Strategy for Solar and Space Physics*
Contributing author, 1 white paper for *Astro2020: Decadal Survey on Astronomy and Astrophysics*
Contributing author, 1 white paper for *NASA: Best Practices for Future Open Code Policy*
Contributing author, 2 white papers for *Helio2010: A Decadal Strategy for Solar and Space Physics*
Contributing author, 1 white paper for *Astro2010: The Astronomy and Astrophysics Decadal Survey*
Contributing scientist on the VAPOR project for volume visualization of large datasets (2008–2012)

Referee, *Journal of Fluid Mechanics* (2020–present)
Referee, *Living Reviews in Solar Physics* (2014–present)
Referee, *Astronomy & Astrophysics* (2011–present)
Referee, *Astrophysical Journal* (2010–present)
Referee, *Geophysical and Astrophysical Fluid Dynamics* (2008–present)
Referee, *Monthly Notices of the Royal Astronomical Society* (2012–present)
NSF and NASA grant reviewer

Awards

2018	University of Colorado Marinus Smith Award
2017	University of Colorado Postdoctoral Mentor, honorable mention
	Prior to CU Boulder
2009–2013	NSF AAPF fellowship
2006-2009	NASA GSRP fellowship
2006	University of Colorado departmental teaching assistant award
2005	University of Colorado departmental teaching assistant award

Professional Organizations

2020 – present	American Geophysical Union
2014 – present	American Physical Society, Division Fluid Dynamics
2003 – present	American Astronomical Society, Solar Physics Division

Publications

Ph.D. thesis

Convection and dynamo action in rapidly rotating suns, 2009, Advisor: Juri Toomre

Open Source Community Codes

Dedalus: a flexible framework for spectrally solving differential equations
Burns, K. J., Vasil, G. M., Oishi, J. S., Lecoanet, D. & **Brown, B. P.**,
http://dedalus-project.org/ (and on github, & Astronomy Source Code Library)
more than 340 refereed papers use this code, and see Burns et al (2020)

Journal articles

h-index: 29
citations: 3287 (from scholar.google.com)
markings: **Papers led by students who I mentored, **students I mentored** and **postdocs I mentored**.

50. *The solar dynamo begins near the surface*,
Vasil, G M, Lecoanet, D, Augustson, K, Burns, K J, Oishi, J S, **Brown, B P**, Brummell, N & Julien, K, 2024, *Nature Astronomy*, *accepted*

49. ***Internally heated and fully compressible convection: Flow morphology and scaling laws*,
Powers, W T, Anders, E H, **Brown, B P**, 2024, *Physical Review Fluids*, *in press*

48. ***Force balances in strong-field magnetoconvection simulations*,
Cresswell, I G, Anders, E H, **Brown, B P**, Oishi, J S, Vasil, G M, 2023, *Physical Review Fluids*, 8 (9), 093503

47. *The photometric variability of massive stars due to gravity waves excited by core convection*,
Anders, E H, Lecoanet, D, Cantiello, M, Burns, K J, Hyatt, B A, Kaufman, E, Townsend, R H D, **Brown, B P**, Vasil, G M, Oishi, J S, & Jermyn, A S, 2023, *Nature Astronomy*, https://doi.org/10.1038/s41550-023-02040-7

46. *The stability of Prendergast magnetic fields*,
Kaufman, E, Lecoanet, D, Anders, E H, **Brown, B P**, Vasil, G M, Oishi, J S, & Burns, K J, 2022, *MNRAS*, 517, 3332-3340

45. *Convective boundary mixing processes*,
Anders, E H, Jermyn, A S, Lecoanet, D, Fuentes, J R, Korre, L, **Brown, B P**,& Oishi, J S, 2022, *Research Notes of the American Astronomical Society*, 6(2), 41

44. *Stellar convective penetration: parameterized theory and dynamical simulations*,
Anders, E H, Jermyn, A S, Lecoanet, D, & **Brown, B P**, 2022, *ApJ*, 926(2), 169

43. *eigentools: A Python package for studying differential eigenvalue problems with an emphasis on robustness*,
Oishi, J S, Burns, K J, Clark, S, Anders, E H, **Brown, B P**, Vasil, G M, & Lecoanet, D, 2021, *Journal of Open Source Software*, 6(62),3079

42. *Single-hemisphere dynamos in M-dwarf stars*,
Brown, B P, Oishi, J S, Vasil, G M, Lecoanet, D, & Burns, K J, 2020, *ApJ*, 902(1), L3

41. ***Convective dynamics with mixed temperature boundary conditions: why thermal relaxation matters and how to accelerate it*,
Anders, E H, Vasil, G M, **Brown, B P**, & **Korre, L**, 2020, *Physical Review Fluids*, 5(8), 083501

40. *Dedalus: A flexible framework for numerical simulations with spectral methods*,
Burns, K J, Vasil, G M, Oishi, J S, Lecoanet, D, & **Brown, B P**, 2020, *Physical Review Research*, 2(2), 023068

39. *The magnetorotational instability prefers three dimensions*,
Oishi, J S, Vasil, G M, Baxter, M, Swan, A, Burns, K J, Lecoanet, D, & **Brown, B P**, 2020, *Proceedings of the Royal Society A*, 476(2233), 20190622

38. ***Entropy Rain: dilution and compression of thermals in stratified domains*,
Anders, E H, Lecoanet, D, & **Brown, B P**, 2019, *ApJ*, 884(1), 65

37. *Breezing through the space environment of Barnard's Star b*,
Alvarado-Gómez, J D, Garraffo, C, Drake, J J, **Brown, B P**, Oishi, J S, Moschou, S P, & Cohen, O, 2019, *ApJ*, 875(2), L12

36. *Tensor calculus in spherical coordinates using jacobi polynomials. part-I: Mathematical analysis and derivations*,
Vasil, G M, Lecoanet, D, Burns, K J, Oishi, J S, & **Brown, B P**, 2019, *Journal of Computational Physics: X*, 3, 100013

35. *Tensor calculus in spherical coordinates using jacobi polynomials. part-II: Implementation and examples*,
Lecoanet, D, Vasil, G M, Burns, K J, **Brown, B P**, & Oishi, J S, 2019, *Journal of Computational Physics: X*, 3, 100012

34. ***Predicting the Rossby number in convective experiments*
Anders, E. H., Manduca, C. M., **Brown, B. P.,** Oishi, J. S., & Vasil, G. M., 2019, *ApJ*, 872, 138

33. ***Accelerated evolution of convective simulations*
Anders, E. H., **Brown, B. P.,** & Oishi, J. S. 2018, *Physical Review Fluids*, 3(8), 083502

32. ***Convective Dynamics and Disequilibrium Chemistry in the Atmospheres of Giant Planets and Brown Dwarfs*
Bordwell, B, **Brown, B P**, & Oishi, J S, 2018, *ApJ*, 854, 8

31. ***Convective heat transport in stratified atmospheres at low and high Mach number*
Anders, E H & **Brown, B P**, 2017, *Physical Review Fluids*, 2(8), 083501

30. *On Differential Rotation and Overshooting in Solar-like Stars*
Brun, A S, Strugarek, A, Varela, J, Matt, S P, Augustson, K C, Emeriau, C, DoCao, O L, **Brown, B**, & Toomre, J, 2017, *ApJ*, 836, 192

29. *Tensor calculus in polar coordinates using Jacobi polynomials*
Vasil, G M, Burns, K J, Lecoanet, D, Olver, S, **Brown, B P**, & Oishi, J S, 2016, *Journal of Computational Physics*, 325, 53–73

28. *Turbulent Chemical Diffusion in Convectively Bounded Carbon Flames*
Lecoanet, D, Schwab, J, Quataert, E, Bildsten, L, Timmes, F X, Burns, K J, Vasil, G M, Oishi, J S, & **Brown, B P**, 2016, *ApJ*, 832, 71

27. *Performance benchmarks for a next generation numerical dynamo model*
Matsui, H, Heien, E, Aubert, J, Aurnou, J M, Avery, M, **Brown, B**, Buffett, B A, Busse, F, Christensen, U R, Davies, C J, Featherstone, N, Gastine, T, Glatzmaier, G A, Gubbins, D, Guermond, J-L, Hayashi, Y-Y, Hollerbach, R, Hwang, L J, Jackson, A, Jones, C A, Jiang, W, Kellogg, L H, Kuang, W, Landeau, M, Marti, P, Olson, P, Ribeiro, A, Sasaki, Y, Schaeffer, N, Simitev, R D, Sheyko, A, Silva, L, Stanley, S, Takahashi, F, Takehiro, S-i, Wicht, J, & Willis, A P, 2016, *Geochemistry, Geophysics, Geosystems*, 17, 1586–1607

26. *M Dwarf Flare Continuum Variations on One-second Timescales: Calibrating and Modeling of ULTRACAM Flare Color Indices*
Kowalski, A F, Mathioudakis, M, Hawley, S L, Wisniewski, J P, Dhillon, V S, Marsh, T R, Hilton, E J, & **Brown, B P**, 2016, *ApJ*, 820, 95

25. *A validated non-linear Kelvin-Helmholtz benchmark for numerical hydrodynamics*
Lecoanet, D, McCourt, M, Quataert, E, Burns, K J, Vasil, G M, Oishi, J S, **Brown, B P**, Stone, J M, & O'Leary, R M, 2016, *MNRAS*, 455, 4274–4288

24. *Numerical simulations of internal wave generation by convection in water*
Lecoanet, D, Le Bars, M, Burns, K J, Vasil, G M, **Brown, B P**, Quataert, E, & Oishi, J S, 2015, *Phys. Rev. E*, 91, 063016:1–10

Prior to CU Boulder

23. *Angular momentum transport via internal gravity waves in evolving stars*
Fuller, J, Lecoanet, D, Cantiello, M, & **Brown, B P**, 2014, *ApJ*, 796, 17:1–12

22. *Properties of 42 solar-type Kepler targets from the Asteroseismic Modeling Portal*
Metcalfe, T. S., Creevey, O. L., Dogan, G., et al. (including **Brown, B P**), 2014, *ApJS*, 214, 27:1–13

21. ** *Conduction in low Mach number flows: Part I Linear and weakly nonlinear regimes*
Lecoanet, D, **Brown, B P**, Zweibel, E G, Burns, K J, Oishi, J S, & Vasil, G M, 2014, ApJ, 797, 94:1–16

20. *Buoyant magnetic loops generated by global convective dynamo action*
Nelson, N J, **Brown, B P**, Brun, A S, Miesch, M S, & Toomre, J, 2014, Sol. Phys., 289, 441–458

19. *Energy conservation and gravity waves in sound-proof treatments of stellar interiors: Part II Lagrangian constrained analysis*
Vasil, G M, Lecoanet, D, **Brown, B P**, Wood, T S, & Zweibel, E G, 2013, *ApJ*, 773, 169:1–23

18. *Magnetic wreaths and cycles in convective dynamos*
Nelson, N J, **Brown, B P**, Brun, A S, Miesch, M S, & Toomre, J, 2013a, *ApJ*, 762, 73:1–20

17. *Magnetic activity cycles in the exoplanet host star epsilon Eridani*
Metcalfe, T S, Buccino, A P, **Brown, B P**, Mathur, S, Soderblom, D R, Henry, T J, Mauas, P J D, Petrucci, R, Hall, J C, & Basu, S, 2013, *ApJ*, 763, L26:1–6

16. *Energy conservation and gravity waves in sound-proof treatments of stellar interiors: Part I anelastic approximations*
Brown, B P, Vasil, G M, & Zweibel, E G, 2012, *ApJ*, 756, 109:1–20

15. *Convection and differential rotation in F-type stars*
Augustson, K C, **Brown, B P**, Brun, A S, Miesch, M S, & Toomre, J, 2012, *ApJ*, 756, 169:1–23

14. *Role of large-scale velocity fluctuations in a two-vortex kinematic dynamo*
Kaplan, E J, **Brown, B P**, Rahbarnia, K, & Forest, C B, 2012, Phys. Rev. E, 85(6), 066315:1–9

13. *Direct observation of the turbulent emf and transport of magnetic field in a liquid sodium experiment*
Rahbarnia, K, **Brown, B P**, Clark, M M, Kaplan, E J, Nornberg, M D, Rasmus, A M, Zane Taylor, N, Forest, C B, Jenko, F, Limone, A, Pinton, J-F, Plihon, N, & Verhille, G, 2012, *ApJ*, 759, 80:1–6

12. *Optimized boundary driven flows for dynamos in a sphere*
Khalzov, I V, **Brown, B P**, Cooper, C M, Weisberh, D B, & Forest, C B, 2012a, *Physics of Plasmas*, 19(11), 112106:1–11

11. *Resistive and ferritic-wall plasma dynamos in a sphere*
Khalzov, I V, **Brown, B P**, Kaplan, E J, Katz, N, Paz-Soldan, C, Rahbarnia, K, Spence, E J, & Forest, C B, 2012b, *Physics of Plasmas*, 19(10), 104501:1–4

10. *Modeling the Parker instability in a rotating plasma screw pinch*
Khalzov, I V, **Brown, B P**, Katz, N, & Forest, C B, 2012c, *Physics of Plasmas*, 19(2), 022107:1–10

9. *Convective Babcock-Leighton dynamo models*
Miesch, M S & **Brown, B P**, 2012, *ApJ*, 746, L26:1–5

8. *Convection and differential rotation properties of G and K stars computed with the ASH code*
Matt, S P, Do Cao, O, **Brown, B P**, & Brun, A S, 2011, *Astronomische Nachrichten*, 332, 897–906

7. *Buoyant magnetic loops in a global dynamo simulation of a young sun*
Nelson, N J, **Brown, B P**, Brun, A S, Miesch, M S, & Toomre, J, 2011, *ApJ*, 739, L38:1–5

6. *Magnetic cycles in a convective dynamo simulation of a young solar-type star*
Brown, B P, Miesch, M S, Browning, M K, Brun, A S, & Toomre, J, 2011, *ApJ*, 731, 69:1–19

5. *Numerical simulation of laminar plasma dynamos in a cylindrical von Kármán flow*
Khalzov, I V, **Brown, B P**, Ebrahimi, F, Schnack, D D, & Forest, C B, 2011, *Physics of Plasmas*, 18(3), 032110:1–9

4. *Persistent magnetic wreaths in a rapidly rotating sun*
Brown, B P, Browning, M K, Brun, A S, Miesch, M S, & Toomre, J, 2010, *ApJ*, 711, 424–438

3. *Exploring the P_{cyc} vs. P_{rot} relation with flux transport dynamo models of solar-like stars*
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2. *Rapidly rotating suns and active nests of convection*
Brown, B P, Browning, M K, Brun, A S, Miesch, M S, & Toomre, J, 2008, *ApJ*, 689, 1354–1372

1. *Rapid rotation, active nests of convection and global-scale flows in solar-like stars*
Brown, B P, Browning, M K, Brun, A S, Miesch, M S, & Toomre, J, 2007, *Astron. Nachr.*, 328, 1002–1005

Whitepapers

9. *The Puzzling Structure of Solar Convection: Window into the Dynamo*, Featherstone, N A, Augustson, K C, Aurnou, J M, Blume, C, **Brown, B P**, Brummell, N, Burns, K J, Calkins, M A, Camisassa, M, Dikpati, M, Fan, Y, Fuentes, J R, Guerrero, G, Hindman, B W, Julien, K, Kitiashvili, I N, Korre, L, Lecoanet, D, Manek, B, Matilsky, L, Miesch, M, Nelson, N J, Oishi, J S, Powers, W T, Rempel, M, Soderlund, K, Stejko, A M, & Vasil, G M, 2023, *arXiv e-prints*, p. arXiv:2305.08823

8. *Solar Magnetism and Structure from the Poles*, Newmark, J, Hoeksema, J T, Featherstone, N, Vourlidas, A, McIntosh, S, Gibson, S, Hassler, D, Dikpati, M, & **Brown, B P**, 2020, *Heliophysics 2050*

7. *The Science Case for a 4π Perspective: A Polar/Global View for Understanding the Solar Cycle*, Hoeksema, J T, Basu, S, Braun, D, **Brown, B P**, Dikpati, M, Featherstone, N, Gibson, S, Hassler, D, Komm, R, Newmark, J, Pevtsov, A A, Vourlidas, A, & Zhao, J, 2020, *Heliophysics 2050*

6. *It's Time to Eliminate the GRE and PGRE in All Astronomy &; Astrophysics PhD Programs: Motivation, Implementation and Outcomes*, Burgasser, A, Aarnio, A, Abazajian, K N, Agüeros, M, Barranco, J A, Berta-Thompson, Z K, **Brown, B P**, Casey, C, Charbonneau, D, Coble, K, Donahue, M, Gallagher, S, Greene, J, Horst, S, Konopacky, Q, Miller, C, Monkiewicz, J, Posselt, J, Ramirez-Ruiz, E, Rauscher, E, Redfield, S, Rudolph, A L, Sandstrom, K, & Venkatesan, A, 2019, BAAS, Vol. 51, p. 38

5. *Perspectives on Reproducibility and Sustainability of Open-Source Scientific Software from Seven Years of the Dedalus Project*, Oishi, J S, **Brown, B P**, Burns, K J, Lecoanet, D, & Vasil, G M, 2018, *ArXiv e-prints 1801.08200*, pp. 1–6

Prior to CU Boulder

4. *An experimental plasma dynamo program for investigations of fundamental processes in heliophysics*, **Brown, B**, Forest, C, Nornberg, M, Zweibel, E, Cattaneo, F & Cowley, S, 2010, *Helio2010: A Decadal Strategy for Solar and Space Physics*, pp. 1–6

3. *The importance of polar observations in understanding the solar dynamo*, Miesch, M, Rempel, M, Kosovichev, A, Sekii, T, Hara, H, Yokoyama, T, Brun, S, Tarbell, T, Appourchaux, T, **Brown, B P** & Toomre, J, 2010, *Helio2010: A Decadal Strategy for Solar and Space Physics*, pp. 1–7

2. *The solar magnetic dynamo and its role in the formation and evolution of the Sun, in the habitability of its planets, and in space weather around Earth*, Schrijver, K, Carpenter, K, Karovska, M, Ayres, T, Basri, G, **Brown, B**, Christensen-Dalsgaard, J, Dupree, A, Guinan, E, Jardine, M, Miesch, M, Pevtsov, A, Rempel, M, Scherrer, P, Solanki, S, Strassmeier, K & Walter, F, 2010, *Helio2010: A Decadal Strategy for Solar and Space Physics*, pp. 1–8

1. *Dynamos and magnetic fields of the Sun and other cool stars, and their role in the formation and evolution of stars and in the habitability of planets*, Schrijver, K, Carpenter, K, Karovska, M, Ayres, T, Basri, G, **Brown, B**, Christensen-Dalsgaard, J, Dupree, A, Guinan, E, Jardine, M, Miesch, M, Pevtsov, A, Rempel, M, Scherrer, P, Solanki, S, Strassmeier, K & Walter, F, 2009, *astro2010: The Astronomy and Astrophysics Decadal Survey*, pp. 262:1–8

Conference proceedings

16. *Combined surface and volumetric occlusion shading*, Schott, M, Martin, T, Grosset, A, Brownlee, C, Hollt, T, **Brown, B P**, Smith, S, & Hansen, C, 2012, *Pacific Visualization Symposium (PacificVis), 2012 IEEE*, IEEE, pp. 169–176

15. *New Era in 3-D Modeling of Convection and Magnetic Dynamos in Stellar Envelopes and Cores*, Toomre, J, Augustson, K C, **Brown, B P**, Browning, M K, Brun, A S, Featherstone, N A, & Miesch, M S, 2012, *in* Shibahashi, H, Takata, M, & Lynas-Gray, A E (eds), *Progress in Solar/Stellar Physics with Helio- and Asteroseismology*, Vol. 462 of *Astronomical Society of the Pacific Conference Series*, pp. 331–344

14. *Stellar magnetism*, Brownlee, C, **Brown, B P**, Clyne, J, Touati, C, Gaither, K, & Hansen, C, 2011, *Proceedings of the 2011 companion on High Performance Computing Networking, Storage and Analysis Companion*, ACM, pp. 151–152

13. *Global-scale Magnetism (and Cycles) in Dynamo Simulations of Stellar Convection Zones*, **Brown, B P**, Browning, M K, Brun, A S, Miesch, M S, & Toomre, J, 2011, *in* Johns-Krull, C, Browning, M K, & West, A A (eds), *16th Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun*, Vol. 448 of *Astronomical Society of the Pacific Conference Series*, pp. 277–284

12. *Global magnetic cycles in rapidly rotating younger suns*, Nelson, N J, **Brown, B P**, Browning, M K, Brun, A S, Miesch, M S, & Toomre, J, 2011, *IAU Symposium*, Vol. 273 of *IAU Symposium*, pp. 272–275

11. *Magnetic Cycles and Meridional Circulation in Global Models of Solar Convection*, Miesch, M S, **Brown, B P**, Browning, M K, Brun, A S, & Toomre, J, 2011, *in* Brummell, N H, Brun, A S, Miesch, M S, & Ponty, Y (eds), *IAU Symposium*, Vol. 271 of *IAU Symposium*, pp. 261–269

10. *Global-scale wreath-building dynamos in stellar convection zones*, **Brown, B P**, Browning, M K, Brun, A S, Miesch, M S, & Toomre, J, 2011, *in* Brummell, N H, Brun, A S, Miesch, M S, & Ponty, Y (eds), *IAU Symposium*, Vol. 271 of *IAU Symposium*, pp. 78–85

9. *Laboratory dynamo experiments*, Nornberg, M D, Forest, C B, **Brown, B P**, Zweibel, E G, Wallace, J B, Clark, M, Spence, E J, Taylor, N Z, Kaplan, E J, & Rahbarnia, K, 2011, *2010 NASA Laboratory Astrophysics Workshop*, pp. C47:1–4

8. *Global-scale simulations of stellar convection and their observational predictions*, **Brown, B P**, 2011, *in* Creech-Eakman, M et al. (eds), *Resolving the future of astronomy with long-baseline interferometry*, *Astronomical Society of the Pacific Conference Series*, in press, pp. 1–9 *arXiv:1106.6075*

7. *Dynamos in stellar convection zones: of wreaths and cycles*, **Brown, B P**, 2010, *in* Appourchaux, T. et al. (eds), *GONG 2010/SOHO 24: A new era of seismology of the Sun and solar-like stars*, *J. Phys. Conf. Series*, pp. 1–10

6. *Three-dimensional simulations of solar and stellar dynamos: The influence of a tachocline*, Miesch, M S, Browning, M K, Brun, A S, Toomre, J, & **Brown, B P**, 2009, *in* M Dikpati, T Arentoft, I González Hernández, C Lindsey & F Hill (ed.), *GONG 2008/SOHO 21: Solar-stellar dynamos as revealed by helio- and asteroseismology*, Vol. 416 of *Astronomical Society of the Pacific Conference Series*, pp. 443–452

5. *Dynamo action and wreaths of magnetism in a younger sun*, **Brown, B P**, Browning, M K, Brun, A S, Miesch, M S & Toomre, J, 2009, *in* M Dikpati, T Arentoft, I González Hernández, C Lindsey & F Hill (ed.), *GONG 2008/SOHO 21: Solar-stellar dynamos as revealed by helio- and asteroseismology*, Vol. 416 of *Astronomical Society of the Pacific Conference Series*, pp. 369–374

4. *Strong dynamo action in rapidly rotating suns*, **Brown, B P**, Browning, M K, Brun, A S, Miesch, M S, Nelson, N J & Toomre, J, 2007, *American Institute of Physics Conference Series*, Vol. 948, pp. 271–278

3. *Variations of solar subsurface weather in the vicinity of active regions*, **Brown, B P**, Haber, D A, Hindman, B W & Toomre, J, 2004, *in* D Danesy (ed.), *GONG 2004/SOHO 14: Helio- and asteroseismology: towards a golden future*, Vol. 559 of *ESA Special Publication*, pp. 345–348

2. *Differential rotation when the Sun spun faster*, **Brown, B P**, Browning, M K, Brun, A S & Toomre, J, 2004, *in* D Danesy (ed.), *GONG 2004/SOHO 14: Helio- and asteroseismology: towards a golden future*, Vol. 559 of *ESA Special Publication*, pp. 341–344

1. *Patterns of vorticity on the solar surface*, **Brown, B P** & Snodgrass, H B, 2003, *in* H Sawaya-Lacoste (ed.), *GONG+ 2002/SOHO 12: Local and global helioseismology: the present and future*, Vol. 517 of *ESA Special Publication*, pp. 109–113

Invited scientific talks & Chaired sessions

Chaired sessions

Nov 2017, **Chaired session**, *D3: Astrophysical Fluid Dynamics*, *American Physical Society Division of Fluid Dynamics Meeting*, Denver, CO

Nov 2016, **Chaired session**, *R10: Convection and Buoyancy Driven Flows: Planetary & Exoplanetary Dynamics*, *American Physical Society Division of Fluid Dynamics Meeting*, Portland, OR

Jan 2013, **Chaired session**, *Star Evolution and Ages*, *American Astronomical Society Winter Meeting*, Long Beach, CA

Jun 2012, **Chaired session**, *Star Clusters and the Milky Way*, *American Astronomical Society Summer Meeting*, Anchorage, AK

Nov 2011, **Chaired session**, *Dynamo Mini Conference*, *American Physical Society: Division of Plasma Physics*, Salt Lake City, UT

Interviews, Media & Press

Jan 2020, *Podcast*: "Episode 84: Super Stars Look Like Zebras with Ryan North", *Titanium Physicists Podcast*

Fall 2019, "Waves of Change: KITP collaborators create a computational framework for fluid dynamics", *KITP Newsletter; featured article*

Nov 2019, "This Gene Technology Could Change the World. Its Maker Isn't Sure It Should.", *Vice magazine*

Public Talks

Nov 2019, *Public Talk*: "The Dedalus Project: open science and high performance science simulations using python", *Astronomy on Tap*, Gunbarrel, CO

Nov 2017, *Public Talk*:"Studying convection in stars like our Sun", NASA Booth, *Supercomputing 2017*, Denver, CO

May 2013, *Public Talk*:"Exploring our magnetic sun: convection and the solar dynamo", UW Space Place, Madison, WI

Sep 2012, *Public talk*: "Exploring our magnetic Sun: convection and the solar dynamo", UW Space Place, Madison, WI

Nov 2007, *Public talk:* "Global dynamo action in a younger sun," NCAR & NASA booths *Supercomputing 2007*, Reno, NV

Panels and Special Sessions

Nov 2022, **Invited panalist**, "What is wrong with the Sun", *Isaac Newton Institute program "Frontiers in dynamo theory: from the Earth to the stars"*, Cambridge, UK

Nov 2021, **Invited panelist**, "Models on the main sequence: quasi equilibrium and its discontents", *Kavli Institute for Theoretical Physics conference "Transport in Stellar Interiors"*, Santa Barbara, CA

Dec 2020, **Invited panelist, Special Session**, SH022 - Solar & Heliospheric Science from Out of the Ecliptic, "Hunting for giant cells at the solar poles", *American Geophysical Union Fall Meeting*, virtual

Jan 2019, **Invited Speaker, Special Session**, "The Dedalus project: open source science in astrophysics with examples in convection and stellar dynamos", *American Astronomical Society Winter Meeting*, Seattle, WA

Aug 2018, **Invited panelist**, "Advances in Computational Astrophysics and the Solar-Stellar-Planetary Connection", *Cool Stars 20*, Boston, MA

Colloquia

Jan 2024, **Colloquium**: "Unusual views on the solar dynamo: tachocline-free dynamos in M-dwarf stars, solar polar views, and different dynamo mechanisms", Earth, Planetary & Space Sciences, University of California, Los Angeles

Nov 2023, **Colloquium**: "Approaching solar and stellar dynamos from unusual angles: M-dwarf stars, solar polar views, and different dynamo mechanisms", Department of Astronomy, Ohio State University, Columbus

Nov 2022, **Colloquium**: "Simple numerical experiments for the Sun, planets, and stars", Isaac Newton Institute, Cambridge, UK

Feb 2022, **Colloquium**: "Approaching the solar dynamo from unusual angles: M-dwarf stars, polar views, and different dynamo mechanisms", Department of Astronomy, Caltech, Pasadena

Dec 2021, **Colloquium**: "Approaching the solar dynamo from unusual angles: M-dwarf stars, polar views, and different dynamo mechanisms", Department of Astronomy, University of Washington, Seattle

Nov 2021, **Colloquium**: "Approaching the solar dynamo from unusual angles: M-dwarf stars, polar views, and different dynamo mechanisms", Department of Applied Mathematics, University of Leeds, England

Oct 2021, **Colloquium**: "What can we learn from multi-D simulations anyways?", Kavli Institute for Theoretical Physics, University of California, Santa Barbara

Jun 2021, **Colloquium**: "Approaching the solar dynamo from unusual angles: M-dwarf stars, polar views, and different dynamo mechanisms", Leibniz-Institute for Astrophysics Potsdam, Germany

Aug 2020, **Colloquium**: " The Sun, the stars and Jupiter Aswirl: fluid dynamics in stars and planets", Department Astrophysical and Planetary Sciences, University of Colorado, Boulder

Mar 2020, **Colloquium**: "The Dedalus project: Lessons learned in building a community code for solar physics" Institute Pascal Université Paris-Saclay, Orsay, France

Mar 2019, **Colloquium**: "The Dedalus project: A flexible approach to solving PDEs, with applications in stellar astrophysics", Institute for Applied Computational Science, Harvard, MA

Oct 2016, **Colloquium**: "Deep solar convection: fundamental problems and progress",
High Altitude Observatory, Boulder, CO

May 2015, **Colloquium**: "Dragons in the deep: dynamics and implications for the solar dynamo",
Institute for Astronomy, Kula, HI

May 2015, **Colloquium**: "Magnetism in global solar and stellar dynamos",
Institute for Astronomy, Honolulu, HI

Apr 2013, **Colloquium**:"Cyclic wreath-building dynamos in the Sun and sun-like stars",
University of Colorado, Boulder, CO

Feb 2013, **Colloquium**:"Wreath-building stellar dynamos: how stars like our Sun get their spots?", Columbia University, New York, NY

Dec 2011, **Colloquium**:"Convective dynamos: how stars like the Sun get their spots",
University of Washington, Seattle, WA

Mar 2010, **Colloquium**: "Cyclic wreath-building dynamos in simulations of solar-type stars," South West Research Institute, Boulder, CO

May 2009, **Colloquium**: "Dynamo action and wreaths of magnetism in rapidly rotating suns," High Altitude Observatory, Boulder, CO

Dec 2008, **Colloquium**: "Dynamos and magnetism in rapidly rotating suns," University of Wisconsin, Madison, WI

Invited Talks

Nov 2023, "Rainy-Benard convection: how rain drives dynamics", *GAFD seminar*, Boulder, CO

Mar 2023, "The Dedalus framework: simple experiments for solar and stellar dynamos", *Whole Sun Workshop*, Institut Pascal, Paris, France

Oct 2019, "The Dedalus Project: High performance python and open science approaches in solar physics", *PyHelio Conference*, Boulder, CO

Sep 2018, "Overshoot in low-Mach number stellar convection", *Geophysical Turbulence Program*, Boulder, CO

Feb 2018, "Compressibility efects in convection", *Natural Convection*, Princeton Center for Theoretical Sciences, Princeton, NJ

Nov 2017, "Convective overshoot in the interiors of solar-type stars", *American Physical Society Division of Fluid Dynamics Meeting*, Denver, CO

Sep 2017, "Convective overshoot at the solar tachocline", *Compressible Convection Conference*, Lyon, France

Aug 2017, "Convective overshoot at the solar tachocline", *American Astronomical Society Solar Physics Division Meeting*, Portland, OR

Nov 2016, "Convective overshoot at stiffly stable interfaces", *American Physical Society Division of Fluid Dynamics Meeting*, Portland, OR

Aug 2016, "Convective overshoot: is there any under solar conditions", *Geophysical Turbulence Program*, Boulder, CO

Oct 2014, "Photospheric dynamics: Dragons in the deep", DKIST Science Working Group, Maui, HI

Oct 2012, "Convective dynamos: field generation on the lower main-sequence", *Second Bcool meeting*, Goettingen, Germany

Nov 2011, "Convective dynamos in solar-type stars," *American Physical Society: Division of Plasma Physics Meeting*, Salt Lake City, UT

Oct 2011, "Convection in main-sequence stars," *The Impact of Asteroseismology across Stellar Astrophysics*, KITP, Santa Barbara, CA

Oct 2011, "Wreath-building dynamos in solar-type stars: is this how stars like the Sun get their spots?", Solar, Stellar and Planetary Sciences seminar, CfA, Boston, MA

Sep 2011, "Modelling Sun-like stars: cyclic convective dynamos," *2011 SORCE Science meeting*, Sedona, AZ

Sep 2011, "Global-scale simulations of stellar convection and their observational predictions," *The Future of Astronomy*, CIERA, Evanston, IL

Jun, 2011, "Global-scale magnetic fields from dynamo simulations of stellar convection," *StarPol: Stellar Polarimetry from birth to death*, Madison, WI

May 2011, "Convection and differential rotation in solar-type stars," *Differential Rotation in Stars*, Princeton, NJ

Apr 2011, "Simulations of global-scale dynamo action in the Sun and other stars," *American Physical Society: April Meeting*, Orange, CA

Jul 2010, **Review talk**: "Dynamos in stellar convection zones: of wreaths and cycles," *GONG 2010/SOHO 24: A new era of seismology of the Sun and solar-like stars*, Aix-en-provence, France

Apr 2010, "Mechanisms at work in global-scale wreath-building stellar dynamos," *Special Topic Workshop on Imbalanced MHD*, Madison, WI

Feb 2010, "Simulations of the global dynamo in stars like the Sun," Plasma physics seminar, University of Wisconsin, Madison, WI

Jan 2010, "Solar rotation II: from the Sun to the stars," Lecture at CMPD/CMSO Winter School, UCLA, Los Angeles, CA

Dec 2009, "Convective flows in plasma experiments," *Flow Driven Instabilities and Turbulence in High Beta Plasmas and Kick-off meeting for the Madison Plasma Dynamo Experiment*, Madison, WI

Jan 2009, "Wreaths of magnetism and other surprises in rapidly rotating suns," Geophysics seminar, UCLA, Los Angles, CA