REFERENCES

- Anders, E. H., & Brown, B. P. 2017, Convective heat transport in stratified atmospheres at low and high Mach number, Physical Review Fluids, 2, 083501
- Anders, E. H., Brown, B. P., & Oishi, J. S. 2018, Accelerated evolution of convective simulations, Physical Review Fluids, 3, 083502
- Anders, E. H., Lecoanet, D., & Brown, B. P. 2019, Entropy Rain: Dilution and Compression of Thermals in Stratified Domains, The Astrophysical Journal, 884, 65
- Anders, E. H., Manduca, C. M., Brown, B. P., Oishi, J. S., & Vasil, G. M. 2019, Predicting the Rossby Number in Convective Experiments, The Astrophysical Journal, 872, 138
- Barker, A. J., Dempsey, A. M., & Lithwick, Y. 2014, Theory and Simulations of Rotating Convection, ApJ, 791, 13
- Basu, S. 1997, Seismology of the base of the solar convection zone, MNRAS, 288, 572
- Bedding, T. R., Butler, R. P., Kjeldsen, H., Baldry, I. K., O'Toole, S. J., Tinney, C. G., Marcy, G. W., Kienzle, F., & Carrier, F. 2001, Evidence for Solar-like Oscillations in β Hydri, ApJ, 549, L105
- Benomar, O., Bazot, M., Nielsen, M. B., Gizon, L., Sekii, T., Takata, M., Hotta, H., Hanasoge, S., Sreenivasan, K. R., & Christensen-Dalsgaard, J. 2018, Asteroseismic detection of latitudinal differential rotation in 13 Sun-like stars, Science, 361, 1231
- Böhm-Vitense, E. 1958, Über die Wasserstoffkonvektionszone in Sternen verschiedener Effektivtemperaturen und Leuchtkräfte. Mit 5 Textabbildungen, ZAp, 46, 108
- Bouchy, F., & Carrier, F. 2001, P-mode observations on α Cen A, A&A, 374, L5
- Brandenburg, A. 2016, Stellar Mixing Length Theory with Entropy Rain, The Astrophysical Journal, 832, 6
- Brown, B. P., Browning, M. K., Brun, A. S., Miesch, M. S., & Toomre, J. 2010, Persistent Magnetic Wreaths in a Rapidly Rotating Sun, The Astrophysical Journal, 711, 424
- Brown, B. P., Miesch, M. S., Browning, M. K., Brun, A. S., & Toomre, J. 2011, Magnetic Cycles in a Convective Dynamo Simulation of a Young Solar-type Star, ApJ, 731, 69
- Brummell, N. H., Clune, T. L., & Toomre, J. 2002, Penetration and Overshooting in Turbulent Compressible Convection, ApJ, 570, 825
- Brummell, N. H., Hurlburt, N. E., & Toomre, J. 1996, Turbulent Compressible Convection with Rotation. I. Flow Structure and Evolution, ApJ, 473, 494
- Brummell, N. H., Hurlburt, N. E., & Toomre, J. 1998, Turbulent Compressible Convection with Rotation. II. Mean Flows and Differential Rotation, ApJ, 493, 955

- Brun, A. S., Strugarek, A., Varela, J., Matt, S. P., Augustson, K. C., Emeriau, C., DoCao, O. L., Brown, B., & Toomre, J. 2017, On Differential Rotation and Overshooting in Solar-like Stars, ApJ, 836, 192
- Buldgen, G. 2019, Current problems in stellar evolution, arXiv e-prints, arXiv:1902.10399
- Burns, K. J., Vasil, G. M., Oishi, J. S., Lecoanet, D., & Brown, B. P. 2019, Dedalus: A Flexible Framework for Numerical Simulations with Spectral Methods, arXiv e-prints, arXiv:1905.10388
- Cattaneo, F., Brummell, N. H., Toomre, J., Malagoli, A., & Hurlburt, N. E. 1991, Turbulent Compressible Convection, ApJ, 370, 282
- Couston, L. A., Lecoanet, D., Favier, B., & Le Bars, M. 2017, Dynamics of mixed convective-stablystratified fluids, Physical Review Fluids, 2, 094804
- Couston, L.-A., Lecoanet, D., Favier, B., & Le Bars, M. 2019, Shape and size of large-scale vortices : a universal fluid pattern in geophysical fluid dynamics, arXiv e-prints, arXiv:1909.03244
- Featherstone, N. A., & Hindman, B. W. 2016, The Emergence of Solar Supergranulation as a Natural Consequence of Rotationally Constrained Interior Convection, The Astrophysical Journal Letters, 830, L15
- Gastine, T., Yadav, R. K., Morin, J., Reiners, A., & Wicht, J. 2014, From solar-like to antisolar differential rotation in cool stars, MNRAS, 438, L76
- Graham, E. 1975, Numerical simulation of two-dimensional compressible convection, Journal of Fluid Mechanics, 70, 689
- Greer, B. J., Hindman, B. W., Featherstone, N. A., & Toomre, J. 2015, Helioseismic Imaging of Fast Convective Flows throughout the Near-surface Shear Layer, Astrophys J. Lett., 803, L17
- Guerrero, G., Smolarkiewicz, P. K., de Gouveia Dal Pino, E. M., Kosovichev, A. G., & Mansour, N. N. 2016, On the Role of Tachoclines in Solar and Stellar Dynamos, The Astrophysical Journal, 819, 104
- Hanasoge, S., Miesch, M. S., Roth, M., Schou, J., Schüssler, M., & Thompson, M. J. 2015, Solar Dynamics, Rotation, Convection and Overshoot, Space Sci. Rev., 196, 79
- Hanasoge, S. M., Duvall, T. L., & Sreenivasan, K. R. 2012, Anomalously weak solar convection, Proceedings of the National Academy of Science, 109, 11928
- Hathaway, D. H., Teil, T., Norton, A. A., & Kitiashvili, I. 2015, The Sun's Photospheric Convection Spectrum, The Astrophysical Journal, 811, 105
- Hotta, H. 2017, Solar Overshoot Region and Small-scale Dynamo with Realistic Energy Flux, ApJ, 843, 52

- Hotta, H., Rempel, M., & Yokoyama, T. 2015, Efficient Small-scale Dynamo in the Solar Convection Zone, ApJ, 803, 42
- Hotta, H., Rempel, M., & Yokoyama, T. 2016, Large-scale magnetic fields at high Reynolds numbers in magnetohydrodynamic simulations, Science, 351, 1427
- Huber, D., Basu, S., Beck, P., Bedding, T. R., Buzasi, D., Cantiello, M., Chaplin, W. J., Christiansen, J. L., Cunha, K., Egeland, R., Fuller, J., Garcia, R. A., Gies, D. R., Guzik, J., Hekker, S., Hermes, J., Jackiewicz, J., Johnson, J., Kawaler, S., Metcalfe, T., Mosser, B., Ness, M., Pinsonneault, M., Piro, A. L., Aguirre, V. S., Soderblom, D., Stassun, K., Tayar, J., ten Brummelaar, T., Roettenbacher, R., Trampedach, R., van Belle, G., van Saders, J., & Stello, D. 2019, Stellar Physics and Galactic Archaeology using Asteroseismology in the 2020's, BAAS, 51, 488
- Hurlburt, N. E., Toomre, J., & Massaguer, J. M. 1984, Two-dimensional compressible convection extending over multiple scale heights, The Astrophysical Journal, 282, 557
- IRC. 2017-2018, *Illinois Report Card: Academic Progress*, https://www.illinoisreportcard.com/state.aspx?source=trends&Stateid=IL
- Jørgensen, A. C. S., & Weiss, A. 2019, Overcoming the structural surface effect with a realistic treatment of turbulent convection in 1D stellar models, Monthly Notices of the Royal Astronomical Society, 488, 3463
- Käpylä, P. J. 2018, Overshooting in simulations of compressible convection, arXiv e-prints, arXiv:1812.07916
- Käpylä, P. J., Rheinhardt, M., Brand enburg, A., Arlt, R., Käpylä, M. J., Lagg, A., Olspert, N., & Warnecke, J. 2017, Extended Subadiabatic Layer in Simulations of Overshooting Convection, The Astrophysical Journal Letters, 845, L23
- Kjeldsen, H., & Frandsen, S. 1991, Stellar photometric stability. II. Ages and distances for 13 open clusters with time series observations., A&AS, 87, 119
- Kowalski, A. F. 2016, in 19th Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun (CS19), Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun, 127
- Laursen, S., Liston, C., Thiry, H., & Graf, J. 2007, What Good Is a Scientist in the Classroom? Participant Outcomes and Program Design Features for a Short-Duration Science Outreach Intervention in K12 Classrooms, CBE Life Science Education, 6, 49
- Lecoanet, D., Brown, B. P., Zweibel, E. G., Burns, K. J., Oishi, J. S., & Vasil, G. M. 2014, Conduction in Low Mach Number Flows. I. Linear and Weakly Nonlinear Regimes, ApJ, 797, 94
- Lecoanet, D., & Jeevanjee, N. 2019, Entrainment in Resolved, Dry Thermals, Journal of the Atmospheric Sciences, https://doi.org/10.1175/JAS-D-18-0320.1, TBD

- Lecoanet, D., & Quataert, E. 2013, Internal gravity wave excitation by turbulent convection, MN-RAS, 430, 2363
- Lecoanet, D., Vasil, G. M., Burns, K. J., Brown, B. P., & Oishi, J. S. 2019, Tensor calculus in spherical coordinates using Jacobi polynomials. Part-II: Implementation and examples, Journal of Computational Physics: X, 3, 100012
- Meltzer, D., & Thornton, R. 2012, Resource Letter ALIP-1: Active-Learning Instruction in Physics, American Journal of Physics, 80, 478
- Paxton, B., Bildsten, L., Dotter, A., Herwig, F., Lesaffre, P., & Timmes, F. 2011, Modules for Experiments in Stellar Astrophysics (MESA), The Astrophysical Journal Supplement, 192, 3
- Redish, E. F., Saul, J. M., & Steinberg, R. N. 1998, Student expectations in introductory physics, American Journal of Physics, 66, 212
- Rempel, M. 2014, Numerical Simulations of Quiet Sun Magnetism: On the Contribution from a Small-scale Dynamo, ApJ, 789, 132
- Rempel, M., Schüssler, M., & Knölker, M. 2009, Radiative Magnetohydrodynamic Simulation of Sunspot Structure, ApJ, 691, 640
- Santos, A. R. G., García, R. A., Mathur, S., Bugnet, L., van Saders, J. L., Metcalfe, T. S., Simonian, G. V. A., & Pinsonneault, M. H. 2019, Surface Rotation and Photometric Activity for Kepler Targets. I. M and K Main-sequence Stars, The Astrophysical Journal Supplement Series, 244, 21
- Santos, A. R. G., Campante, T. L., Chaplin, W. J., Cunha, M. S., Lund, M. N., Kiefer, R., Salabert,
 D., García, R. A., Davies, G. R., Elsworth, Y., & Howe, R. 2018, Signatures of Magnetic Activity in the Seismic Data of Solar-type Stars Observed by Kepler, ApJS, 237, 17
- Schofield, M., Chaplin, W. J., Huber, D., Campante, T. L., Davies, G. R., Miglio, A., Ball, W. H., Appourchaux, T., Basu, S., Bedding, T. R., Christensen-Dalsgaard, J., Creevey, O., García, R. A., Handberg, R., Kawaler, S. D., Kjeldsen, H., Latham, D. W., Lund, M. N., Metcalfe, T. S., Ricker, G. R., Serenelli, A., Silva Aguirre, V., Stello, D., & Vanderspek, R. 2019, The Asteroseismic Target List for Solar-like Oscillators Observed in 2 minute Cadence with the Transiting Exoplanet Survey Satellite, ApJS, 241, 12
- Schou, J., Antia, H. M., Basu, S., Bogart, R. S., Bush, R. I., Chitre, S. M., Christensen-Dalsgaard, J., Di Mauro, M. P., Dziembowski, W. A., Eff-Darwich, A., Gough, D. O., Haber, D. A., Hoeksema, J. T., Howe, R., Korzennik, S. G., Kosovichev, A. G., Larsen, R. M., Pijpers, F. P., Scherrer, P. H., Sekii, T., Tarbell, T. D., Title, A. M., Thompson, M. J., & Toomre, J. 1998, Helioseismic Studies of Differential Rotation in the Solar Envelope by the Solar Oscillations Investigation Using the Michelson Doppler Imager, ApJ, 505, 390
- Shchukina, N. G., & Trujillo Bueno, J. 2019, The diagnostic potential of the weak field approximation for investigating the quiet Sun magnetism: the Si I 10 827 Å line, A&A, 628, A47

- Spruit, H. C. 1997, Convection in stellar envelopes: a changing paradigm., Memorie della Societa Astronomica Italiana, 68, 397
- Stein, R. F., & Nordlund, Å. 1998, Simulations of Solar Granulation. I. General Properties, ApJ, 499, 914
- Stein, R. F., & Nordlund, Å. 2012, On the Formation of Active Regions, Astrophys J. Lett., 753, L13
- Strugarek, A., Beaudoin, P., Charbonneau, P., & Brun, A. S. 2018, On the Sensitivity of Magnetic Cycles in Global Simulations of Solar-like Stars, ApJ, 863, 35
- Tarshish, N., Jeevanjee, N., & Lecoanet, D. 2018, Buoyant Motion of a Turbulent Thermal, Journal of Atmospheric Sciences, 75, 3233
- Thompson, M. J., Toomre, J., Anderson, E. R., Antia, H. M., Berthomieu, G., Burtonclay, D., Chitre, S. M., Christensen-Dalsgaard, J., Corbard, T., De Rosa, M., Genovese, C. R., Gough, D. O., Haber, D. A., Harvey, J. W., Hill, F., Howe, R., Korzennik, S. G., Kosovichev, A. G., Leibacher, J. W., Pijpers, F. P., Provost, J., Rhodes, E. J., J., Schou, J., Sekii, T., Stark, P. B., & Wilson, P. R. 1996, Differential Rotation and Dynamics of the Solar Interior, Science, 272, 1300
- Tobias, S. M., Brummell, N. H., Clune, T. L., & Toomre, J. 1998, Pumping of Magnetic Fields by Turbulent Penetrative Convection, ApJ, 502, L177
- Van Kooten, S. J., & Cranmer, S. R. 2017, Characterizing the Motion of Solar Magnetic Bright Points at High Resolution, ApJ, 850, 64
- Vennix, J., den Brok, P., & Taconis, R. 2017, Perceptions of STEM-based outreach learning activities in secondary education, Learning Environments Research, 20, 21
- Vennix, J., den Brok, P., & Taconis, R. 2018, Do outreach activities in secondary STEM education motivate students and improve their attitudes towards STEM?, International Journal of Science Education, 40, 1263
- Wood, T. S., & Brummell, N. H. 2012, Transport by Meridional Circulations in Solar-type Stars, ApJ, 755, 99
- Wood, T. S., & Brummell, N. H. 2018, A Self-consistent Model of the Solar Tachocline, ApJ, 853, 97
- Yu, J., Huber, D., Bedding, T. R., Stello, D., Hon, M., Murphy, S. J., & Khanna, S. 2018, Asteroseismology of 16,000 Kepler Red Giants: Global Oscillation Parameters, Masses, and Radii, ApJS, 236, 42