

PUBLICATIONS OF ROBERT M. KERR

Books, editor or major chapter

7. Bustamante, M.D., R.M. Kerr, A.C. Newell & M. Tsubota (editors) 2013: Proceedings of the IUTAM Symposium on Understanding Common Aspects of Extreme Events in Fluids, UCD Dublin, Ireland 2-6 July 2012. Elsevier.
6. Schumacher, J., R.M. Kerr & K. Horiuti: 2012 Structure and Dynamics of Vorticity in Turbulence, In *Ten Chapters in Turbulence* (eds. P.A. Davidson, Y. Kaneda, K.R. Sreenivasan) Cambridge University Press.
5. Kerr, R.M. & M. Oliver: 2011 The Ever-Elusive Blowup in the Mathematical Description of Fluids. In *An Invitation to Mathematics: From Competitions to Research*, D. Schleicher and M. Lackmann (eds.), pp. 137–164, Springer-Verlag, Berlin. Proceedings of the 50th International Mathematics Olympiad, Bremen, Germany, August 2009.
4. Kerr, R.M. 2001: A new role for vorticity and singular dynamics in turbulence. In *Nonlinear Instability Analysis Volume II*. (ed. L. Debnath), WIT Press, Southampton, United Kingdom, pp 15–68.
3. Kerr, R.M., 2001: Is there a 2D cascade in 3D convection. In *Advances in Wave Interaction and Turbulence*, (eds. P. Milewski, L. Smith, E. Tabak, F. Waleffe), part of the Contemporary Mathematics Series published by the American Mathematics Society.
2. Kerr, R.M. & P. Fox (editors) 2000: *Geophysical and Astrophysical Convection* Gordon and Breach.
1. Kerr, R.M., & Y. Kimura (editors) 2000: *Developments in Geophysical Turbulence*. Proceedings of the IUTAM symposium at the National Center for Atmospheric Research, Boulder, CO 16-19 June 1998. Kluwer Academic Publishers, Dordrecht.

Thesis, Refereed Publications

- 52 Kerr, R.M. 2018: Enstrophy and circulation scaling for Navier-Stokes reconnection. *J. Fluid Mech.* **839**, R2.
- 51 Kerr, R.M. 2018: Trefoil knot timescales for reconnection and helicity. *Fluid Dynamics Res.* **50**, 011422. <http://iopscience.iop.org/article/10.1088/1873-7005/aa8163>
- 50 Rorai, C., Skipper, J., Kerr, R. M., & Sreenivasan, K. R. 2016: Approach and separation of quantised vortices with balanced cores. *J. Fluid Mech.* **808**, 641-667.
- 49 Gibbon, J.D., Donzis, D.A., Gupta, A., Kerr, R.M., Pandit, R. & Vincenzi, D. Regimes of nonlinear depletion and regularity in the 3D Navier-Stokes equations. *Nonlinearity* **27**, 2605-2625, 2014. Also: arXiv:1402.1080
- 48 Donzis, D., Gibbon, J.D, Gupta, A., Kerr, R.M., Pandit, R., Vincenzi, D., 2013: Vorticity moments in four numerical simulations of the 3D Navier-Stokes equations. *J. Fluid Mech.* **732**, 316-331.
- 47 Kerr, R.M. 2013: Bounds for Euler from vorticity moments and line divergence *J. Fluid Mech.* **729**, R2.
- 46 Kerr, R.M. 2013: Swirling, turbulent vortex rings formed from a chain reaction of reconnection events, *Phys. Fluids* **25**, 065101.
- 45 Kerr, R.M. 2012: Dissipation and enstrophy statistics in turbulence: are the simulations and mathematics converging? *J. Fluid Mech.* **700**, 1-4.

- 44 R.M. Kerr 2011: Vortex stretching as a mechanism for quantum kinetic energy decay, *Phys. Rev. Lett.* **106**, 224501.
- 43 Gibbon, J.D., M.D. Bustamante, R.M. Kerr 2008: The three-dimensional Euler equations: singular or non-singular?, *Nonlinearity* **21**, T123-T129.
- 42 Bustamante, M.D. & R. M. Kerr 2008: 3D Euler about a 2D symmetry plane. *Physica D* **237**, 1912-1920.
- 41 Liu, Y., P.G. Tucker and R.M. Kerr 2008: Linear and nonlinear model large-eddy simulations of a plane jet. *Computers and Fluids* **37**, 439-449.
- 40 Holm, D.D. and R.M. Kerr 2007: Helicity in the formation of turbulence *Phys Fluids* **19**, 025101.
- 39 Gibbon, J.D., D.D. Holm, R.M. Kerr, I Roulstone 2006: Quaternions and particle dynamics in the Euler fluid equations, *Nonlinearity* **19**, 1969-1983.
- 38 Kerr, R.M., 2005: Velocity and scaling of collapsing Euler vortices *Phys. Fluids* **17**, 075103.
- 37 Kerr, R.M., 2005: Vortex collapse and turbulence *Fluid Dyn Res* **36**, 249–260.
- 36 Holm, D.D. and Kerr, R.M., 2002: Transient vortex events in the initial value problem for turbulence, *Phys. Rev. Lett.* **88** 244501.
- 35 Kerr, R.M., Meneguzzi, M., and Gotoh, T., 2001: An inertial range crossover in structure functions. *Phys. Fluids* **13**, 1985–1994.
- 34 Kerr, R.M., 2001: The energy budget in Rayleigh-Bénard convection, *Phys. Rev. Lett.* **87** 244502.
- 33 Kerr, R.M. and Herring, J. 2000: Prandtl number dependence of Nusselt number in DNS. *J. Fluid Mech.* **419**, 325–344.
- 32 Clark, T.L., Hall, W.D., Kerr, R.M., Middleton, D., Radke, L., Ralph, F.M., and Neiman, P.J., Levinson, D. 2000: On the origins of aircraft damaging clear-air turbulence during the 9 December 1992 Colorado downslope windstorm: Numerical simulations and comparison with observations. *J. Atmos. Sci* **57**, 1105–1131.
- 31 Kerr, R.M. and Brandenburg, A. 1999: Evidence for a singularity in ideal magnetohydrodynamics: implications for fast reconnection. *Phys. Rev. Lett.* **83**, 1155-1158.
- 30 Chang, T., Hertzberg, J., & Kerr. R. M. 1997: Three-dimensional vortex/wall interaction: Entrainment in numerical simulation and experiment. *Phys. Fluids* **9**, 57-66.
- 29 Kerr, R. M. 1996: Rayleigh Number Scaling in Numerical Convection. *J. Fluid Mech.* **310**, 139-179.
- 28 Swaminathan, N., S. Mahalingam, & R. M. Kerr 1996: Structure of nonpremixed reaction zones in numerical isotropic turbulence. *Theoretical and Computational Fluid Dynamics.* **8**, 1-17.
- 27 Kerr, R. M., J.A. Domaradzki, & G. Barbier 1996: Small-scale properties of nonlinear interactions and subgrid-scale energy transfer in isotropic turbulence. *Phys. Fluids* **8**, 197.
- 26 Kerr, R.M. 1996: Cover illustration: vortex structure of Euler collapse. *Nonlinearity* **9** 271-272.
- 25 Kerr, R. M., Herring, J. R., & Brandenburg, A. 1995: Large-scale structure in Rayleigh-Bénard convection with impenetrable sidewalls. *Chaos, Solitons, and Fractals* **5**, 2047.

- 24 Virk, D., Hussain, F. & Kerr, R. M., 1995: Compressible vortex reconnection. *J. Fluid Mech.* **304**, 47-86.
- 23 R. Benzi, Biferale, L., Kerr, R. M. & E. Trovatore 1996: Helical shell models for three-dimensional turbulence. *Phys. Rev. E* **53**, 3541.
- 22 Biferale, L. & Kerr, R. M. 1995: On the role of inviscid invariants in shell models of turbulence. *Phys. Rev. E* **52**, 6113–6122.
- 21 Leonard, A. D., Hamlen, R. C., Kerr, R. M. & Hill, J. C. 1995: Evaluation of closure models for turbulent reacting flows. *Industrial & Engineering Chemistry Research* **34**, 3640-3652. [published by the American Chemical Society; special issue honoring 35 years of the text "Transport Phenomena" by Bird, Stewart, & Lightfoot]
- 20 Chakrabarti, M., Kerr, R. M., & Hill, J. C. 1995: Direct numerical simulation of chemical selectivity in homogeneous turbulence. *AIChE Journal* **41** (11), 2356-2370.
- 19 Herring, J.R., R. M. Kerr, & R. Rotunno 1994: Ertel's potential vorticity in unstratified turbulence. *J. Atmos. Sci.* **51**, 35.
- 18 Sullivan, N. P., S. Mahalingam, & R. M. Kerr 1994: Deterministic forcing of homogeneous, isotropic turbulence. *Phys. Fluids* **6** 1612.
- 17 Herring, J.R., & R. M. Kerr 1993: Development of enstrophy and spectra in numerical turbulence. *Phys. Fluids* **A5**, 2792.
- 16 Kerr, R. M. 1993: Evidence for a singularity of the three-dimensional incompressible Euler equations. *Phys. Fluids* **A5**, 1725.
- 15 Wu, W.-S., D. K. Lilly, & R. M. Kerr 1992: Helicity and thermal convection with shear. *J. Atmos. Sci.* **49**, 1800.
- 14 Kerr, R. M., 1990: Velocity, scalar and transfer spectra in numerical turbulence. *J. Fluid Mech.*, **211**, 309.
- 13 Chen, H., J. R. Herring, R. M. Kerr, & R. Kraichnan, 1989: Non-Gaussian statistics in isotropic turbulence. *Phys. Fluids A*, **1**, 1844.
- 12 Kerr, R. M., & F. Hussain, 1989: Simulation of vortex reconnection. *Physica D*, **37**, 474.
- 11 Kerr, R. M., 1988: Simulation of Rayleigh–Taylor flows using vortex blobs. *J. Comp. Phys.*, **76**, 48.
- 10 Kerr, R. M., 1987: Histograms of helicity and strain in numerical turbulence. *Phys. Rev. Lett.*, **59**, 783.
- 9 Pumir, A. and R. M. Kerr, 1987: Numerical simulation of interacting vortex tubes. *Phys. Rev. Lett.*, **58**, 1636.
- 8 Ashurst, W. T., A. R. Kerstein, R. M. Kerr, and C. H. Gibson, 1987: Alignment of vorticity and scalar gradient with strain rate in simulated Navier–Stokes turbulence. *Phys. Fluids*, **30**, 2343.
- 7 Kerr, R. M., 1985: Higher order derivative correlations and the alignment of small-scale structures in isotropic numerical turbulence. *J. Fluid Mech.*, **153**, 31.
- 6 Herring, J. R., and R. M. Kerr, 1982: Comparison of direct numerical simulation with prediction of two-point closures. *J. Fluid Mech.*, **118**, 205.

- 5 Kerr, R. M., 1981: Theoretical investigation of a passive scalar such as temperature in isotropic turbulence. Ph.D. thesis, Cooperative Thesis No. 64, Cornell University and NCAR. digitized copy at <http://nldr.library.ucar.edu/repository/osgc/OSGC-000-000-001-855>.
- 4 Nelkin, M., and Kerr, R. M., 1981: The decay of scalar variance in terms of a modified Richardson law for pair dispersion. *Phys. Fluids*, **24**, 1754–1756.
- 3 Kerr, R. M., and M. Nelkin, 1980: Self-similar decay of turbulent kinetic energy in a model with only local energy transfer. *Phys. Fluids*, **23**, 1916–1918.
- 2 Kerr, R. M., and E. D. Siggia, 1978: Cascade model of fully developed turbulence. *J. Stat. Phys.*, **19**, 543.
- 1 Fisher, M. E., and R. M. Kerr, 1977: Partial differential approximates for multicritical singularities. *Phys. Rev. Lett.*, **39**, 667.

Recent submissions and postings. Unposted submissions available at:
<http://www2.warwick.ac.uk/fac/sci/math/people/staff/>

- Kerr, R.M.: 2017 Trefoil knot structure during reconnection. arXiv:1703.01676v2
- Kerr, R.M.: 2017 Scaling of Navier-Stokes trefoil reconnection. arXiv:1610.00398v3.
- Kerr, R.M.: 2015 Simulated Navier-Stokes trefoil reconnection. arXiv:1509.03124v1.
- Kopera, M.A., R.M. Kerr, H.M. Blackburn & D. Barkley 2014: Direct numerical simulation of turbulent flow over a backward-facing step. Submitted to J. Fluid Mech. [backwardpaper_submission.pdf](#)
- Garcia-Gutiérrez, L., R.M. Kerr, E. Somfai & D.R.J. Singer 2014: A simplified multi-particle collision dynamics method to simulate microvascular capillary blood flow. Submitted to Cardiovascular Research. [r2__garciakerrsomfaisinger.pdf](#)

Reviewed Conference Proceedings

- 10 Kerr, R.M. 2013: Fully developed hydrodynamic turbulence from a chain reaction of reconnection events. In *Procedia IUTAM Understanding Common Aspects of Extreme Events in Fluids*, University College Dublin, Dublin, Ireland, 2-6 July 2012. (eds M.D. Bustamante, A.C. Newell, R.M. Kerr, M. Tsubota) Elsevier, *Procedia IUTAM*, **9** pp. 57-68. <http://www.sciencedirect.com/science/journal/22109838/9>
- 9 R.M. Kerr 2013: The Growth of Vorticity Moments in the Euler Equations In *Procedia IUTAM Topological Fluid Dynamics: Theory and Applications*, Isaac Newton Institute for Mathematical Sciences, Cambridge, UK, 23-27 July 2012. (eds K. Bajer, Y. Kimura, H.K. Moffatt) Elsevier, *Procedia IUTAM*, **7** pp. 49-58. <http://www.sciencedirect.com/science/journal/22109838/7>
- 8 R.M. Kerr & M.D. Bustamante 2011: Exploring symmetry plane conditions in numerical Euler solutions. *Proceedings of Workshop on Partial Differential Equations and Fluid Mechanics*, University of Warwick, July 2010. (eds. J.C Robinson, J. Rodrigo, W. Sadowski) Cambridge University Press.
- 7 Kerr R.M. 2005: Helicity generation in 3D Euler and turbulence In *Elementary Vortices and Coherent Structures Proceedings of the IUTAM Symposium Kyoto October 2004*. (eds. S. Kida, M. Yamada, S. Yoden) Springer-Verlag.

- 6 Kerr, R.M. and P.G. Tucker, 2005: Nonlinear LES for DES suitable flows AIAA-2005-0668, 43rd Aerospace Sciences Meeting and Exhibit Conference, AIAA, Reno, NV
- 5 Kerr, R.M. 2000: Common threads to atmospheric, astrophysical and laboratory convection. In *Geophysical and Astrophysical Convection*. Proceedings of meeting at the National Center for Atmospheric Research, October 1995. (eds. R.M. Kerr & P. Fox). Gordon and Breach.
- 4 Saiki, E.M., Kerr, R.M., and Large, W. G. 2000: Numerical simulation of three-dimensional thermohaline fingering. In *Developments in Geophysical Turbulence*. Proceedings of the IUTAM symposium at the National Center for Atmospheric Research, Boulder, CO 16-19 June 1998. (eds. R.M. Kerr & Y. Kimura). Kluwer Academic Publishers, Dordrecht. pp. 67-80.
- 3 Kerr, R.M. 1997: Euler Singularities and Turbulence. In 19th ICTAM Kyoto '96. (eds. T. Tatsumi, E. Watanabe & T. Kambe). Elsevier Science.
- 2 Kerr, R. M. 1992: Evidence for a singularity of the three-dimensional incompressible Euler equations. In *Topological aspects of the dynamics of fluids and plasmas*. Proceedings of the NATO-ARW workshop at the Institute for Theoretical Physics, University of California at Santa Barbara (eds. H.K Moffatt, G.M. Zaslavsky, M. Tabor & P. Comte). Kluwer Academic Publishers, Dordrecht, Netherlands.
- 1 Kerr, R. M., D. Virk, & F. Hussain, 1990: Effects of incompressible and compressible vortex reconnection. In *Topological Fluid Mechanics*. Proceedings of the IUTAM meeting at Cambridge University. (eds. H. K. Moffatt & A. Tsinober). Cambridge University Press, Cambridge, England.

Unrefereed Publications

- 15 Brandenburg, A. and R. M. Kerr, 2001: Helicity in Hydro and MHD Reconnection. In *Quantized Vortex Dynamics and Superfluid Turbulence*, (eds. C.F. Barenghi, R.S. Donnelly, J. Vinen) Cambridge University Press.
- 14 R.M. Kerr, 2000: Reconnection and the road to turbulence. In *Coherent vortical structure — its role in turbulence dynamics* (ed. S. Kida).
- 13 Gibbon, J., Galanti, B., and Kerr, R.M. 2000: Stretching and compression of vorticity in the 3D Euler equations. In *Turbulence Structure and Vortex Dynamics*. (ed. J.C.R. Hunt & J.C. Vassilicos), Cambridge University Press, Cambridge.
- 12 Kerr, R. M. 1999: The Outer Regions in Singular Euler. In *Fundamental problematic issues in turbulence*. (eds. Tsinober and Gyr) Birkhauser.
- 11 Kerr, R.M. 1999: Dynamic estimation tests of decaying isotropic turbulence. In *Direct and Large-Eddy Simulation: 3rd ERCOFTAC Workshop*. (eds. P.R. Voke, N.D. Sandham and L. Kleiser), Kluwer Academic Publishers, Dordrecht, Netherlands.
- 10 Swaminathan, N., S. Mahalingam, & R. M. Kerr 1995: Some conditional statistics in reacting numerical turbulence. Presented at the 12th Australian Fluid Mechanics Conference, December 10-15.
- 9 Kerr, R. M. 1995: The role of singularities in Euler. In *Small-scale structure in hydro and magnetohydrodynamic turbulence*. (eds. A. Pouquet, P.-L. Sulem) Lecture Notes, Springer-Verlag.
- 8 Kerr, R. M. 1993: Scaling of a singularity of Euler. In *Singularities in Fluids, Plasmas and Optics*. Proceedings of the NATO-ARW, Heraklion, Greece. (eds. R. E. Caflisch and G. C. Papanicolaou). Kluwer Academic Publishers, Dordrecht, Netherlands.

- 7 Kerr, R. M. 1993: The role of singularities in turbulence. In *Unstable and Turbulent Motion of Fluid*. (ed. S. Kida). World Scientific Publishing, Singapore.
- 6 Swaminathan, N., S. Mahalingam, & R. M. Kerr 1993: Direct numerical simulation of reversible and irreversible chemical reactions in turbulent nonpremixed flames. Presented in 31st Aerospace Science Meeting & Exhibit, January, 11-14, 1993, Reno, Nevada.
- 5 Herring, J.R., & R. M. Kerr 1991: Some contributions of two-point closure to large-eddy simulations. *Proceedings of the International Workshop on "Large-Eddy Simulation: Where Do We Stand?"*, University of South Florida, Tallahassee, B. Galperin, Ed., Cambridge University Press, MA.
- 4 Herring, J.R., & R. M. Kerr 1991: Small-scale structures in turbulence: their implications for turbulence closures. Monte Verità Colloquium on Turbulence, Th. Dracos and A. Tsinober Eds., Birkhäuser, Bale Publishers.
- 3 Kerr, R. M., T. Nakano, & M. Nelkin, 1985: Decay of a coherent scalar disturbance in a turbulent flow. NASA Technical Memo 86700.
- 2 Kerr R.M. 1985: Kolmogorov and scalar spectral regimes in numerical turbulence NASA Technical Memo 86699.
- 1 Kerr R.M. 1983: Higher-order derivative correlations and the alignment of small-scale structures in isotropic numerical turbulence. NASA Technical Memo 84407.

Web Publications

Kerr, R.M., 2012: Incompressible hydrodynamic turbulence from a chain reaction of vortex reconnection events. arXiv:1212.3829v1.

Kerr, R.M., 2012: Bounds on a singular attractor in Euler using vorticity moments. arXiv:1212.1106v1.

Kerr, R.M., 2010: Numerical generation of a vortex ring cascade in quantum turbulence. arXiv:1006.3911v2.

Kerr, R.M., 2006: Computational Euler History. <http://arxiv.org/abs/physics/0607148>

Work in Progress: Drafts written, under review, or in press.

- C.) Vlaskamp, J. H. A., Thomas, P. J., Hollerbach, R. & Kerr, R. M., 2011: Taylor columns in deep water: testing the limits of the Taylor-Proudman theorem. *Bulletin of the American Physical Society*, Vol.56 pp. 140-141.
- B.) Kerr, R.M. & G.P. King 2009: Evidence for a mid-latitude, mesoscale downscale energy cascade from the marine boundary layer. Submitted to *J. Atmos. Sci.*
- A.) Vlaskamp, J.H.A., Thomas, P.J., Hollerbach, R. & Kerr, R.M.: A stereo-PIV study of the Taylor-column generated by a rotating disk. Division of Fluid Dynamics, November 21-23 2010. *Bulletin of the American Physical Society*.

MEETINGS (primary organizer)

- 2009: 1-3 September 2009 Warwick EPSRC Symposium on Challenges in Scientific Computing, Workshop on Computational Fluid Dynamics.
- 2006: 13-17 March 2006 Warwick Turbulence Symposium, Workshop on Environmental Turbulence.

- 2005: 9-17 September 2005 Warwick Turbulence Symposium, Workshop on Singularities, Coherent Structures and Their Role in Intermittent Turbulence
- 2005: 25 April 2005, Turbulence Prelude, MIRW Co-organiser
- 2004: 18 October 2004 Singular Euler Dynamics MIRW Warwick. Co-organiser and speaker
- 2003: Co-convenor of Institute for Advanced Study, Princeton conference on Turbulence. Session on 22/March/2003.
- 1998: Co-convenor of IUTAM/IUGG symposium on Developments in Geophysical Turbulence
- 1996: Co-convenor of mini-symposium on Vortex Dynamics and Turbulence at the International Congress on Theoretical and Applied Mechanics, Kyoto.
- 1995: Co-convenor of NCAR/GTP workshop on Geophysical and Astrophysical Convection.
- 1994: Co-convenor of NCAR/GTP mini-symposium on Magnetic helicity.
- 1994: Convenor of NCAR/GTP mini-symposium on DNS and LES.