CURRICULUM VITÆ

David Gerard Dritschel

Born 15 June 1960 in Teaneck, New Jersey U.S.A.
Citizenship: *American/British* Marital Status: *Married, with 5 children*

Address: School of Mathematics and Statistics, University of St Andrews
St Andrews KY16 9SS, Fife, Scotland

Telephone:	+44 (0)1334 463721	E-mail:	david.dritschel@st-andrews.ac.uk
Secretary:	+44 (0)1334 462344	Web site:	http://www-vortex.mcs.st-andrews.ac.uk
Facsimile:	+44 (0)1334 463748	Home page:	http://www-vortex.mcs.st-andrews.ac.uk/∼dgd

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Degrees:

Ph.D. in Geophysical Fluid Dynamics, Princeton University, May 1985;

B.Sc. (*Summa cum laude*) in Physics, University of Texas at Austin, May 1981.

Thesis:

"The stability of certain two- and three-dimensional vortical motions: a possible explanation for the multiple vortex phenomenon in tornados" (Ph.D. Dissertation, Princeton University; Supervisor: R.T. Pierrehumbert).

Positions held:

10/98 – : **Professor of Mathematics**, The University of St Andrews;

10/98 – 10/03: UK Natural Environment Research Council (NERC) **Senior Research Fellow** (awarded but declined, in order to take up above post);

10/97 – 10/98: **Reader in Mathematics**, The University of Warwick;

9/92 – 9/98 (minus period below): NERC **Advanced Research Fellow**;

4/93 – 4/94: "**Directeur de Recherche**" of the CNRS at the "Service Hydrographique de l'Ocean et de la Marine", Toulouse;

9/86 – 9/92: Science and Engineering Research Council **Postdoctoral Research Associate**, University of Cambridge;

9/85 – 9/86: NATO National Science Foundation **Postdoctoral Research Fellow**, University of Cambridge;

9/81 – 9/85: NSF **Doctoral research student** in the Geophysical Fluid Dynamics Program at Princeton University.

Awards & Honours:

5/08: Elected as a **Fellow of the Royal Society of Edinburgh**;

3/03: Elected as a **Member of the Edinburgh Mathematical Society**;

9/99: Elected as a **Fellow of the American Meteorological Society**;

6/96: Elected as a **Fellow of the Royal Meteorological Society**;

11/93: **American Physical Society's François Frenkiel Award** (with D.W. Waugh);

9/92 – 9/96: **Research Fellow**, St. Catharine's College Cambridge.

Research Overview:

My current research encompasses broad aspects of atmospheric and oceanic vortex dynamics. This includes understanding the control exerted by the fundamental constraints of rotation and stratification in the geophysical environment, turbulence, gravity waves (analogous to free surface waves but propagating within the fluid) from their generation to their interaction with vortices, and the emergence of generic flow structures and circulation patterns in weakly-forced geophysical flows. This research has not only involved, but has very much depended upon, the development of innovative numerical methods. One such method, called "contour advection", developed by myself and M.H.P. Ambaum at the University of Reading, has been so promising that it is now being considered seriously for implementation in global models of weather forecasting and climate prediction. This project is being developed in close collaboration with the *UK Meteorological Office*, the *European Centre for Medium Range Weather Forecasts*, the *Southhampton Oceanography Centre*, and other UK academic institutions. There is now a new website, www.casl.org.uk, providing free software and support. In work involving my research group in St Andrews, I have also developed new methods based on "optimally" accurate variables — arising from physical considerations — which significantly outperform numerical methods using standard variables. These advances are now being taken seriously by both the academic community and practical research institutions, and in recognition, the UK Natural Environment Research Council awarded me a prestigious Senior Research Fellowship for full-time research over 5 years. These innovative numerical methods are becoming popular due to their extraordinary efficiency and accuracy. This has helped create a healthy research portfolio with colleagues in the USA, the UK, Europe and Australia, and has attracted significant international research funds. In turn, this has helped increase our understanding of the fundamental characteristics of geophysical vortex dynamics. The approaches underpinning these innovative methods are likely to be of significant practical use in a much wider context.

Major public lectures and press appearances:

16 October 2000: Featured in "Equinox: The Maelstrom", Channel 4 (UK);

20 June 2001: Supporting Presidential address at the Royal Meteorological Society, London.

Miscellaneous:

Sackler Distinguished Lecturer in Geophysics, Tel Aviv, April 2008.

Associate Editor: Geophysical and Astrophysical Fluid Dynamics (http://www.informaworld.com/gafd), from January 2007.

Invited talks: Approximately 10 per year in academic departments, research institutes, workshops and international conferences.

Research visits (extended):

- 1–30/9/1996: University of Sydney and Monash University, Australia, supported by the British Council Academic Links and Interchange Scheme.
- 1/10–12/12/1996: Isaac Newton Institute of Mathematical Sciences (Cambridge) program on the "Mathematics of Atmosphere and Ocean Dynamics".
- 16/3–23/4/1998: University of Sydney, supported by the Australian Research Council.
- 1/2–20/3/2000: Grande Plateforme Tournante de Grenoble "Coriolis", supported by the European

Community.

- 15–31/10 & 1–15/12/2000: Isaac Newton Institute program on the "Geometry and Topology of Fluid Flows".
- 1/9–12/12/2008: Isaac Newton Institute program on "High Reynolds Number Turbulence".

Research visits (frequent): Cambridge University, Columbia University, Johns Hopkins University, University of Sydney.

Grants and Directorships:

3/16-9/16: **Engineering and Physical Sciences Research Council (EPSRC)**, "A prototype vortex-in-cell algorithm for modelling moist convection" (with D. Parker, A. Blyth and S. Boeing at Leeds), £26,000;

1/10 – 1/13: **Engineering and Physical Sciences Research Council**, "The structure, stability and interaction of geophysical vortices" (with J. Reinaud & R. Scott), £330,000;

6/08 – 6/10: **European Community (EC)**, Marie Curie Intra-European Fellowship to support Dr Xavier Perrot, "Flow interactions between the ocean surface and the interior", 165,000 euros.

6/08 – 6/10: **EC**, Marie Curie Intra-European Fellowship to support Dr Jerome Fontane, "A new look at jets and vortices in planetary atmospheres", 169,000 euros.

3/04 – 2/07: **EPSRC**, "A new twist to rotating stratified turbulence", £198,000;

7/03 – 1/04: **Natural Environment Research Council (NERC)**, "The vortex dynamics of the polar vortex–Aleutian high system: a systematic study of stability and nonlinear interaction", £24,737;

1/01 – 1/04: **EPSRC**, "Geometric methods in geophysical fluid dynamics" Network in Mathematics (headed by S. Reich at Imperial College London), £45,000;

2/00 – 6/00: **European Community (EC)**, Training and Mobility of Researchers – Access to Large Scale Facilities, "The breakdown of columnar vortices in a rotating, stratified fluid at finite Rossby, Froude & Reynolds numbers" (with J.-B. Flór), 200,000FF.

10/00 – 10/03: **EPSRC**, "Vortex interactions in rotating, stably-stratified flows", £191,000;

8/99 – 8/02: *Project Director* for the "Centre for Research into Ecological and Environmental Modelling" at St Andrews (headed by S.T. Buckland) — see http://www.creem.st-and.ac.uk, £1,800,000;

4/99 – 4/02: **Natural Environment Research Council**, "A new approach to modelling internal waves in the ocean" (with O. Bühler), £145,000;

4/97 – 10/01: **NERC**, High Performance Computing grant, "High Resolution Atmospheric Fluid Dynamics" (with M.E. McIntyre and P.H. Haynes), £110,000;

9/98 – 10/98: **EPSRC**, Workshop, "The long-time behaviour of inviscid, rotating, stratified turbulence" (with A.C. Newell), £24,000;

9/97 – 12/97: **European Science Foundation**, Transport Processes in the Atmosphere and Oceans, support of I. Mortazavi as a visiting research fellow;

9/93 – 9/95: **EC** Human Capability & Mobility network on two-dimensional turbulence (with researchers in the UK, France, Italy, Spain and Portugal);

9/93 – 9/95: **EPSRC**, computational resources for the UK contribution to the above grant (with H.K. Moffatt);

9/91 – 9/94: **NATO International Scientific Exchange Program**, Collaborative Research Grant (with B. Legras), 200,000BF.

Conference Organisation:

European Geophysical Society General Assembly convener for the Vortex Dynamics section for 7 of the last 20 years;

5/93: Co-organiser of the meeting "Modelling Ocean Vortices", Amsterdam;

8/95: Co-organiser of the 2nd International Workshop on Vortex Flows and Related Numerical Methods, Montréal;

6/98: Principal organiser of the "Vortex Dynamics in Geophysical Flows" workshop, Castro Marina, Italy;

9/98 – 6/99: Co-organiser of the "Mathematics and Computation" symposium, University of Warwick;

7/05: Co-organiser of the 1st International Conference on High Reynolds Number Vortex Interactions, Toulouse.

5/07: Co-organiser of the 20th Annual Scottish Fluid Mechanics Meeting, St Andrews.

9/08 – 12/08: Co-organiser of the Isaac Newton Institute programme on Turbulence, Cambridge.

12/08: Principal organiser of the IUTAM Symposium on Turbulence in the Atmosphere and Oceans, Cambridge.

Refereeing:

Journal of Fluid Mechanics, Physics of Fluids, Journal of Computational Physics, Journal of Mechanics B/Fluids, Philosophical Transactions, Proceedings of the Royal Society, Physical Review Letters, Computing Systems in Engineering, Chaos, Nature, Journal of Atmospheric Sciences, Journal of Physical Oceanography, Quarterly Journal of the Royal Meteorological Society;

UK Natural Environment Research Council, UK Engineering and Physical Sciences Research Council, US National Science Foundation, European Science Foundation, Australian Research Council, New Zealand Science Foundation.

Departmental Activities:

Head of the **Vortex Dynamics** Research Group in Applied Mathematics (http://www-vortex.mcs.st-andrews.ac.uk).

Head of the Division of Applied Mathematics (2/06 – 2/10).

Research Supervision and Teaching:

Ph.D. supervision of D.W. Waugh (Cambridge, degree awarded 1994; now Professor at Johns Hopkins University), S.-L. Lam (Cambridge, degree awarded 1998; now Lecturer at the University of Hong Kong), A.R. Mohebalhojeh (Cambridge, degree awarded 2000; now a Lecturer at the University of Tehran); W. McKiver (St Andrews, degree awarded 2004; now a Research Fellow at the University of St Andrews); J. Shipton (St Andrews, degree awarded 2008; now a Research Fellow at the University

of Oxford); R. Smith (St Andrews, degree awarded 2009); G. Henderson (St Andrews, degree awarded 2010), D. Lucas (St Andrews, degree awarded 2011, now a Research Fellow at the University of Cambridge), H. Płotka (St Andrews, degree awarded 2012, now a Research Fellow at ETH, Zurich), C. Evans, T. Jougla and L. Hatfield (current). (current).

Taught full lecture courses on *dynamical systems*, *vorticity dynamics*, *2nd year applied mathematics*, *fluid dynamics*, and *geophysical fluid dynamics* at the Universities of Cambridge and St Andrews.

External examiner 2001–2006 (MSci/Postgrad. Mathematics and Meteorology) for the University of Reading.

External examiner 2007–2011 (Undergrad. Mathematics) for the University of Edinburgh.

Book Reviews:

Chaos: Making of a New Science By J. Gleick. Viking, 1987. 352 pp. **In:** *J. Fluid Mech.* **216**, 657–658 (1990);

Perspectives of Nonlinear Dynamics, Vols. 1 & 2 By E. Atlee Jackson. Cambridge University Press, 1989 & 1990. 495 & 632 pp;

Chaotic Evolution and Strange Attractors. By David Ruelle. Cambridge University Press, 1989. 96 pp. **In:** *J. Fluid Mech.* **226**, 655–656 (1991).

Large-Scale Atmosphere-Ocean Dynamics, I Analytical Methods and Numerical Models and **II Geometric Methods and Models** By J. Norbury and I. Roulestone, *Geophys. Astrophys. Fluid Dyn.* **97**, 359–363 (2003).

Papers in Refereed Journals:

[papers in press are available at http://www-vortex.mcs.st-andrews.ac.uk/∼dgd/papers]

Dritschel, D.G.: The stability and energetics of corotating uniform vortices. *J. Fluid Mech.* **157**, 95–134 (1985);

Dritschel, D.G.: The nonlinear evolution of rotating configurations of uniform vorticity. *J. Fluid Mech.* **172**, 157–182 (1986);

Dritschel, D.G.: Nonlinear stability bounds for inviscid, two-dimensional, parallel or circular flows with monotonic vorticity, and the analogous three-dimensional quasi-geostrophic flows. *J. Fluid Mech.* **191**, 575–582 (1988);

Dritschel, D.G.: The repeated filamentation of two-dimensional vorticity interfaces. *J. Fluid Mech.* **194**, 511–547 (1988);

Dritschel, D.G.: Contour surgery: a topological reconnection scheme for extended integrations using contour dynamics. *J. Comput. Phys.* **77**, 240–266 (1988);

Dritschel, D.G.: Contour dynamics/surgery on the sphere. *J. Comput. Phys.* **78** 477–483 (1988);

Dritschel, D.G.: Contour dynamics and contour surgery: numerical algorithms for extended, high-resolution modelling of vortex dynamics in two-dimensional, inviscid, incompressible flows. *Computer Phys. Rep.* **10**, 77–146 (1989);

Dritschel, D.G.: On the stabilization of a two-dimensional vortex strip by adverse shear. *J. Fluid Mech.* **206**, 193–221 (1989);

Dritschel, D.G.: The stability of elliptical vortices in an external straining flow. *J. Fluid Mech.* **210**, 223–261 (1990);

Dritschel, D.G. & McIntyre, M.E.: Does contour dynamics go singular? *Phys. Fluids A* **2**, 748–753 (1990);

Dritschel, D.G.: Generalized helical Beltrami flows in hydrodynamics and magnetohydrodynamics. *J. Fluid Mech.* **222**, 525–542 (1991);

Dritschel, D.G. & Zabusky, N.J.: A new, but flawed, numerical method for vortex patch evolution in two dimensions. *J. Comput. Phys.* **93**, 481–484 (1991);

Legras, B. & Dritschel, D.G.: The elliptical model of two-dimensional vortex dynamics. Part I: the basic state. *Phys. Fluids A* **3**, 845–854 (1991);

Dritschel, D.G. & Legras, B.: The elliptical model of two-dimensional vortex dynamics. Part II: disturbance equations. *Phys. Fluids A* **3**, 855–868 (1991);

Dritschel, D.G., Haynes, P.H., Juckes, M.N. & Shepherd, T.G.: The stability of a two-dimensional vorticity filament under uniform strain. *J. Fluid Mech.* **230**, 647–665 (1991);

Waugh, D.W. & Dritschel, D.G.: The stability of filamentary vorticity in two-dimensional geophysical vortex-dynamics models. *J. Fluid Mech.* **231**, 575–598 (1991);

Dritschel, D.G. & Polvani, L.M.: The roll-up of vorticity strips on the surface of a sphere. *J. Fluid Mech.* **234**, 47–69 (1992);

Dritschel, D.G. & Waugh, D.W.: Quantification of the inelastic interaction of unequal vortices in two-dimensional vortex dynamics. *Phys. Fluids A* **4**, 1737–1744 (1992);

Dritschel, D.G.: A fast contour dynamics method for many-vortex calculations in two-dimensional flows. *Phys. Fluids A* **5(1)**, 173–186 (1993);

Legras, B. & Dritschel, D.G.: A comparison of the contour surgery and pseudo-spectral methods. *J. Comput. Phys* **104**, 287–302 (1993);

Dritschel, D.G. & Legras, B.: Modeling vortex motion in the oceans and atmosphere. *Physics Today* **46(3)**, 44–51 (1993); reprinted (in Japanese) in *Parity* **1**, 4–12 (1994);

Dritschel, D.G.: Vortex properties of two-dimensional turbulence. *Phys. Fluids A* **5(4)**, 984–997 (1993);

Nycander, J., Dritschel, D.G. & Sutyrin, G.G.: The dynamics of long frontal waves in the shallow water equations. *Phys. Fluids A* **5(5)**, 1089–1091 (1993);

Legras, B. & Dritschel, D.G.: Vortex stripping and the generation of high vorticity gradients in two-dimensional flows. *Applied Scientific Research* **51**, 445–455 (1993);

Polvani, L.M. & Dritschel, D.G.: Wave and vortex dynamics on the surface of the sphere: Equilibria and their stability. *J. Fluid Mech.* **255**, 35–64 (1993);

Dritschel, D.G. & Saravanan, R.: Three-dimensional quasi-geostrophic contour dynamics, with an application to stratospheric vortex dynamics. *Quart. J. Roy. Meteorol. Soc.* **120**, 1267–1297 (1994);

Mariotti, A., Legras, B. & Dritschel, D.G.: Vortex stripping and the erosion of coherent structures in two-dimensional flows. *Phys. Fluids* **6**, 3954–3962 (1994);

Yao, H.B., Dritschel, D.G. & Zabusky, N.J.: High-gradient phenomena in two-dimensional vortex interactions. *Phys. Fluids* **7**, 539–548 (1995);

Dritschel, D.G.: A general theory for two-dimensional vortex interactions. *J. Fluid Mech.* **293**, 269–303 (1995);

Dritschel, D.G. & Zabusky, N.J.: On the nature of vortex interactions and models in unforced nearly-inviscid two-dimensional turbulence. *Phys. Fluids* **8(5)**, 1252–1256 (1996);

Dritschel, D.G. & de la Torre Juárez, M.: The instability and breakdown of tall columnar vortices in a quasi-geostrophic fluid. *J. Fluid Mech.* **328**, 129–160 (1996);

Dritschel, D.G. & Ambaum, M.H.P.: A contour-advective semi-Lagrangian numerical algorithm for simulating fine-scale conservative dynamical fields. *Quart. J. Roy. Meteorol. Soc.* **123**, 1097–1130 (1997);

Dritschel, D.G.: Introduction to "contour dynamics for the Euler equations in two dimensions". *J. Comput. Phys.* **135(2)**, 217–219 (1997);

Dritschel, D.G.: On the persistence of non-axisymmetric vortices in inviscid two-dimensional flows. *J. Fluid Mech.* **371**, 141–155 (1998);

Dritschel, D.G., Polvani, L.M. & Mohebalhojeh, A.R.: The contour-advective semi-Lagrangian algorithm for the shallow water equations. *Mon. Wea. Rev.* **127(7)**, 1551–1565 (1999);

Waugh, D.W. & Dritschel, D.G.: The dependence of Rossby wave breaking on the vertical structure within the polar vortex. *J. Atmos. Sci.* **56(14)**, 2359–2375 (1999);

Dritschel, D.G., de la Torre Juárez, M. & Ambaum, M.H.P.: On the three-dimensional vortical nature of atmospheric and oceanic flows. *Phys. Fluids* **11(6)**, 1512–1520 (1999);

Dritschel, D.G.: Scale ratios in decaying quasi-geostrophic turbulence. *Il Nuovo Cimento C* **22(6)**, 867–874 (1999);

Dritschel, D.G. & Macaskill, C.: The role of boundary conditions in the simulation of rotating, stratified turbulence. *Geophys. Astrophys. Fluid Dyn.* **92(3-4)**, 233–253 (2000);

Mohebalhojeh, A.R. & Dritschel, D.G.: On the representation of gravity waves in numerical models of the shallow water equations. *Quart. J. Roy. Meteorol. Soc.* **126**, 669–688 (2000);

Stegner, A. & Dritschel, D.G.: A numerical investigation of the stability of isolated vortices beyond the quasi-geostrophic regime. *J. Phys. Oceanogr.* **30(10)**, 2562–2573 (2000);

Rogberg, P. & Dritschel, D.G.: Mixing and transport in two-dimensional vortex interactions. *Phys. Fluids* **12(12)**, 3285–3288 (2000);

Lam, J.S.-L. & Dritschel, D.G.: On the beta-drift of an initially circular vortex patch. *J. Fluid Mech.* **436**, 107–129 (2001);

Cho, J.Y.-K., de la Torre Juárez, M., Ingersoll, A. & Dritschel, D.G.: A high-resolution, three-dimensional model of Jupiter's Great Red Spot. *J. Geophys. Res.-Planets* **106(E3)**, 5099–5105 (2001);

Legras, B., Dritschel, D.G. & Caillol, P.: The erosion of a distributed two-dimensional vortex in a background straining flow. *J. Fluid Mech.* **441**, 369–398 (2001);

Mohebalhojeh, A.R. & Dritschel, D.G.: Hierarchies of balance conditions for the f-plane shallow water equations. *J. Atmos. Sci.* **58(16)**, 2411–2426 (2001);

Dritschel, D.G.: Vortex merger in rotating stratified flows. *J. Fluid Mech.* **455**, 83–101 (2002);

Viúdez, A. & Dritschel, D.G.: An explicit potential vorticity conserving approach to modelling nonlinear internal gravity waves. *J. Fluid Mech.* **458**, 75–101 (2002);

Reinaud, J.N. & Dritschel, D.G.: The merger of vertically offset quasi-geostrophic vortices. *J. Fluid Mech.* **469**, 287–315 (2002);

McKiver, W. & Dritschel, D.G.: The motion of a fluid ellipsoid in a general uniform background flow. *J. Fluid Mech.* **474**, 147–173 (2003);

Reinaud, J.N., Dritschel, D.G. & Koudella, C.R.: The shape of the vortices in quasi-geostrophic turbulence. *J. Fluid Mech.* **474**, 175–191 (2003);

Viúdez, A. & Dritschel, D.G.: Vertical velocity in mesoscale geophysical flows. *J. Fluid Mech.* **483**, 199–223 (2003);

Dritschel, D.G. & Viúdez, A.: A balanced approach to modelling rotating stably-stratified geophysical flows. *J. Fluid Mech.* **488**, 123–150 (2003);

Macaskill, C., Padden, W.E.P. & Dritschel, D.G.: The CASL algorithm for quasi-geostrophic flow in a cylinder. *J. Comput. Phys.* **188**, 232–251 (2003);

Scott, R.K., Dritschel, D.G., Polvani, L.M. & Waugh, D.W.: Enhancement of Rossby wave breaking by steep potential vorticity gradients in the winter stratosphere. *J. Atmos. Sci.* **61(8)**, 904–918 (2004);

Viúdez, A. & Dritschel, D.G.: Potential vorticity and the quasigeostrophic and semigeostrophic mesoscale vertical velocity. *J. Phys. Oceanogr.* **34(4)**, 865–887 (2004);

Dritschel, D.G., Reinaud, J.N. & McKiver, W.: The quasi-geostrophic ellipsoidal vortex model. *J. Fluid Mech.* **505**, 201–223 (2004);

Mohebalhojeh, A.R. & Dritschel, D.G.: Contour-advective semi-Lagrangian algorithms for many-layer primitive equation models. *Quart. J. Roy. Meteorol. Soc.* **130**, 347–364 (2004);

Viúdez, A. & Dritschel, D.G.: Dynamic potential vorticity initialization and the diagnosis of mesoscale motion. *J. Phys. Oceanogr.* **34(12)**, 2761–2773 (2004);

Benilov, E.S., Nycander, J. & Dritschel, D.G.: Destabilisation of barotropic flows by small-scale topography. *J. Fluid Mech.* **517**, 359–374 (2004);

Viúdez, A. & Dritschel, D.G.: Optimal potential vorticity balance of geophysical flows. *J. Fluid Mech.* **521**, 343–352 (2004);

Reinaud, J.N. & Dritschel, D.G.: The critical merger distance between two co-rotating quasi-geostrophic vortices. *J. Fluid Mech.* **522**, 357–381 (2005);

Scott, R.K. & Dritschel, D.G.: Quasi-geostrophic vortices in compressible atmospheres. *J. Fluid Mech.* **530**, 305–325 (2005);

Dritschel, D.G., Scott, R.K. & Reinaud, J.N.: The stability of quasi-geostrophic ellipsoidal vortices. *J. Fluid Mech.* **536**, 401–421 (2005);

Scott, R.K. & Dritschel, D.G.: Downward wave propagation on the polar vortex. *J. Atmos. Sci.* **62(9)**, 3382–3395 (2005);

Viúdez, A. & Dritschel, D.G.: Spontaneous generation of inertia-gravity wave packets by balanced geophysical flows. *J. Fluid Mech.* **553**, 107–117 (2006);

Scott, R.K. & Dritschel, D.G.: Vortex-vortex interactions in the winter stratosphere. *J. Atmos. Sci.* **63(2)**, 726–740 (2006);

Tran, C.V. & Dritschel, D.G. Impeded inverse energy transfer in the Charney-Hasegawa-Mima model of quasi-geostrophic flows. *J. Fluid Mech.* **551**, 435–443 (2006);

Tran, C.V. & Dritschel, D.G. Vanishing enstrophy dissipation in two-dimensional Navier–Stokes turbulence in the inviscid limit. *J. Fluid Mech.* **559** 107–116 (2006);

Billant, P., Dritschel, D.G. & Chomaz, J.-M.: Bending and twisting instabilities of columnar elliptical vortices in a rotating strongly stratified fluid. *J. Fluid Mech.* **561**, 73–102 (2006);

Dritschel, D.G. & Ambaum, M.H.P.: The diabatic contour advective semi-Lagrangian algorithm. *Mon. Weather Rev.* **134(9)**, 2503–2514 (2006);

Dritschel, D.G. & Vanneste, J.: The instability of a potential vorticity front. *J. Fluid Mech.* **561**, 237–254 (2006);

Smith, R.K. & Dritschel, D.G.: Revisiting the Rossby-Haurwitz wave test case with Contour Advection. *J. Comput. Phys.* **217(2)**, 473–484 (2006);

McKiver, W. & Dritschel, D.G.: The stability of an ellipsoidal vortex in a background shear flow. *J. Fluid Mech.* **560**, 1–17 (2006);

Tran, C.V. & Dritschel, D.G. Large-scale dynamics in two-dimensional Euler and surface quasi-geostrophic flows. *Phys. Fluids* **18**, 121703 (2006);

Dritschel, D.G. & Viúdez, A.: The persistence of balance in geophysical flows. *J. Fluid Mech.* **570**, 365–383 (2007);

Chérubin, L., Carton, X. & Dritschel, D.G.: Vortex dipole formation by baroclinic instability of boundary currents. *J. Phys. Oceanogr.* **37(6)**, 1661–1677 (2007);

Bambrey, R.R., Reinaud, J.N. & Dritschel, D.G.: Strong interactions between two co-rotating quasi-geostrophic vortices. *J. Fluid Mech.* **592**, 117–133 (2007);

Mohebalhojeh, A.R. & Dritschel, D.G.: Assessing the numerical accuracy of complex spherical shallow water flows. *Mon. Wea. Rev.* **135(11)**, 3876–3894 (2007);

Dritschel, D.G., Tran, C.V. & Scott, R.K. Revisiting Batchelor's theory of two-dimensional turbulence. *J. Fluid Mech.* **591**, 379–391 (2007);

McKiver, W. & Dritschel, D.G.: Balance in non-hydrostatic rotating stratified turbulence. *J. Fluid Mech.* **596**, 201–219 (2008);

Ozugurlu, E., Reinaud, J.N. & Dritschel, D.G.: Interaction between two quasi-geostrophic vortices of unequal intensity. *J. Fluid Mech.* **597**, 395–414 (2008);

Dritschel, D.G. & McIntyre, M.E.: Multiple jets as PV staircases: the Phillips effect and the resilience of eddy-transport barriers. *J. Atmos. Sci.* **65(3)**, 855–874 (2008);

Dritschel, D.G., Scott, R.K., Macaskill, C., Gottwald, G.A. & Tran, C.V. Unifying scaling theory for vortex dynamics in two-dimensional turbulence. *Phys. Rev. Lett.* **101**, 094501 (2008);

Lucas, D. & Dritschel, D.G.: A family of helically symmetric vortex equilibria. *J. Fluid Mech.* **634**, 245–268 (2009);

Reinaud, J.N. & Dritschel, D.G.: Destructive interactions between two counter-rotating quasi-geostrophic vortices. *J. Fluid Mech.* **639**, 195–211 (2009);

Dritschel, D.G., Scott, R.K., Macaskill, C., Gottwald, G.A. & Tran, C.V. Late time evolution of unforced inviscid two-dimensional turbulence. *J. Fluid Mech.* **640**, 215–233 (2009);

Mohebalhojeh, A.R. & Dritschel, D.G.: The diabatic contour-advective semi-Lagrangian algorithms for the spherical shallow water equations. *Mon. Wea. Rev.* **137**, 2979–2994 (2009);

Dritschel, D.G. & Scott, R.K.: On the simulation of nearly inviscid two-dimensional turbulence. *J. Comput. Phys.* **228**, 2707–2711 (2009);

Fontane, J. & Dritschel, D.G.: The HyperCASL Algorithm: a new approach to the numerical simulation of geophysical flows. *J. Comput. Phys.* **228**, 6411–6425 (2009);

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