CURRICULUM VITÆ

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Dr Jean Noël Reinaud, HDR, FIMA
Mathematical Institute
University of St Andrews
North Haugh
St Andrews KY16 9SS, Scotland
Tel : +44 (0)1334 463742
e-mail: jean.reinaud@st-andrews.ac.uk
Homepage : https://jnreinaud.github.io
ORCID : 0000-0001-5449-6628
ResearcherID : M-4669-2016

born on the 5^{th} of April 1973
British and French citizenships

Current position

Senior lecturer in Applied Mathematics, University of St Andrews.

Education

1991 Baccalauréat Série C (Maths & Physics) (Lycée Beaussier, La Seyne sur Mer)

1991/93 Advanced Classes in Mathematics to prepare entrance to the French 'Grandes Ecoles'
— Mathématiques Supérieures, lycée Dumont d'Urville, Toulon, France.
— Mathématiques Spéciales P', lycée Dumont d'Urville, Toulon, France.

1996 Engineering degree (M.Eng) in Aeronautics, 'Ecole Nationale Supérieure d'Ingénieurs de Constructions Aéronautiques' (ENSICA, now ISAE-Supaéro), Toulouse, France.

DEA (M.Sc) in Fluid Mechanics, Toulouse, distinction *très bien*.
— Dissertation: *Résolution lagrangienne des équations d'Euler bidimensionnelles par nméthode vortex*. Supervisor : Dr L. Joly

2000 Ph.D in Fluid Dynamics, Institut National Polytechnique de Toulouse, distinction *très honorable*. Thesis awarded the *prix Léopold Escande*.
— Dissertation: *Analyse physique par simulations numériques lagrangiennes de couches de mélange à densité variable*. Supervisors : Prof P. Chassaing & Dr L. Joly.

2019 Habilitation à Diriger des Recherches (HDR)
Météorologie, Océanographie, Physique de l'environnement
Université de Brest, France.
Interactions tourbillonnaires en écoulements stratifiés tournants
(Vortex Interactions in rotating stratified flows)

2020 Qualification aux fonctions de Professeur des Universités, France
Section 60: Mécanique & Section 37: Météorologie, Océanographie

Positions held

1996/97	National service. Centre d'Essais de la Méditérannée, Ile du Levant. *Engineer*.
1 Oct 2000 / 31 Aug 03	University of St Andrews, Vortex Dynamics research group. *Research Fellow* funded by the UK EPSRC.
1 Sep 2003 / 31 July 2018	University of St Andrews, School of Mathematics and Statistics. *Lecturer in Applied Mathematics*.
1 Aug 2018 /	University of St Andrews, School of Mathematics and Statistics. *Senior lecturer in Applied Mathematics*.

Postgraduate/Postdoctoral supervision Mr Amit Kiran, MSc student "Interactions between two atmospheric Quasi-Geostrophic Vortices" (graduated in 2004, PhD student at the University of Warwick).

Dr Ross Bambrey, PhD student "Strong Vortex interactions in Quasi-Geostrophic Flows" (co-supervisor: D.G. Dritschel), October 2003 – May 2007.

Dr Ersin Ozugurlu, Postdoctoral research fellow "A comprehensive exploration of vortex interactions in geophysical flows.", September 2004 – June 2006, now assistant professor in Turkey.

Dr David Devlin, PhD student "An investigation into the use of balance in operational numerical weather prediction" (co-supervisor: M. Cullen, Met Office) 2005/2011.

Dr William McKiver, Postdoctoral research fellow "The structure, stability and interaction of geophysical vortices " (co-workers: D. Dritschel, R. Scott), January 2010 - January 2011.

Dr Yue-Kin Tsang, Postdoctoral research fellow "The structure, stability and interaction of geophysical vortices " (co-workers: D. Dritschel, R. Scott), September 2011 - July 2013.

External PhD examination

External examiner for the PhD of Alan Hinds (University of London), 2007 and Bin Bin Xue (Univerity of London), 2017.

Internal PhD examination

Internal examiner for the PhD of Jemma Shipton (2010), Louise Smy (2011), Daniel Lucas (2012), Luke Hatfield (2021).

Awards

2001 *Léopold Escande* Ph.D thesis prize from the scientific council of the Institut National Polytechnique de Toulouse.

2008 *Gallery of Fluid Motion Prize* from the American Physical Society *(with J. Fontane & L. Joly)*

Grants

2004/2006	*A comprehensive exploration of vortex interactions in geophysical flows.* UK Engineering and Physical Sciences Research Council, $£96,683$.
2005/2008	*Numerical Study of Atmospheric and Oceanic Models.* UK Engineering and Physical Sciences Research Council, $£52,892$ Met Office $£16,950$
2009/2012	*The structure, stability and interaction of geophysical vortices.* UK Engineering and Physical Sciences Research Council (PI, with Co-Inv Dr Richard Scott & Prof. David Dritschel), $£382,762$

Refereeing: Journal of Fluid Mechanics, Journal of Atmospheric Sciences, Canadian Journal of Physics, Fluid Dynamics Research, Physics of Fluids, Geophysical and Astrophysical Fluid Dynamics, Non Linear Processes in Geophysics, European Journal of Applied Mathematics, Ocean Modelling, Ocean Dynamics, Journal of Engineering Mathematics, Deep-Sea Research Part I, Geophysical Research Letters, Fluids, Chaos, Journal of Geophysical Research - Atmospheres, Journal of Geophysical Research - Oceans, Journal of Geophysical Research - Planets, Revista Mexicana de Física, Regular and Chaotic Dynamics, Proceedings of the Royal Society A, Proceedings of the Royal Society of Edinburgh, IEEE Access, Symmetry, Scientific Reports, Annali di Matematica Pura e Applicata (1923-), Applied Science, Water, Atmospheric Chemistry and Physics, Journal of Marine Science and Engineering. Also reviewer for EPSRC and NSF and ERC Alliance grants.

Reviewing: Mathematical Reviews (AMS).

Memberships:

- 2006 - Member of the Edinburgh Mathematical Society.
- 2016/17 - Member of the EPSRC Peer Review Associate College.
- 2017 - Member of the EPSRC College
- 2017 - Member of EUROMECH
- 2020 - Fellow of the Institute of Mathematics and its Applications

Conference organisation:

- International Conference on Geophysical and Astrophysical Vortex Interactions (ICGAVI), 11-14 June 2019, St Andrews, UK
- Second International Conference on High Reynolds numer vortex interaction, 31 Aug-2 Sept 2009, Brest, France.
- 20th Annual Scottish Fluid Mechanics Meeting, 25 May 2007, St Andrews, UK
- First International Conference on High Reynolds numer vortex interaction, 29-31 Aug 2005, Toulouse, France.

Publications:

- Reinaud, J.N., Joly, L.: Numerical Simulation of a Variable-Density Mixing Layer. *ESAIM Proc* **7**, 359–368, (1999)
- Reinaud, J.N., Joly, L., Chassaing, P.: The baroclinic secondary instability of the two-dimensional shear layer. *Phys Fluids* **12(10)**, 2489–2505, (2000)

- Reinaud, J.N., Dritschel, D.G.: The merger of vertically offset quasi-geostrophic vortices. *J. Fluid Mech.* **469**, 287–315 (2002)
- Reinaud, J.N., Dritschel, D.G., Koudella, C.R.: The shape of vortices in quasi-geostrophic turbulence. *J. Fluid Mech.* **474**, 175–191 (2003)
- Dritschel, D.G., Reinaud, J.N., McKiver, W.J.: The quasi-geostrophic ellipsoidal model. *J. Fluid Mech.* **505**, 201–223 (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)
- Dritschel, D.G., Scott, R.K., Reinaud, J.N.: The stability of quasi-heostrophic ellipsoidal vortices. *J. Fluid Mech.* **536**, 401–421 (2005)
- Joly, L., Reinaud, J.N.: The merger of two-dimensional radially stratified high-Froude number vortices. *J. Fluid Mech.* **582**, 133–151 (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)
- Ozugurlu, E. , Reinaud, J.N., Dritschel, D.G.: Interaction between two quasi-geostrophic vortices of unequal potential vorticity. *J. Fluid Mech.* **597**, 395–414 (2008)
- Fontane, J., Joly, L. , Reinaud, J.N.: Fractal Kelvin-Hemlholtz breakups. *Phys. Fluids* **20**, 091109-1 (2008)
- Reinaud, J.N., Carton, X.: The stability and the nonlinear evolution of quasi-geostrophic hetons. *J. Fluid Mech.* **636**, 195-211 (2009)
- Reinaud, J.N., Dritschel, D.G.: Destructive interactions between two counter-rotating quasi-geostoprhic vortices. *J Fluid Mech.* **639**, 109-135 (2009)
- Perrot, X., Reinaud, J.N., Carton, X. and Dritschel, D.G.: Homostrophic vortex interaction under external strain in a coupled QG-SQG model. *Regul. Chaotic Dyn.* **15(1)**, 66–83 (2010)
- Reinaud, J.N.: On the stability of continuously stratified quasi-geostrophic hetons. *Fluid Dyn. Res.* **47(3)**, 035510 (2015)
- Reinaud, J.N. , Carton, X.: Head on collisions between two quasi-geostoiphic hetons in a continuously stratified fluid. *J. Fluid Mech* **779**, 144-180 (2015)
- Reinaud, J.N., Carton, X.: Existence, stability and formation of baroclinic tripoles in quasi-geostrophic flows. *J. Fluid Mech.* **785**, 1-30 (2015)
- Carton, X., Ciani, D. Verron, J., Reinaud, J., Sokolovskiy, M.: Vortex merger in surface quasi-geotrophic flows. *Geophys. Astrophys. Fluid Dyn.* **110(1)**, 1-22 (2016)
- Reinaud, J.N., Carton, X.: The interaction between two oppositely travelling, horizontally offset, antisymmetric quasi-geostrophic hetons. *J. Fluid Mech*, **794**, 409-443 (2016)
- Reinaud, J.N., Dritschel, D.G., Carton, X.: Interaction between a surface quasi-geostrophic buoyancy filament and an internal vortex. *Geophys. Astrophys. Fluid Dyn.* **110(6)**, 461-490 (2016)
- Reinaud, J.N.: Piecewise uniform potential vorticity pancake shielded vortices. *Geophys. Astrophys. Fluid Dyn.* **111(1)**, 32-64 (2017)
- Reinaud, J.N., Sokolovskiy, M.A., Carton, X.: Geostrophic tripolar vortices in a two-layer fluid: Linear stability and nonlinear evolution of equilibria. *Phys. Fluids*, **29(3)**, 036601, (2017)

- Reinaud, J.N., Carton, X., Dritschel, D.G.: Interaction between a quasi-geostrophic buyoancy filament and a heton. *Fluids*, **2**(3), 37, (2017)
- Reinaud, J.N., Dritschel, D.G., X. Carton: Interaction between a surface quasi-geostrophic buoyancy anomaly jet and internal vortices. *Phys. Fluids*, **29(8)**, 086603, (2017)
- Carton, X., Morvan, M., Reinaud, J.N., Sokolovskiy, M.A., L'Hégaret, P. and Vic, C.: Vortex merger near a topographic slope in a homogeneous rotating fluid. *Regul. Chaotic Dyn.*, **22**(5), 455-478 (2017)
- de Marez, C., Carton, X., Morvan, M. and Reinaud, J.N.: The interaction of two vortices near a topographic slope in a stratified ocean. *Fluids*, **2**(4), 57 (2017)
- Reinaud, J.N.: The interaction of two co-rotating quasi-geostrophic vortices in the vicinity of a surface buoyancy filament. *Geophys. Astrophys. Fluid Dyn.* **112**(2), 130-155, (2018)
- Reinaud, J.N., Dritschel, D.G.: The merger of geophysical vortices at finite Rossby and Froude number. *J. Fluid Mech.* **848**, 388-410 (2018)
- Reinaud, J.N., Sokolovskiy, M.A. and Carton, X. Hetonic quartets in a two-layer quasi-geostrophic flow: V-states and stability. *Phys. Fluids* **30(5)**, 056602 (2018)
- Koshel, K.V., Reinaud, J.N., Riccardi, G., Ryzhov, E.A. Entrapping of a vortex pair interacting with a fixed point vortex revisited. Part I: Point vortices. *Phys. Fluids* **30(9)**, 096603 (2018)
- Reinaud, J.N., Koshel, K.V. and Ryzhov, E.A. Entrapping of a vortex pair interacting with a fixed point vortex revisited. Part II: Finite size vortices and the effect of deformation. *Phys. Fluids* **30(9)**, 096604 (2018)
- Reinaud, J.N. Three-dimensional quasi-geostrophic vortex equilibria with m-fold symmetry. *J. Fluid Mech.* **863**, 32-59 (2019)
- Reinaud, J.N. and Dritschel, D.G. The stability and the nonlinear evolution of quasi-geostrophic toroidal vortices. *J. Fluid Mech.* **863**, 60-78 (2019)
- Reinaud, J.N. and Carton, X. The alignment of two three-dimensional quasi-geostrophic vortices. *Geophys. Astrophys. Fluid Dyn.* **114**(4-5), 524-560, (2020)
- Reinaud, J.N.: Stability of filaments of uniform quasi-geostrophic potential vorticity. *Geophys. Astrophys. Fluid Dyn.* **114**(6), 798-820, (2020)
- Reinaud, J.N.: Baroclinic toroidal quasi-geostrophic vortices. *Phys. Fluids* **32**(5), 056601, (2020) - *featured article*
- Sokolovskiy, M.A, Koshel, K.V., Dritschel, D.G. & Reinaud, J.N.: N-symmetric interaction of N hetons. Part I: Analysis of the case N=2. *Phys. Fluids* **32**(9), 096601, (2020)
- Reinaud, J.N.: Self-similar collapse of three geophysical vortices. *Geophys. Astrophys. Fluid Dyn.* **115**(4), 369-392, (2021)
- Reinaud, J.N. and Carton, X.: The merger of two three-dimensional quasi-geostrophic baroclinic tripolar eddies. *Geophys. Astrophys. Fluid Dyn.* **115**(5-6), 523-550, (2021)
- Reinaud, J.N.: Three-dimensional quasi-geostrophic staggered vortex arrays. *Regul. Chaotic Dyn.*, **26**(5), 505-525, (2021)
- Reinaud, J.N.: Finite-core quasi-geostrophic circular vortex arrays with a central vortex. *AIP Adv.*, **12**(2), 025302, (2022)

- Reinaud, J.N., Dritschel, D.G. and Scott, R.K.: Self-similar collapse of three vortices in the generalised Euler and quasi-geostrophic equations. *Physica D*, **434**, 133226, (2022)
- Reinaud, J.N.: Circular vortex arrays in generalised Euler's and quasi-geostrophic dynamics. *Regul. Chaotic Dyn.*, **27**(3), 353-368, (2022)
- Oulhen, E., Reinaud, J.N. and Carton, X.: Formation of small-scale vortices in the core of a large merged vortex. *Geophys. Astrophys. Fluid Dyn.*, **116**(5-6), 411-432, (2022)
- Reinaud, J.N. : Filaments of uniform quasi-geostrophic potential vorticity in pure strain. *Geophys. Astrophys. Fluid Dyn.*, **published online** (2023)
- Reinaud, J.N, and X. Carton: Quasi-geostrophic vortex vertical alignment in near collapse interactions. *Geophys. Astrophys. Fluid Dyn.*, **published online** (2023)
- Reinaud, J.N.: Finite Froude and Rossby numbers counter-rotating vortex pairs. *J. Fluid Mech.*, **accepted** (2023)

Editing

- High Reynolds number vortex interactions. *Geophys. Astrophys. Fluid Dyn.* **105** (4-5), 2011 - *Special issue - guest editor*
- Geophysical and Astrophysical vortex interactions. *Geophys. Astrophys. Fluid Dyn.* **114** (4-5), 2020 - *Special issue - guest editor*
- Vortex Dynamics: Theory and Application to Geophysical Flows. *Mathematics (MDPI)*, in the section *Dynamical systems*, 2021