

## Dr. Cédric BEAUME

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## Associate Professor in Applied Mathematics University of Leeds

### Research interests

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Fluid instabilities (transition to turbulence, dry salt lakes); pattern formation (spatial localization); numerical methods (pseudo-spectral, continuation, machine learning)

### Education and past positions

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- since 2024 **Deputy Director of Research and Innovation**  
School of Mathematics, University of Leeds
- since 2019 **Associate Professor in Applied Mathematics**  
School of Mathematics, University of Leeds
- 2016–2019 **Lecturer in Applied Mathematics (equiv. Assistant Professor)**  
School of Mathematics, University of Leeds
- 2014–2015 **Research Fellow in Computational Aerodynamics (equiv. Assistant Professor)**  
Department of Aeronautics, Imperial College London
- 2012–2014 **Postdoctoral Scholar (Prof. E. Knobloch)**  
Department of Physics, University of California, Berkeley
- 2012 **Geophysical Fluid Dynamics Fellow**  
Woods Hole Oceanographic Institution
- 2009–2012 **PhD in Fluid Dynamics and Teaching Assistant (Prof. A. Bergeon)**  
Institut de Mécanique des Fluides de Toulouse, Université de Toulouse
- 2009 **MSc in Fluid Dynamics, Energetics & Transfers, ranked first**  
Université de Toulouse
- 2007 **BSc in Mathematics, Computer Science and Applications**  
Université de Toulouse

### Awards

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- Faculty Partnership Supervisor Award, Faculty of Engineering and Physical Sciences and Leeds University Union, University of Leeds (2020) *shortlisted*
- Leverhulme Research Project Grant on “Melt Fracture: a Finite Amplitude Instability” (2018)
- European Commission: Seal of Excellence (2017)
- Center for Nonlinear Science, Georgia Institute of Technology: Joseph Ford Fellowship (2014–2016) *declined*
- Royal Society: Newton International Fellowship (2013–2014) *declined*
- Geophysical Fluid Dynamics fellowship at the Woods Hole Oceanographic Institution (2012)
- French research ministry fellowship (2009–2012)

## Research (1/2)

### Articles (1/2)

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- *Toward convectons in the supercritical regime: Homoclinic snaking in natural doubly diffusive convection*,  
J. Tumelty, C. Beaume & A. Rucklidge, *SIAM J. Appl. Dyn. Sys.* **22**, 1710–1742 (2023)
- *Salt polygons and porous media convection*,  
J. Lasser, J. Nield, M. Ernst, V. Karius, G. Wiggs, M. Threadgold, C. Beaume & L. Goehring,  
*Phys. Rev. X* **13**, 011025 (2023)  
Covered by media outlets: *Nature Physics* **19**, 476 (2023); *Physics* **16**, 31 (2023); *Pour la Science*;  
*the Independent*; etc.
- *Training a neural network to predict dynamics it has never seen*,  
A. Pershin, C. Beaume, K. Li & S. M. Tobias, *Phys. Rev. E* **107**, 014304 (2023)
- *Optimizing the control of transition to turbulence using a Bayesian method*,  
A. Pershin, C. Beaume, T. Eaves & S. M. Tobias, *J. Fluid Mech.* **941**, A25 (2022)
- *Near-onset dynamics in natural doubly diffusive convection*,  
C. Beaume, A. M. Rucklidge & J. Tumelty, *J. Fluid Mech.* **934**, A42 (2022)
- *Transition to doubly diffusive chaos*,  
C. Beaume, *Phys. Rev. Fluids* **5**, 103903 (2020)
- *A probabilistic protocol for the assessment of transition and control*,  
A. Pershin, C. Beaume & S. M. Tobias, *J. Fluid Mech.* **895**, A16 (2020)
- *Dynamics of spatially localized states in transitional plane Couette flow*,  
A. Pershin, C. Beaume & S. M. Tobias, *J. Fluid Mech.* **867**, 414–437 (2019)
- *Three-dimensional doubly diffusive convectons: instability and transition to complex dynamics*,  
C. Beaume, A. Bergeon & E. Knobloch, *J. Fluid Mech.* **840**, 74–105 (2018)
- *Adaptive Stokes preconditioning for steady incompressible flows*,  
C. Beaume, *Commun. Comput. Phys.* **22**, 494–516 (2017)
- *Modulated patterns in a reduced model of a transitional shear flow*,  
C. Beaume, E. Knobloch, G. P. Chini & K. Julien, *Phys. Scr.* **91**, 024003 (2016)
- *Time-periodic forcing of spatially localized structures*,  
P. Gandhi, C. Beaume & E. Knobloch, *Springer Proc. Phys.* **173**, 303–316 (2016)
- *Dynamics of phase slips in systems with time-periodic modulation*,  
P. Gandhi, E. Knobloch & C. Beaume, *Phys. Rev. E* **92**, 062914 (2015)
- *A new resonance mechanism in the Swift–Hohenberg equation with time periodic forcing*,  
P. Gandhi, C. Beaume & E. Knobloch, *SIAM J. Appl. Dyn. Sys.* **14**, 860–892 (2015)  
Selected for a Media Gallery in Dynamical Systems Magazine
- *Reduced description of exact coherent states in parallel shear flows*,  
C. Beaume, G. P. Chini, K. Julien & E. Knobloch, *Phys. Rev. E* **91**, 043010 (2015)
- *Exact coherent structures in an asymptotically reduced description of parallel shear flows*,  
C. Beaume, E. Knobloch, G. P. Chini & K. Julien, *Fluid Dyn. Res.* **47**, 015504 (2015)
- *Localized states in periodically forced systems*,  
P. Gandhi, C. Beaume & E. Knobloch, *Phys. Rev. Lett.* **114**, 034102 (2015)
- *Spatial localization in heterogeneous systems*,  
H.-C. Kao, C. Beaume & E. Knobloch, *Phys. Rev. E* **89**, 012903 (2014)
- *Localized rotating convection with no-slip boundary conditions*,  
C. Beaume, H.-C. Kao, E. Knobloch & A. Bergeon, *Phys. Fluids* **25**, 024105 (2013)
- *Nonsnaking doubly diffusive convectons and the twist instability*,  
C. Beaume, E. Knobloch & A. Bergeon, *Phys. Fluids* **25**, 114102 (2013)
- *Convectons and secondary snaking in three-dimensional natural doubly diffusive convection*,  
C. Beaume, A. Bergeon & E. Knobloch, *Phys. Fluids* **25**, 024105 (2013)  
Selected as a Research Highlight by the editor
- *Convectons in a Rotating Fluid Layer*,  
C. Beaume, A. Bergeon, H.-C. Kao & E. Knobloch, *J. Fluid Mech.* **717**, 417–448 (2013)

## Research (2/2)

Recorded talks and posters available at <http://cbeaume.com/en/publications.html>

### Articles (2/2)

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- *A reduced model for exact coherent states in high Reynolds number shear flows*,  
C. Beaume, *Proc. Geophysical Fluid Dynamics Program*, Woods Hole, 389–412 (2012)
- *Homoclinic snaking of localized states in doubly diffusive convection*,  
C. Beaume, A. Bergeon & E. Knobloch, *Phys. Fluids* **23**, 094102 (2011)
- *Electrolyte Stability in a Nanochannel with Charge Regulation*,  
C. Beaume, F. Plouraboué, A. Bergeon & E. Knobloch, *Langmuir*, 27 (17), 11187–11198 (2011)
- *Etats spatialement localisés dans la convection de double diffusion*,  
C. Beaume, A. Bergeon & E. Knobloch, *Proc. Congrès Français de Mécanique*, 2296–2301 (2011)

### Conferences

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- Dynamics Days Europe, Naples (Italy, 2023)
- International Couette–Taylor Workshop, Barcelona (Spain, 2023)
- UK Fluids Conference, Sheffield (UK, 2022)
- International Congress of Theoretical and Applied Mechanics, online (2021)
- SIAM Conference on Applications of Dynamical Systems, online (2021) *poster*
- Bifurcations and Instabilities in Fluid Dynamics, Limerick (Ireland, 2019)
- SIAM Conference on Applications of Dynamical Systems, Snowbird (USA, 2019)
- Dynamics Days Europe, Loughborough (UK, 2018)
- Pattern formation in fluids and soft matter, Leeds (UK, 2018)
- British Applied Mathematics Colloquium, Surrey (UK, 2017)
- Recurrence, Self-Organization, and the Dynamics of Turbulence, Santa Barbara (USA, 2017) *featured talk*
- Dynamics Days Europe, Corfu (Greece, 2016)
- Dynamics Days Europe, Exeter (UK, 2015)
- European Turbulence Conference, Delft (Netherlands, 2015)
- Bifurcations and Instabilities in Fluid Dynamics, Paris (France, 2015)
- SIAM Conference on Applications of Dynamical Systems, Snowbird (USA, 2015)
- SIAM Conference on Nonlinear Waves and Coherent Structures, Cambridge (UK, 2014)
- Turbulent Mixing and Beyond Workshop, Trieste (Italy, 2014)
- Dynamics Days US, Atlanta (USA, 2014) *featured talk*
- Annual Meeting of the APS Division of Fluid Dynamics, Pittsburgh (USA, 2013)
- SIAM Conference on Applications of Dynamical Systems, Snowbird (USA, 2013)
- Dynamics Days US, Denver (USA, 2013) *featured talk*
- Annual Meeting of the APS Division of Fluid Dynamics, San Diego (USA, 2012)
- Dynamics Days Europe, Göteborg (Sweden, 2012)
- Annual Meeting of the APS Division of Fluid Dynamics, Baltimore (USA, 2011)
- Congrès Français de Mécanique, Besançon (France, 2011)
- Bifurcations and Instabilities in Fluid Dynamics, Barcelona (Spain, 2011)

## Teaching (1/2)

Teaching material available at <http://cbeaume.com/en/teaching.html>

### University of Leeds

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**Fluid Dynamics (Level 5 – MATH5453):** 12h of lectures per year (2020–2023)

**Fluid Dynamics (Level 3 – MATH3620):** 33h of lectures per year (2016–2023)

Satisfaction rate: 89% (8/9 in 2021), 100% (4/4 in 2020), 100% (26/26 in 2019), 100% (9/9 in 2018), 100% (11/11 on 2017), 89% (16/18 in 2016)

**Optimizing F1 Strategies (Level 3 – MATH3001):** 10h of supervision and competition organization per year (2018/19–2022/23)

**The Lorenz System (Level 3 – MATH3001):** 10h of supervision per year (2016/17–2018/19)

**Linear Differential Equations and Transforms (Level 2 – MATH2375):** 10h of workshops in 2022

**Introduction to Optimization (Level 2 – MATH2640):** 10h of workshops in 2017

**Vector Calculus (Level 2 – MATH2365):** 10h of workshops in 2019

**Core Mathematics (Level 1 – MATH1005):** 14h of tutorials in 2023

**Probability and Statistics 1 (Level 1 – MATH1710):** 20h of tutorials in 2022

**Numbers and Vectors (Level 1 – MATH1055):** 10h of tutorials in 2017

**Mathematics (Level 1 – MATH1010):** 10h of tutorials in 2016, 2018

Satisfaction rate: 100% (4/4 in 2016)

### Imperial College London

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**Fundamentals of Fluid Mechanics (MSc – AEM-ADV07):** 12h of lectures in 2014, 2015

Satisfaction rate: 87% (13/15 in 2015), 100% (33/33 in 2014)

### Université de Toulouse

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**High-order numerical methods (MRes):** 10h of labs in 2010

**Computational environment (MSc):** 8h of lectures in 2010

**Fluid Mechanics (Level 2):** 27h of lecture-tutorials in 2012

**Mechanics (Level 2):** 12h of labs in 2010

**Mechanics (Level 1):** 22h of tutorials in 2010, 21h of labs in 2011

**Physics (Level 1):** 30h of tutorials in 2009, 27.5h of tutorials in 2010, 12h of labs in 2012

## Teaching (2/2)

### Research supervision

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<b>PhD</b>	Laura Pinkney (University of Leeds, 2022–now): TBD Matthew Threadgold (University of Leeds, 2020–now): TBD Hamza Liaquet (University of Leeds, 2020–now): TBD Reece Coyle (University of Leeds, 2018–now): Spatially localized states in the Zhang–Viñals equation Joanna Tumelty (University of Leeds, 2018–2022): Localised states in natural doubly diffusive convection Anton Pershin (University of Leeds, 2017–2020): Assessment and control of transition to turbulence in plane Couette flow Punit Gandhi (University of California at Berkeley, 2013–2016): Localized states in driven dissipative systems with time-periodic modulation
<b>Master</b>	University of Leeds: 8 year-long MSc supervised from 2017 until 2023 (many more in smaller projects) Imperial College London: 2 MSc supervised in 2015 Université de Toulouse: 1 MSc supervised in 2010

## Other

### Professional service

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<b>Organization</b>	Formula 1 Strategy Competition, online (2018–2024): <a href="http://www.cbeaume.com/en/teaching_f1.html">http://www.cbeaume.com/en/teaching_f1.html</a> Conference “Perspectives in Nonlinear Sciences”, Cargèse (France, 2018): <a href="http://www.cbeaume.com/pins18">http://www.cbeaume.com/pins18</a> Minisymposium “Spatial localisation in fluids” at the British Applied Mathematics Colloquium, Surrey (UK, 2017) Minisymposium “Spatial localization: recent progress in theory and applications” at SIAM Conference on Nonlinear Waves and Coherent Structures, Cambridge (UK, 2014)
<b>Journal Reviewer</b>	Fluid Dyn. Res. (since 2011); Phys. Fluids (since 2012); J. Atmos. Oceanic Technol., J. Fluid Mech., J. Phys. Chem., Physica D (since 2013); Chaos, SIAM J. Appl. Dyn. Sys. (since 2015); IMA J. Appl. Math. (since 2016); J. Eng. Math., Phys. Rev. Lett. (since 2017)
<b>Grant Reviewer</b>	FONDECYT (Chile, since 2015), FWO (Belgium, since 2017), NWO (Netherlands, since 2017), DFG (Germany, since 2021)
<b>PhD Examiner</b>	Imperial College London (UK, since 2019) University of Leeds (UK, since 2019) University of Southampton (UK, since 2018) University of Loughborough (UK, since 2018)
<b>University of Leeds</b>	Incoming student sport project supervisor (2017, 2018) Access to Leeds tutor (2017, 2018, 2019, 2023) Post Application Visit Afternoons (2017, 2018, 2019, 2020, 2021) Convenor for the Teaching Enhancement Scheme group on “Teaching Induction for New Lecturers” (2016–2017) School of Mathematics representative at the Discovery Themes Fair (2016) Organiser of the Leeds Applied Mathematics Seminar series (2016–2023)
<b>UC Berkeley</b>	Founder of the Berkeley Fluids Seminar series: <a href="http://www.cbeaume.com/berkeleyfluids">http://www.cbeaume.com/berkeleyfluids</a> (2013–2014)
<b>IMFT</b>	Editor of the book of Ph.D theses (2011) Organiser of the Graduate students day (2011)
<b>University of Toulouse</b>	Open Days organiser: Aerodynamics workshop and windtunnel visit (2010) Unit of Mathematics representative at the Introduction to academic topics meeting (2011) Open Days organiser: Aerodynamics & numerics workshops (2010, 2011) Administration of the Linux computer network of the Department of Mechanics (2009–2012)

### Hobbies

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- **Chess** since 2022
- **Classical music** **Piano** since 1991
- **Motorsports** **Racing driver** 2002–2007  
**Journalist** 2005–2006  
**Mechanics** 2007–2009