Georg Gottwald

Professor

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Curriculum Vitae

School of Mathematics and Statistics F07
University of Sydney, Sydney N.S.W. 2006. Australia
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Education

Ph.D.	Applied Mathematics, Monash University, 1999.
Diplom	Physics, Heinrich-Heine Universität Düsseldorf, Germany, 1995.

Employment and Academic Positions

1/2013–	Full Professor, University of Sydney.
1/2013–	Visiting Professor, University of Surrey.
1/2010—12/2014	ARC Future Fellow, University of Sydney.
1/2009—12/2012	Associate Professor, University of Sydney.
1/2006—12/2009	Senior Lecturer, University of Sydney.
1/2004—12/2009	ARC Australian Research Fellowship, University of Sydney.
7/2002—12/2006	Lecturer, University of Sydney.
1/2001— 6/2002	Postdoctoral position at the University of Surrey, U.K. (joint affiliation with Imperial College).
5/1999—12/2000	Postdoctoral position at the Institut Non-Linéaire de Nice, France.
10/1998— 4/1999	Software Developer, Applied Financial Services, Melbourne, Australia.

Fellowships and Awards

2010	Future Fellowship, Australian Research Council (4 years).
2010	Australian Research Fellowship (5 years, declined), Australian Research Council.
2004	Australian Research Fellowship (5 years), Australian Research Council.
2003	EPSRC Visiting Fellowship (3 years), U.K.
2000	MASIE Postdoctoral Fellowship (2 years), University of Surrey/Imperial College.
1995	DAAD (Deutscher Akademischer Austauschdienst) (3 years) Postgraduate Fellowship.

Research Funding since 2002

Over \$4.1M in competitive grant funding since appointment as a Lecturer in 2002; for example:

668	*Data-driven modelling of dynamical systems: A measure transport framework*, ARC Discovery Grant. With Tiangang Cui. 2021
356k	*A dynamical systems theory approach to machine learning*, ARC Discovery Grant. 2021
30k	*Novel stochastic numerical methods for complex multiscale dynamical systems with applications in microbiology*, University of Sydney and University of Geneva Collaboration Award. With Gilles Vilmart. 2019.
357k	*Mathematical model reduction for complex networks*, ARC Discovery Grant. 2017.
372k	*The Shape of Chaos: Geometric Advances in Partially Hyperbolic Dynamics*, ARC Discovery Grant. With Andy Hammerlindl. 2017.
30k	*Stochastic Parametrisation and Uncertainty Quantification for Complex Dynamical Multi-Scale Systems*, University of Sydney and University of Utrecht Collaboration Award. With Jason Frank. 2019.
270k	*Extracting macroscopic variables and their dynamics in multiscale systems with metastable states*, ARC Discovery Grant. With Gary Froyland. 2012.
762k	*Stochastic methods in mathematical geophysical fluid dynamics*, ARC Future Fellowship. 2010.
400k	*Stochastic methods in mathematical geophysical fluid dynamics*, ARC Australian Research Fellowship. 2010.
224k	*Nonlinear time series analysis for physiological data*, ARC Discovery Grant. With Michael Breakspear. 2006.
577k	*Geometric methods in geophysical fluid dynamics*, ARC Australian Research Fellowship. 2004.
18k	*Detection of Chaos in Nonlinear Dynamical Systems, and Hypermeander of Spirals in Excitable Media*, EPSRC Visiting Fellowship. 2003.
4.5k	*Geometric methods in numerical geophysical fluid dynamics*, Australian Academy of Sciences travel grant. 2003.

Postgraduate Students

2025–	Henry Irvine, PhD
2023–	Yinhao Xu, PhD
2018–2023	Wenqi Yue, PhD
2018–2021	Madeleine Cartwright (USyd Medalist), MSc (Department of Transport, Victoria)
2016–2020	Caroline Wormell (USyd Medalist), PhD (Lecturer at University of Sydney)
2015–2019	Brent Giggins, PhD (Data Scientist at WolliesX)
2011–2015	John MacLean, PhD (Lecturer at University of Adelaide)
2008–2011	Lewis Mitchel, (U Wollongong Medalist), PhD (Associate Professor at University of Adelaide)
2009–2011	Pamela Guzman, MSc (Administration at Universidad Católica de Temuco)
2008–2009	David Kelly (USyd Medalist), MSc (Instructor/Assistant Professor at Courant Institute)
2006–2010	Sebastian Hermann, PhD (Derivative trader at IMC Pacific)
2007–2008	John Hornibrook, MSc (Microsoft)
2004–2008	Shakti Menon, PhD (Senior Scientist at Institute of Mathematical Sciences, Chennai)

Postdocs supervised

Ramon Xulvi-Brunet, (now Professor at Escuela Politecnica Nacional, Ecuador)

Andy Hammerlindl, (now Associate Professor at Monash University, Australia)

Jeroen Wouters, (now Lecturer at University of Reading, UK)

Lauren Smith, (now Senior Lecturer at University of Auckland, NZ)

Pinak Mandal (current)

Editorial work, Reviewing (papers and grants)

2025 -	Editorial Board for *Physical Review E*
2024 -	Editorial Board for *Journal of Computational Dynamics*
2021 -	Editorial Board for *SIAM Journal on Applied Dynamical Systems*
2019	Editor for *Chaos* Focus Issue on *"Linear Response Theory: Theory and Applications"*
2018-	Editorial Advisory Board for *Chaos*
2015	Editor for *Springer Lecture Notes in Physics* on *"Chaos Prediction Methods and Predictability"*
2014	Editor for *Chaos* Focus Issue on *"Chaos Prediction Methods and Predictability"*
2013 -	Associate Editor for *Geophysical and Astrophysical Fluid Dynamics*
2008	Guest editor for *Journal of Nonlinear Sciences*, Springer
Ongoing	Assessing grant applications and final reports for the ARC, EPSRC, EU, INRIA, NRF, NSERC
Ongoing	Refereeing for international journals (approximately 25 papers per year)

Conferences, Seminars and Summer Schools Organized

Co-organizer	*Workshop on Numerical Methods for Complex High-Dimensional Systems*, Jervis Bay, 23-26 July 2024
Co-organizer	*Randomization for simplified machine learning: Random Features and Reservoir Computers*, minisymposium at ICIAM, Tokyo, 20-25 August, 2023
Scientific committee	*INI Satellite Programme: Geophysical fluid dynamics; from mathematical theory to operational prediction*, Reading, 29 August - 23 September 2022
Co-organizer	*Machine Learning for the Working Mathematician*, online Seminar series, University of Sydney 2022
Co-organizer	*Linear response: Rigorous results and applications*, Bernoulli Center, Lausanne, 25-29 January 2021
Co-organizer	*SDG workshop: Dynamical Systems - Theory and Application*, Jervis Bay, 23-27 November 2020
Co-Founder	*One-world Seminar Series: Mathematics of Climate*, since November 2020 (online)
Program Director	*SIAM Mathematics of Planet Earth 2020*, Orange County, June 8-10 2020 (online)
Co-organizer	*Workshop on Multiscale Methods for Deterministic and Stochastic Dynamics*, Geneva, 29-30 January 2019
Co-organizer	*Big data, data assimilation, and uncertainty quantification*, Institut Henri Poincaré, Paris, 12-15 December 2019
Co-organizer	*Workshop on Economics & Climate*, Utrecht, 15-17 July 2019
Co-organizer	Invited minisymposium at *EquaDiff 2019*, Leiden, 8-12 July 2019
Co-organizer	2 minisymposia at *SIAM Conference on Applications of Dynamical Systems (DS19)*, Snowbird, 19-23 May 2019
Co-organizer	*Winter School Les Houches: Physics and Mathematics of Turbulent Flows at Different Scales*, Les Houches, 25 February - 1 March 2019
Co-organizer	*Workshop on Multiscale Methods for Stochastic Dynamics*, Geneva, 31 January - 1 February 2017
Co-organizer	*R&D Workshop: Data Assimilation*, Bureau of Meteorology, Melbourne, 5-9 December 2016
Co-organizer	*Advances in Ergodic Theory, Hyperbolic Dynamics, and Statistical Laws*, Canberra, 28 November - 2 December 2016
Co-organizer	*SDG workshop: Multiscale Dynamical Systems - Theory and Application*, Blackheath, Blue Mountains, 2-5 November 2015
Co-organizer	*Methods of Chaos Detection and Predictability: Theory and Applications*, Max Planck Institute Dresden, 2013
Co-organizer	International Workshop on *Set-Oriented Numerics (SON Sydney 2012)*, UNSW, Sydney, 3-7 September 2012
Organizer	AustMS, 5 minisymposia (*Integrable Systems*, *Biomathematics*, *Stochastic Aspects of Dynamical Systems*, *Fluid Mechanics* and *Nanotechnology*), Wollongong, 2011
Organizer	Dynamic Days Asia-Pacific 6 (DDAP6), minisymposium on *Stochastic Aspects of Dynamical Systems*, UNSW, 2010
Chair	*Sydney Dynamics Group*, University of Sydney and UNSW, 2007–
Co-organizer	*5th ICE-EM/AMSI Summer School*, University of Sydney, 2006

Publications

Journal Articles (refereed)

1. G.A. Gottwald, R. H. J. Grimshaw and B. Malomed (1997), '*Parametric envelope solitons in coupled Korteweg-de Vries equations*', Phys. Lett. A **227**, 47-54.

2. G.A. Gottwald, R. H. J. Grimshaw and B. Malomed (1998), '*Stable two-dimensional parametric solitons in hydrodynamic models*', Phys. Lett. A **248**, 208-218.

3. G.A. Gottwald and R.H.J. Grimshaw (1999), '*The formation of coherent structures in the context of blocking*', J. Atmos. Sci. **56**, 3640-3662.

4. G.A. Gottwald and R.H.J. Grimshaw (1999), '*The effect of topography on the dynamics of interacting solitary waves as an example for atmospheric blocking*', J. Atmos. Sci. **56**, 3663-3678.

5. G.A. Gottwald, L. Kramer, V. Krinsky, A. Pumir and V. Barelko (2000), '*Persistence of zero velocity fronts in reaction diffusion systems*', Chaos **10**, 731-737.

6. G.A. Gottwald, A. Pumir and V. Krinsky (2001), '*Spiral wave drift induced by stimulating wave trains*', Chaos **11**, 487-494.

7. H. Dullin, G.A. Gottwald and D. Holm (2001), '*An integrable shallow water system with linear and nonlinear dispersion*', Phys. Rev. Lett. **87** nr. 19, 4501-4504.

8. G.A. Gottwald and M. Nicol (2002), '*On the nature of Benford's Law*', Physica A **303**, 387-396.

9. R.H.J. Grimshaw, B. Malomed and G.A. Gottwald (2002), '*Singular and regular gap solitons between three dispersion curves*', Phys. Rev. E **65**, 66606.

10. J. Frank, G.A. Gottwald and S. Reich (2002), '*A Hamiltonian particle-mesh method for the rotating shallow-water equations*, Meshless Methods for Partial Differential Equations, Springer Lecture Notes in Computational Science and Engineering **26**, 131-142.

11. T. Bridges, G. Derks, G.A. Gottwald (2002), '*Stability and instability of solitary waves of the fifth-order KdV equation: a numerical framework*', Physica D **172**, 190-216.

12. H. Dullin, G.A. Gottwald and D. Holm (2003), '*Camassa-Holm, Korteweg-de Vries-5 and other asymptotically equivalent equations for shallow water waves*', Fluids Dynamics Research **33**, 73-95.

13. G.A. Gottwald and I. Melbourne (2004), '*A new test for chaos in deterministic systems*', Proc. Roy. Soc. Lond. **A 460**, 603-611.

14. H. Dullin, G.A. Gottwald and D. Holm (2004), '*On asymptotically equivalent shallow water wave equations*', Physica **D 190**, 1-14.

15. G.A. Gottwald and L. Kramer (2004), '*Propagation failure in excitable media in 1 and 2 dimensions*', Chaos **14**, 855-863.

16. G. Derks and G.A. Gottwald (2005), '*A robust numerical method to study oscillatory instability of gap solitary waves*', SIAM J. Appl. Dyn. Systems **4**, 140-158.

17. G.A. Gottwald and I. Melbourne (2005), '*Testing for chaos in deterministic systems with noise*', Physica D **212**, 100-110.

18. S. Menon and G.A. Gottwald (2005), '*On bifurcations in reaction-diffusion systems in chaotic flows*', Phys. Rev. E **71**, 066201-066207.

19. R. Thuraisingham and G.A. Gottwald (2006), '*On multiscale entropy analysis for physiological data*', Physica A **366**, 323-332.

20. S. Cox and G.A. Gottwald (2006), '*A bistable reaction–diffusion system in a stretching flow*', Physica D **216**, 307-318.

21. G.A. Gottwald and L. Kramer (2006), '*A normalform for excitable media*', Chaos **16**, 013122.

22. I. Falconer, G.A. Gottwald, I. Melbourne and K. Wormnes (2007), '*Application of the 0-1 test for chaos to experimental data*', SIAM J. Appl. Dyn. **6**, 395-402.

23. G.A. Gottwald, M. Oliver and N. Tecu (2007), '*Long-time accuracy for approximate slow manifolds in a finite dimensional model of balance*', Journal of Nonlinear Science **17**, 383-407.

24. S. Menon and G.A. Gottwald (2007), '*Bifurcations of flame filaments in chaotically mixed combustion reactions*', Phys. Rev. E **75**, 016209.

25. S. Balasuriya, G.A. Gottwald, J. Hornibrook and S. Lafortune (2007), '*High Lewis number combustion wavefronts: A perturbative Melnikov analysis*', SIAM J. Applied Math. **67**, 464-486.

26. G.A. Gottwald (2007), '*Dispersive regularizations and numerical discretizations for the inviscid Burgers*', J. Phys. A **40**, 14745-14758.

27. I. Melbourne and G.A. Gottwald (2008), '*Power spectra for deterministic chaotic dynamical systems*', Nonlinearity **21**, 179-189 (included in the *high-profile articles* of 2008).

28. G.A. Gottwald and I. Melbourne (2008), '*Comment on "Reliability of the 0-1 test for chaos"*', Phys. Rev. E. **77**, 028201.

29. G.A. Gottwald (2008), '*Bifurcation analysis of a normal form for excitable media: Are stable dynamical alternans on a ring possible?*', Chaos **18**, 013129.

30. D.G. Dritschel, R.K. Scott, C. Macaskill, G.A. Gottwald and C.V. Tran (2008), '*A unifying theory for vortex dynamics in two-dimensional turbulence*', Phys. Rev. Lett. **101**, 094501 (selected as an Editor's Suggestion).

31. G.A. Gottwald and I. Melbourne (2009), '*On the implementation of the 0-1 test for chaos*', SIAM J. Appl. Dyn. Systems **8**, 129-145.

32. S. Menon and G.A. Gottwald (2009), '*On bifurcations in a chaotically stirred excitable medium*', Physica D **238**, 461-475.

33. G.A. Gottwald and M. Oliver (2009), '*Boltzmann's dilemma – an introduction to statistical mechanics via the Kac ring*', SIAM Review **51**, 613-635.

34. G.A. Gottwald and I. Melbourne (2009), '*On the validity of the 0-1 test for chaos*', Nonlinearity **22**, 1367-1382.

35. K. Bergemann, G.A. Gottwald and S. Reich (2009), '*Ensemble propagation and continuous matrix factorization algorithms*', Q.J.R.Meteorolog.Soc. **135**, 1560-1572.

36. D.G. Dritschel, R.K. Scott, C. Macaskill, G.A. Gottwald and C.V. Tran (2009), '*Vortex self-similarity in unforced inviscid two-dimensional turbulence*', Journal of Fluid Mechanics **640**, 217-235.

37. S. Balasuriya and G.A. Gottwald (2010), '*Wavespeed in reaction-diffusion systems, with applications to chemotaxis and population pressure*', J. Math. Biolog. **61**, 377-399.

38. S. Hermann and G.A. Gottwald (2010), '*The large core limit of spiral waves in excitable media: A numerical approach*', SIAM Journal on Applied Dynamical Systems **9**, 536-567.

39. G.A. Gottwald (2010), '*On recent trends in climate dynamics*', AMS Gazette **37**, 319-326.

40. G.A. Gottwald, L. Mitchell and S. Reich (2011), '*Controlling overestimation of error covariance in ensemble Kalman filters with sparse observations: A variance limiting Kalman filter*', Monthly Weather Review **139**, 2650-2667.

41. D. Kelly and G.A. Gottwald (2011), '*On the topology of synchrony optimized networks of a Kuramoto-model with non-identical oscillators*', Chaos **21**, 025110.

42. J. Frank and G.A. Gottwald (2011), '*The Langevin equation limit of the Nosé-Hoover-Langevin thermostat*', J. Stat. Phys. **143**, 715-724.

43. L. Mitchell and G.A. Gottwald (2012), '*Data assimilation in slow-fast systems using homogenized climate models*', J. Atmos. Sci. **69**, 1359-1377.

44. L. Mitchell and G.A. Gottwald (2012), '*On finite size Lyapunov exponents in multiscale systems with slow and fast metastable states*', Chaos **22**, 023115.

45. L. Mitchell and G.A. Gottwald (2013), '*Controlling model error of underdamped forecast models in sparse observational networks using a variance limiting Kalman filter*', Q.J.R. Meteorolog. Soc. **139**, 212-225.

46. J. Frank and G.A. Gottwald (2013), '*Stochastic homogenization for an energy conserving multi-scale toy model of the atmosphere*', Physica D **254**, 45-65.

47. G.A. Gottwald and J. Harlim (2013), '*The role of additive and multiplicative noise in filtering complex dynamical systems*', Proc. Roy. Soc. A **469**, 20130096.

48. G.A. Gottwald and I. Melbourne (2013), '*A Huygens principle for diffusion and anomalous diffusion in spatially extended systems*', Proc. Natl. Acad. Sci. USA **110** (21), 8411-8416.

49. G.A. Gottwald and I. Melbourne (2013), '*Homogenization for deterministic maps and multiplicative noise*', Proc. Roy. Soc. A **469**, 20130201.

50. G.A. Gottwald and A. Majda (2013), '*A mechanism for catastrophic filter divergence in data assimilation for sparse observation networks*', *Nonlin. Processes Geophys.* **20**, 705-712.

51. J. Maclean and G.A. Gottwald (2014), '*On convergence of the projective integration method for stiff ordinary differential equations*', *Comm. Math. Sci.* **12** (2), 235-255.

52. G.A. Gottwald (2014), '*Controlling balance in an Ensemble Kalman filter*', *Nonlin. Processes Geophys.* **21**, 417-426.

53. G.A. Gottwald and I. Melbourne (2014), '*A test for a conjecture on the nature of attractors for smooth dynamical system*', *Chaos* **24**, 024403.

54. G.A. Gottwald and M. Oliver (2014), '*Slow dynamics via degenerate variational asymptotics*', *Proc. Roy. Soc. A* **470**, 20140460.

55. G. Froyland, G.A. Gottwald and A. Hammerlindl (2014), '*A computational method to extract macroscopic variables and their dynamics in multiscale systems*', *SIAM Journal on Applied Dynamical Systems* **13**, 1816-1846.

56. J. Maclean and G.A. Gottwald (2015), '*On convergence of higher order schemes for the projective integration method for stiff ordinary differential equations*', *Journal of Computational and Applied Mathematics* **288**, 44-69.

57. G.A. Gottwald (2015), '*Model reduction for networks of coupled oscillators*', *Chaos* **25**, 053111.

58. G.A. Gottwald, K. Peters and L. Davies (2016), '*A data-driven method for the stochastic parametrisation of subgrid-scale tropical convective area fraction*', *Q.J.R. Meteorolog. Soc.* **142**, 349–359.

59. G.A. Gottwald and I. Melbourne (2016), '*Broadband nature of power spectra for intermittent maps with summable and nonsummable decay of correlations*', *Journal of Physics A* **49**, 174003. (2016 Highlight article).

60. G. Froyland, G.A. Gottwald and A. Hammerlindl (2016), '*A trajectory-free framework for analysing multiscale systems*', *Physica D* **238–239**, 34–43.

61. G.A. Gottwald, J. Wormell and J. Wouters (2016), '*On spurious detection of linear response and misuse of the fluctuation-dissipation theorem in finite time series*', *Physica D* **331**, 89–101.

62. G.A. Gottwald and I. Melbourne (2016), '*Central limit theorems and suppression of anomalous diffusion for systems with symmetry*', *Nonlinearity* **29**, 2941-2960.

63. G.A. Gottwald and I. Melbourne (2016), '*On the detection of superdiffusive behaviour in time series*', *J. Stat. Mech.* **2016** (12), 123205.

64. D.G. Dritschel, G.A. Gottwald and M. Oliver (2017), '*Comparison of variational balance models for the rotating shallow water equations*', *Journal of Fluid Mechanics* **822**, 689-716.

65. G.A. Gottwald, H. Mohamad and M. Oliver (2017), '*Optimal balance via adiabatic invariance of approximate slow manifolds*', *SIAM MMS* **15**(4), 1404–1422.

66. C.J. Cotter, G.A. Gottwald, D.D. Holm (2017), '*Stochastic partial differential fluid equations as a diffusive limit of deterministic Lagrangian multi-time dynamics*', *Proc. Roy. Soc. A* **473**, 20170388.

67. G.A. Gottwald (2017), '*Finite-size effects in a stochastic Kuramoto model*', *Chaos* **27**, 101103.

68. J. Frank and G.A. Gottwald (2018), '*A note on statistical consistency of numerical integrators for multi-scale dynamics*', *SIAM MMS* **16**(2), 1017–1033.

69. C. Wormell and G.A. Gottwald (2018), '*On the validity of linear response theory in high-dimensional deterministic dynamical systems*', *J. Stat. Phys.* **172**(6), 1479–1498.

70. E.J. Hancock and G.A. Gottwald (2018), '*Model reduction for Kuramoto models with complex topologies*', *Phys. Rev. E* **98**, 012307.

71. S. Balasuriya and G.A. Gottwald (2018), '*On estimating stochastic stable and unstable sets and their role as transport barriers in stochastic flows*', *Phys. Rev. E* **98**, 013106.

72. G.A. Gottwald and D.E. Pelinovsky (2018), '*On the impossibility of solitary Rossby waves in meridionally unbounded domains*', *Phys. Fluids* **30**(11), 116601.

73. G. Giggins and G.A. Gottwald (2019), '*Stochastically perturbed bred vectors in multi-scale systems*', *Q.J.R. Meteorolog. Soc.* **145**, 642–658.

74. J. Wouters and G.A. Gottwald (2019), '*Edgeworth expansions for slow-fast systems with finite time scale separation*', *Proc. Roy. Soc. A* **475**, 20180358.

75. M. Cartwright and G.A. Gottwald (2019), '*A collective coordinate framework to study the dynamics of travelling*

waves in stochastic partial differential equations', *Physica D* **397**, 54–64.

76. L. Smith and G.A. Gottwald (2019), '*Chaos in networks of coupled oscillators with multimodal natural frequency distributions*', *Chaos* **29**, 093127.

77. J. Wouters and G.A. Gottwald (2019), '*Stochastic model reduction for slow-fast systems with moderate time-scale separation*', *SIAM MMS* **17(4)**, 1172–1188.

78. I. Wohltmann, R. Lehmann, G.A. Gottwald, K. Peters, A. Protat, V. Louf, C. Williams, W. Feng and M. Rex (2019), '*A Lagrangian convective transport scheme including a simulation of the time air parcels spend in updrafts*', *Geoscientific Model Development* **12**, 4387–4407.

79. C. Wormell and G.A. Gottwald (2019), '*Linear response for macroscopic observables in high-dimensional systems*', *Chaos* **29**, 113127. (selected as an Editor's pick).

80. G.A. Gottwald and F. Gugole (2020), '*Detecting regime transitions using dynamic mode decomposition*', *J. Stat. Phys.***179** 1028–1045.

81. W. Yue, L. Smith and G.A. Gottwald (2020), '*Model reduction for the Kuramoto-Sakaguchi model: The importance of non-entrained rogue oscillators*', *Phys. Rev. E* **101**, 062213.

82. G. Giggins and G.A. Gottwald (2020), '*Stochastically perturbed bred vectors in single-scale systems*', *Q.J.R. Meteorolog. Soc.* **146**, 4038–4054.

83. L. Smith and G.A. Gottwald (2020), '*Model reduction for the collective dynamics of globally coupled oscillators: From finite networks to the thermodynamic limit*', *Chaos* **30**, 093107.

84. G.A. Gottwald (2021), '*A model for Dansgaard-Oeschger events and millennial-scale abrupt climate change without external forcing*', *Climate Dynamics* **56**(1), 227-243.

85. G.A. Gottwald and I. Melbourne (2021), '*Simulation of non-Lipschitz stochastic differential equations driven by α-stable noise: a method based on deterministic homogenisation*', *SIAM MMS* **19**(2), 665–687.

86. G.A. Gottwald and S. Reich (2021), '*Supervised learning from noisy observations: Combining machine-learning techniques with data assimilation*', *Physica D* **423**, 132911.

87. L. Smith and G.A. Gottwald (2021), '*Mesoscopic model reduction for the collective dynamics of sparse coupled oscillator networks*', *Chaos* **31**, 073116.

88. M. Cartwright and G.A. Gottwald (2021), '*A collective coordinate framework to study solitary waves in stochastically perturbed Korteweg-de Vries equations*', *Phys. Rev. E* **104**, 024201.

89. G.A. Gottwald and S. Reich (2021), '*Combining machine learning and data assimilation to forecast dynamical systems from noisy partial observations*', *Chaos* **31**, 101103 (selected as Featured and selected as Scilight).

90. N. James, M. Menzies and G.A. Gottwald (2022), '*On financial market correlation structures and diversification benefits across and within equity sectors*', Physica A **604**, 127682.

91. A. Sandoz, V. Ducret, G.A. Gottwald, G. Vilmart and KJ. Perron (2023), '*SINDy for delay-differential equations: application to model bacterial zinc response*', *Proc. Roy. Soc. A* **479**, 20220556.

92. J. Fialkowski, S. Yanchuk, I. Sokolov, E. Schöll, G.A. Gottwald and R. Berner (2023), '*Heterogeneous nucleation in finite size adaptive dynamical networks*', *Phys. Rev. Lett.* **130**, 067402.

93. C. Jiao and G.A. Gottwald (2023), '*Lévy flights as an emergent phenomenon in a spatially extended system*', *Proc. Roy. Soc. A* **479**, 20230349.

94. M. Engel and G.A. Gottwald (2024), '*Canards in modified equations for Euler discretizations*', *AMS Contemporary Mathematics* **806**, 15–28.

95. K. Riechers, N. Boers and G.A. Gottwald (2024), '*Glacial abrupt climate change as a multi-scale phenomenon resulting from monostable excitable dynamics*', *Journal of Climate* **37**(8), 2741-2763.

96. G.A. Gottwald and I. Melbourne (2024), '*Time-reversibility and nonvanishing Lévy area*', *Nonlinearity* **37**(7), 075018.

97. W. Yue and G.A. Gottwald (2024), '*A stochastic approximation for the finite-size Kuramoto-Sakaguchi model*', *Physica D.* **468**, 134292.

98. G.A. Gottwald, F. Li, Y. Marzouk and S. Reich (2025), '*Stable generative modelling using Schrödinger bridges*', *Philosophical Transactions of the Royal Society A* **383** (2299), 20240332

99. P. Cahill and G.A. Gottwald (2025), '*A modified Hegselmann–Krause model for interacting voters and political*

parties', *Physica A* **665**, 130490.

100. L. Smith and G.A. Gottwald (2025), '*Data assimilation for networks of coupled oscillators: Inferring unknown model parameters from partial observations*', *Proc. Roy. Soc. A* **481**, 20240813.

101. P. Mandal and G.A. Gottwald (2025), '*Learning dynamical systems with hit-and-run random feature maps*', *Nature Communications* **16**, 5961.

102. Y.Xu, G.A. Gottwald and Z. Kuncic (2025), '*Learning chaotic dynamics with neuromorphic network dynamics*', *APL Machine Learning* **3**(4), 046104.

103. P. Mandal, G.A. Gottwald and N. Cranch (2026), '*On the choice of the non-trainable internal weights in random feature maps for forecasting chaotic dynamical systems*', *Foundations of Data Science* **8**, 168–199.

104. J. Lohmann and G.A. Gottwald (2025), '*Choosing observables that capture critical slowing down before tipping points: a Fokker-Planck operator approach*', *Physical Review E* **112**(6), 064204.

Conference Proceedings and Other Publications

105. G.A. Gottwald, L. Kramer, V. Krinsky, A. Pumir and V. Barelko (2001), '*Co-existence of stable states in reaction diffusion systems*', In: Proceedings of "La 3ème Rencontre du Non-linèaire 2000", 154-158, Orsay, edited by Y. Pomeau and R. Ribotta.

106. R.H.J. Grimshaw and G.A. Gottwald (2001),'*Models for instability in geophysical flows*', In: Proceedings of IUTAM Symposium on Advances in Mathematical Modelling of Atmosphere and Ocean Dynamics Kluwer Academic Publishers, 153-161, edited by P.F. Hodnett.

107. R.H.J. Grimshaw, B. Malomed and G.A. Gottwald (2002), '*Cuspons and peakons vis-a-vis regular solitons and collapse in a three-wave system*', Proceedings of the AMS-IMS-SIAM Conference "The Legacy of Inverse Scattering Theory in Nonlinear Wave Propagation" CONM (Contemporary Math) AMS series, edited by J. Bona, R. Choudhury and D. Kaup.

108. G.A. Gottwald and L. Kramer (2005), '*On a normalform for excitable media*', Oberwolfach Reports, Volume 2, Issue 2, 1941-1942.

109. D.G. Dritschel, R.K. Scott, C. Macaskill, G.A. Gottwald and C.V. Tran (2009), '*Vortex self-similarity and the evolution of unforced inviscid two-dimensional turbulence*', Advances in Turbulence XII, Springer Proceedings in Physics Volume 132, 461-464.

110. G.A. Gottwald and A. Majda, L. Mitchell and S. Reich (2012), '*Constraining overestimation of error covariances in ensemble Kalman filters*', Oberwolfach Reports, Volume 9, Issue 4, 3430–3431.

111. G.A. Gottwald and Ch. Skokos (2014), '*Preface to the Focus Issue: Chaos Detection Methods and Predictability*', Chaos, Volume 24, 024201.

112. G.A. Gottwald (2020), '*Introduction to Focus Issue: Linear response theory: Potentials and limits*', Chaos, Volume 30, 020401.

113. Y.Xu, G.A. Gottwald and Z. Kuncic (2025), '*Dynamic reservoir computing with physical neuromorphic networks*', *2025 International Joint Conference on Neural Networks (IJCNN)* 1–8.

Book Chapters

114. G.A. Gottwald and I. Melbourne (2016), '*The* 0-1 *test for chaos: A review*', In: Chaos Detection and Predictability, Springer Lecture Notes in Physics 915 (C. Skokos and G.A. Gottwald, eds.)

115. G.A. Gottwald, D. Crommelin and C. Franzke (2017), '*Stochastic climate theory*', In: Nonlinear and Stochastic Climate Dynamics, Cambridge University Press (C. Franzke and T. O'Kane, eds.)

Selected Addresses

Invited Speaker	*Model Hierarchies in Atmosphere, Ocean, and Climate Sciences*, Oberwolfach, Germany, 2024
Invited Speaker	*Constrained Dynamics, Stochastic Numerical Methods and the Modeling of Complex Systems*, Oberwolfach, Germany, 2024
Invited Speaker	*Mathematics of Entropic AI in the Natural Sciences*, Oberwolfach, Germany, 2024
Invited Speaker	*SIAM UQ 2024*, Trieste, Italy, 2024
Invited Speaker	*Dynamics in Coupled Network Systems*, WIAS Berlin, Germany, 2023.
Invited Speaker	*Transport and Scale Interactions in Geophysical Flows*, Oberwolfach, Germany, 2023.
Invited Speaker	*Foundations of Computational Mathematics (FoCM 2023)*, Paris, France, 2023.
Invited Speaker	*Probabilistic Methods in Dynamics*, Pisa, Italy, 2023.
Invited Participant	*The Mathematical and Statistical Foundation of Future Data-Driven Engineering*, Isaac Newton Institute, Cambridge, UK, 2023
Invited Speaker	*Critical Transitions in Complex Climate Models*, Munich, Germany, 2023.
Invited Speaker	*Topics in Multiple Time Scale Dynamics*, Banff, Canada, 2022.
Invited Speaker	*Conference on Mathematical & Computational Issues in the Geosciences (GS21)*, (online) 2021.
Invited Speaker	*European Geosciences Union General Assembly*, (online) Vienna, Austria, 2021.
Invited Speaker	*SIAM Conference on Mathematical & Computational Issues in the Geosciences (GS21)*, (online) 2021
Invited Speaker	*SIAM Conference on Applications of Dynamical Systems*, (online) 2021.
Invited Speaker	*Seminar*, University of Reading (online) 2021.
Invited Speaker	*Seminar*, Caltech (online) 2021.
Invited Speaker	*Scaling Cascades in Complex Systems Colloquium*, Freie Universität Berlin (online) 2021.
Invited Speaker	*SIAM Conference on Computational Science and Engineering*, (online) 2021.
Invited Speaker	*Second Symposium on Machine Learning and Dynamical Systems*, Fields Institute % Princeton University (online) 2020.
Invited Speaker	*Colloquium*, Potsdam University (online) 2020.
Invited Speaker	*Annual Meeting of the Australian Mathematical Society*, (online) 2020.
Invited Speaker	*One World: Stochastic Numerics and Inverse Problems*, online seminar series 2020.
Invited Speaker	*SIAM Conference on Mathematics of Planet Earth*, (online) 2020.
Invited Speaker	*European Geosciences Union General Assembly*, (online) 2020.
Invited Lecturer	*Les Houches School of Physics: Physics and Mathematics of Turbulent Flows at Different Scales*, Les Houches, France, 2019.
Keynote Speaker	*National Colloquium on Data Assimilation*, Rennes, France, 2018.
Keynote Speaker	*NDNS+ workshop 2018*, Twente, The Netherlands, 2018.
Keynote Speaker	*Ergodic Theory, Algorithms and Rigorous Computations*, Warwick, UK, 2017.
Invited Speaker	*Transport in Unsteady Flows: from Deterministic Structures to Stochastic Models and Back Again*, Banff, Canada, 2017.
Keynote Speaker	*60th Annual Meeting of the Australian Mathematical Society*, Canberra, 2016.
Invited Speaker	*Mathematical and Algorithmic Aspects of Atmosphere-Ocean Data Assimilation*, Oberwolfach, Germany, 2016.
Invited Speaker	*5th Data Analysis and Modeling in Earth Science (DAMES) conference*, Hamburg, Germany, 2016.
Invited Speaker	*SON 2016 - 7th International Workshop on Set Oriented Numerics*, Berlin, Germany, 2016.
Invited Speaker	*Multiscale Interactions in Geophysical Fluids*, Oberwolfach, Germany, 2016.
Invited Lecturer	*Summer Research Program on Dynamics of Complex Systems*, ICTS, Bangalore, India, 2016.
Invited Speaker	*SciCADE 2015*, Potsdam, Germany, 2015.
Invited Speaker	*Averaging and Homogenization in Deterministic and Stochastic Systems*, Luminy, France, 2015.

Invited Speaker	*Random Dynamical Systems and Multiplicative Ergodic Theorems*, Banff, Canada, 2015.
Invited Speaker	*XXVII Marian Smoluchowski Symposium on Statistical Physics*, Zakopane, Poland, 2014
Invited Speaker	*International Symposium on Nonlinear Theory and its Applications (NOLTA2014)*, Luzern, Switzerland, 2014
Invited Speaker	*Methods of Chaos Detection and Predictability: Theory and Applications*, Max Planck Institute Dresden, 2013.
Invited Speaker	*European Geosciences Union General Assembly*, Vienna, Austria, 2013.
Invited Speaker	*Stochastic Modeling of the Oceans and Atmosphere*, Institute for Mathematics and its Applications (IMA), Minnesota, U.S.A., 2013.
Invited Speaker	*Mathematical and Algorithmic Aspects of Atmosphere-Ocean Data Assimilation*, Oberwolfach, Germany, 2012.
Invited Speaker	*Data Assimilation: Numerical methods for solving the filtering problem and high order methods for saving parabolic PDEs*, Oxford, UK, 2012.
Invited Speaker	*9th AIMS Conference on Dynamical Systems, Differential Equations and Applications*, Orlando, U.S.A., 2012.
Invited Speaker	*European Geosciences Union General Assembly*, Vienna, Austria, 2012.
Invited Speaker	*IMA Conference on Mathematics of the Climate System*, 2 talks, Reading, UK, 2011.
Invited Speaker	*LMS symposium on The Mathematics of Data Assimilation*, 2 talks, Durham, UK, 2011.
Invited Speaker	*European Geosciences Union General Assembly*, 2 talks, Vienna, Austria, 2011.
Plenary Speaker	*ANZIAM 2011*, Adelaide, 2011.
Invited Speaker	*Isaac Newton Institute programme Mathematical and Statistical Approaches to Climate Modelling and Prediction*, 2 talks, Cambridge, UK, 2010.
Invited Speaker	*SIAM Conference on Applications of Dynamical Systems*, Snowbird, U.S.A., 2009.
Invited Speaker	*SIAM Conference on mathematical and computational issues in the Geosciences*, Leipzig, Germany, 2009.
Invited Speaker	*Wave-flow interactions network meeting*, Edinburgh, UK, 2009.
Invited Speaker	*Geometric and stochastic methods in geophysical fluid dynamics*, Bremen, Germany, 2008
Invited Speaker	*Nonlinear Dynamics and Chaos: Advances and Perspectives*, Aberdeen, U.K., 2007.
Keynote address	*AMSI Workshop Symmetries and Stability*, Canberra, 2007.
Keynote address	*NZIMA Dynamical Systems and Numerical Analysis conference*, Hamilton, NZ, 2006.
Keynote address	*Geometry, Mechanics and Symmetry*, Lisbon, Portugal, 2001.

Besides these conference talks I gave numerous talks at national and international institutions, amongst those Imperial College, Cambridge University, University of Warwick, University of Surrey, Loughborough University, Universität Bayreuth, Universität Tübingen, Jacobs University Bremen, Universität Potsdam.

Recent visiting invitations

Universität Potsdam (2008,2009,2010,2016,2022,2023,2024, Sebastian Reich), Free University Amsterdam (2024, Bob Rink), Utrecht University (2018,2024, Jason Frank), Wuhan University (2017, Jinqiao Duan), ICTS, Bangalore (2016, Amit Apte), Warwick University (2016, Ian Melbourne), Imperial College (2012,2016,2022,2023 Colin Cotter, Darryl Holm), CWI, Amsterdam (2012, Daan Crommelin, Jason Frank), University of Surrey (2008,2009,2012, Ian Roulstone, Ian Melbourne), University of St. Andrews (2011, David Dritschel), Jacobs University Bremen (2008,2009,2010,2016, Marcel Oliver), Université Paul Sabatier, Toulouse (2009, Pierre-Henri Chavanis)