

**CURRENT POSITION**

Assistant Professor  
Department of Applied Mathematics  
University of Colorado, Boulder

**EDUCATION**

- **University of Colorado at Boulder**  
Ph.D. in Applied Mathematics, May 2011
- **College of William and Mary, Williamsburg, VA**  
B.S. in Mathematics, *summa cum laude*, May 2005

**RESEARCH INTERESTS**

- Multiscale Modeling, Analysis, and Simulation
- Data Assimilation & Uncertainty Quantification for Turbulent Dynamical Systems
- Geophysical Fluid Dynamics, esp. Physical Oceanography

**PUBLICATIONS** **Refereed Journal Articles**

- [34] **I. Grooms** and W. Kleiber, “*Diagnosing, modeling, and testing a multiplicative stochastic Gent-McWilliams parameterization*” *Ocean Modelling* **133** 2019.
- [33] **I. Grooms** and K. Julien, “*Multiscale models in geophysical fluid dynamics*” *Earth and Space Science* **5** 2018.
- [32] J. D. Christopher, N. T. Wimer, C. Lapointe, T. R. S. Hayden, **I. Grooms**, G. B. Rieker, and P. E. Hamlington, “*Parameter estimation for complex thermal-fluid flows using approximate Bayesian computation*” *Phys. Rev. Fluids* **3** 2018.
- [31] A. Chen, W. Barham, and **I. Grooms** “*Comparing eddy-permitting ocean model parameterizations via Lagrangian particle statistics in a quasigeostrophic setting*” *Journal of Geophysical Research: Oceans* **123** 2018.
- [30] G. Robinson, **I. Grooms**, and W. Kleiber “*Improving particle filter performance by smoothing observations*” *Monthly Weather Review* **146** 2018.
- [29] W. Barham, S. Bachman, and **I. Grooms** “*Some effects of horizontal discretization on linear baroclinic and symmetric instabilities*” *Ocean Modelling* **125** 2018.
- [28] W. Barham and **I. Grooms** “*An eddifying Stommel model: Fast eddy effects in a two-box ocean*” accepted to *Geophysical & Astrophysical Fluid Dynamics* 2018.
- [27] **I. Grooms** “*Simulations of eddy kinetic energy transport in barotropic turbulence*” *Phys. Rev. Fluids* **2** 2017.
- [26] J. B. Weiss and **I. Grooms** “*Assimilation of ocean sea-surface height observations of mesoscale eddies*” *Chaos* **27** 2017.
- [25] **I. Grooms** and L. Zanna “*A note on ‘Towards a stochastic parameterization of ocean mesoscale eddies’*” *Ocean Modelling* **113** 2017.
- [24] **I. Grooms** “*A Gaussian-product stochastic Gent-McWilliams parameterization*” *Ocean Modelling* **106** 2016.
- [23] **I. Grooms** and L.-P. Nadeau “*The effects of mesoscale atmosphere-ocean coupling on the quasigeostrophic double gyre*” *Fluids* **1** 2016.

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- [22] D. Nieves, **I. Grooms**, K. Julien, and J. B. Weiss “*Investigations of non-hydrostatic, stably stratified and rapidly rotating flows*” *J. Fluid Mech.* **801** 2016.
- [21] C. B. Rocha, W. R. Young, and **I. Grooms** “*On Galerkin approximations for the quasigeostrophic equations*” *J. Phys. Oceanogr.* **46** 2016.
- [20] **I. Grooms** “*A computational study of turbulent kinetic energy transport in barotropic turbulence on the  $f$ -plane*” *Phys. Fluids* **27** 2015.
- [19] **I. Grooms** and Y. Lee “*A framework for variational data assimilation with superparameterization*” *Nonlin. Proc. Geophys.* **22** 2015.
- [18] **I. Grooms**, Y. Lee, and A. J. Majda “*Ensemble filtering and low resolution model error: Covariance inflation, stochastic parameterization, and model numerics,*” *Mon. Weather Rev.* **143**, 2015.
- [17] **I. Grooms**, Y. Lee, and A. J. Majda “*Numerical Schemes for Stochastic Backscatter in the Inverse Cascade of Quasigeostrophic Turbulence,*” *Multiscale Modeling & Simulation* **13**, 2015.
- [16] **I. Grooms** “*Submesoscale Baroclinic Instability in the Balance Equations,*” *J. Fluid Mech.* **762**, 2015.
- [15] **I. Grooms**, A. J. Majda, and K. S. Smith “*Stochastic Superparameterization in a Quasigeostrophic Model of the Antarctic Circumpolar Current,*” *Ocean Modelling* **85**, 2015.
- [14] **I. Grooms** and J. P. Whitehead “*Bounds on Heat Transport in Rapidly Rotating Rayleigh-Bénard Convection,*” *Nonlinearity* **28**, 2015.
- [13] **I. Grooms** “*Asymptotic Behavior of Heat Transport for a Class of Exact Solutions in Rotating Rayleigh-Bénard Convection,*” *Geophys. Astrophys. Fluid Dyn* **109**, 2015.
- [12] **I. Grooms**, Y. Lee, and A. J. Majda “*Ensemble Kalman Filters for Dynamical Systems with Unresolved Turbulence,*” *J. Comp. Phys.* **273**, 2014.
- [11] **I. Grooms** and A. J. Majda “*Stochastic Superparameterization in Quasigeostrophic Turbulence,*” *J. Comp. Phys.* **271**, 2014.
- [10] A. J. Majda and **I. Grooms** “*New Perspectives on Superparameterization for Geophysical Turbulence,*” *J. Comp. Phys.* **271**, 2014.
- [9] **I. Grooms** and A. J. Majda “*Stochastic Superparameterization in a One-Dimensional Model for Wave-Turbulence,*” *Commun. Math. Sci.* **12**, 2014.
- [8] **I. Grooms**, L.-P. Nadeau, and K. S. Smith “*Mesoscale Eddy Energy Locality in an Idealized Ocean Model,*” *J. Phys. Oceanogr.* **43**, 2013.
- [7] **I. Grooms** and A. J. Majda “*Efficient Stochastic Superparameterization for Geophysical Turbulence,*” *Proc. Nat. Acad. Sci. USA* **110**, 2013.
- [6] **I. Grooms**, K. S. Smith, and A. J. Majda “*Multiscale Models for Synoptic-Mesoscale Interactions in the Ocean,*” *Dyn. Atmos. Oceans* **58**, 2012.
- [5] K. Julien, A. Rubio, **I. Grooms**, and E. Knobloch “*Statistical and Physical Balances in Low Rossby Number Rayleigh-Bénard Convection,*” *Geophys. Astrophys. Fluid Dyn.* **106**, 2012.
- [4] **I. Grooms**, K. Julien, and B. Fox-Kemper “*On the Interactions Between Planetary Geostrophy and Mesoscale Eddies,*” *Dyn. Atmos. Oceans* **51**, 2011.
- [3] **I. Grooms** and K. Julien, “*Linearly Implicit Methods for Nonlinear PDEs with Linear Dispersion and Dissipation,*” *J. Comp. Phys.* **230**, 2011.

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- [2] **I. Grooms**, K. Julien, J. B. Weiss, and E. Knobloch, “*Model of Convective Taylor Columns in Rotating Rayleigh-Bénard Convection*,” Phys. Rev. Lett. **104**, June 2010. **Cover Article**
- [1] **I. Grooms**, R. M. Lewis, and M. W. Trosset, “*Molecular Embedding via a Second Order Dissimilarity Parameterized Approach*,” SIAM J. Sci. Comp. **31**, 2009.

**Conference Proceedings**

- [3] J. Christopher, D. Petrykowski, T. Hayden, C. Lapointe, N. Wimer, S. Nigam, **I. Grooms**, P. Hamlington, G. Rieker, “*Parameter Estimation using Wavelength Modulation Spectroscopy Temperature Measurements and Approximate Bayesian Computation*” Light, Energy and the Environment, Optical Society of America, 2018.
- [2] J. Christopher, C. Lapointe, N. Wimer, T. Hayden, **I. Grooms**, G.B. Rieker, and P.E. Hamlington “*Parameter Estimation for a Turbulent Buoyant Jet with Rotating Cylinder Using Approximate Bayesian Computation*” 23rd AIAA Computational Fluid Dynamics conference, 2017.
- [1] J. Christopher, C. Lapointe, N. Wimer, T. Hayden, **I. Grooms**, G.B. Rieker, and P.E. Hamlington “*Parameter Estimation for a Turbulent Buoyant Jet Using Approximate Bayesian Computation*” 55th AIAA Aerospace Sciences Meeting, 2017.

**TEACHING EXPERIENCE**

- Numerical Analysis 1, APPM/MATH 5600, Fall 2017 & 2018
- Data assimilation for high-dimensional dynamical systems, APPM 4/5720, Fall 2016
- Matrix Methods and Applications, APPM 3310, Spring 2016–2018 & Fall 2018
- Honors Calculus 2 for Engineers, APPM 1360, Fall 2015
- Calculus 2 for Engineers, APPM 1360, Summer 2007

**AWARDS AND HONORS**

- **Turcotte Award** “to recognize an outstanding dissertation by a recent graduate that contributes directly to nonlinear geophysics.” Nonlinear Geophysics section of the American Geophysical Union, 2011
- **William and Mary Prize in Mathematics**, 2005

**PROFESSIONAL MEMBERSHIPS** I am a lifetime member of:

- The Society for Industrial and Applied Mathematics (SIAM)
- The American Geophysical Union (AGU)