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CURRENT POSITION Assistant Professor
Department of Applied Mathematics
University of Colorado, Boulder

PREPARATION

- **New York University**
Postdoc at the Courant Institute of Mathematical Sciences, June 2011–May 2015
- **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

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

PUBLICATIONS **Refereed Journal Articles**

- [37] W. Barham and **I. Grooms**, “*On energy exchanges between eddies and the mean flow in quasigeostrophic turbulence*” *J. Fluid Mech.* **885** 2020.
- [36] M. Watwood, **I. Grooms**, K. Julien, and K. S. Smith, “*Energy-conserving Galerkin approximations for quasigeostrophic dynamics*” *J. Comp. Phys.* **388** 2019.
- [35] W. Barham and **I. Grooms**, “*Exact instantaneous optimals in the non-geostrophic Eady problem and the detrimental effects of discretization*” *Theoretical and Computational Fluid Dynamics* **33** 2019.
- [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*” *Geophysical & Astrophysical Fluid Dynamics* **113** 2019.
- [27] **I. Grooms** “*Simulations of eddy kinetic energy transport in barotropic turbulence*” *Phys. Rev. Fluids* **2** 2017.

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- [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.
- [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,” *SIAM 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.

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- [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.
- [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] O. Doronina, C. Towery, J. Christopher, I. Grooms, P. Hamlington, “*Turbulence Model Development Using Markov Chain Monte Carlo Approximate Bayesian Computation*” AIAA Scitech Forum, 2019.
- [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.

Submitted Manuscripts

- [3] B. Pachev, J. P. Whitehead, G. Fantuzzi, I. Grooms, “*Rigorous bounds on the heat transport of rotating convection with Ekman pumping*”
- [2] J. Small, A. DuVivier, D. Whitt, M. Long, **I. Grooms**, W. Large, “*On the control of subantarctic stratification by the ocean circulation*” Climate Dynamics, in revision.
- [1] G. Robinson, I. Grooms, “*A tunable multiresolution smoother for scattered data with application to particle filtering*”

Software

- Computational fluid dynamics software used in my research on my github account: <https://github.com/iangrooms> Contributions to other projects may also be viewed through github.

TEACHING

- Linear Algebra with Statistical Applications, APPM 5720, Fall 2019
- Numerical Linear Algebra, APPM 5620, Spring 2018 & 2020
- Numerical Analysis 1, APPM/MATH 5600, Fall 2017 & 2018
- Data assimilation for high-dimensional dynamical systems, APPM 4/5510, Fall 2016 & 2019
- Matrix Methods and Applications, APPM 3310, Spring 2016–2018 & Fall 2018
- Calculus 2 for Engineers, APPM 1360, Summer 2007, Fall 2015, Spring 2019

**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 I am a lifetime member of:

MEMBERSHIPS

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