

Di Qi

Department of Mathematics & Center for Atmosphere and Ocean Science
Courant Institute of Mathematical Sciences
New York University
251 Mercer Street, N.Y. 10012 U.S.A.
Phone: 347-735-0576
email: qidi@cims.nyu.edu
URL: <http://cims.nyu.edu/qidi/>

Academic Position

Postdoctoral Research Fellow
COURANT INSTITUTE OF MATHEMATICAL SCIENCES, NEW YORK UNIVERSITY
Mentor: Andrew J. Majda

Research Interests

- Uncertainty quantification and model reduction strategies
- Statistical control methods for complex turbulent systems
- Theoretical and numerical statistical analysis for turbulent flows
- Turbulent diffusion of passive tracers in geophysical flows
- Filtering, multiscale data analysis, and information theory

Education

- 2017 Ph.D. in Mathematics/Atmosphere and Ocean Science (with distinction)
COURANT INSTITUTE OF MATHEMATICAL SCIENCES, NEW YORK UNIVERSITY, NY, USA
Advisor: Andrew J. Majda
- 2012 B.S. in Mathematics (major) and Physics (minor)
SHANGHAI JIAO TONG UNIVERSITY, SHANGHAI, CHINA
Advisor: Shi Jin

Research Publications & Submissions

JOURNAL ARTICLES (* INDICATES THE CORRESPONDING AUTHOR)

submitted:

Qi, D.*, and Majda, A.J. (2019). Zonal jet creation from secondary instability of drift waves for plasma edge turbulence. Submitted to *Chinese Annals of Mathematics*. *arXiv preprint arXiv:1901.08590*.

Majda, A.J., Moore, M.N.J., and Qi, D.* (2019). A statistical dynamical model to predict extreme events and anomalous features in shallow water waves with abrupt depth change. *Proceedings of the National Academy of Sciences*.

Qi, D., Majda, A.J., and Cerfon, A.J. (2018). A flux-balanced model for collisional plasma edge turbulence: numerical simulations with different aspect ratios. Submitted to *Physics of Plasmas*. *arXiv preprint arXiv:1812.00131*.

Qi, D.*, and Majda, A.J. (2018). Transient metastability and selective decay for the coherent zonal structures in plasma edge turbulence. Submitted to *Journal of Nonlinear Science*.

published:

Majda, A.J., Qi, D., and Cerfon, A.J. (2018). A flux-balanced fluid model for collisional plasma edge turbulence: model derivation and basic physical features. *Physics of Plasmas*, 25(10), p.102307.

Qi, D.*, and Majda, A.J. (2018). Rigorous statistical bounds in uncertainty quantification for one-layer turbulent geophysical flows. *Journal of Nonlinear Science*, 28(5), pp. 1709–1761.

Majda, A.J., and Qi, D.* (2018). Using statistical functionals for effective control of inhomogeneous complex turbulent dynamical systems. *Physica D: Nonlinear Phenomena*.

Qi, D.*, and Majda, A.J. (2018). Predicting extreme events for passive scalar turbulence in two-layer baroclinic flows through reduced-order stochastic models. *Communications in Mathematical Sciences*, 16(1), pp.17–51.

Majda, A.J., and Qi, D.* (2018). Strategies for reduced-order models for predicting the statistical responses and uncertainty quantification in complex turbulent dynamical systems. *SIAM Review*, 60(3), 491–549.

Majda, A.J., and Qi, D.* (2017). Effective control of complex turbulent dynamical systems through statistical functionals. *Proceedings of the National Academy of Sciences*, 114(22), pp. 5571–5576.

Qi, D.*, and Majda, A.J. (2017). Low-dimensional reduced-order models for statistical response and uncertainty quantification: barotropic turbulence with topography. *Physica D: Nonlinear Phenomena*, 343, pp. 7–27.

Lee, Y., Majda, A.J., and Qi, D. (2017). Preventing catastrophic filter divergence using adaptive additive inflation for baroclinic turbulence. *Monthly Weather Review*, 145(2), pp. 669–682.

Qi, D.*, and Majda, A.J. (2016). Low-dimensional reduced-order models for statistical response and uncertainty quantification: two-layer baroclinic turbulence. *Journal of the Atmospheric Sciences*,

73(12), pp. 4609–4639.

Lee, Y., Majda, A.J., and Qi, D. (2016). Stochastic superparameterization and multiscale filtering of turbulent tracers. *Multiscale Modeling & Simulation*, 15(1), pp. 215–234.

Majda, A.J., and Qi, D.* (2016). Improving prediction skill of imperfect turbulent models through statistical response and information theory. *Journal of Nonlinear Science*, 26(1), pp. 233–285.

Qi, D.*, and Majda, A.J. (2015). Predicting fat-tailed intermittent probability distributions in passive scalar turbulence with imperfect models through empirical information theory. *Communications in Mathematical Sciences*, 14(6), pp. 1687–1722.

Qi, D.*, and Majda, A.J. (2015). Blended particle methods with adaptive subspaces for filtering turbulent dynamical systems. *Physica D: Nonlinear Phenomena*, 298, pp. 21–41.

Majda, A.J., Qi, D., and Sapsis, T.P. (2014) Blended particle filters for large-dimensional chaotic dynamical systems. *Proceedings of the National Academy of Sciences*, 111(21), pp. 7511–7516.

Conferences & Workshops

- 12/2018 *Statistical bounds for turbulent geophysical flows in uncertainty quantification*, Nonlinear PDEs from Oceanic and Atmospheric Dynamics and Related Topics, Guangzhou, China, December 2018.
- 12/2018 *Rigorous statistical bounds in uncertainty quantification for turbulent geophysical flows*, Applied Mathematics and Statistics Youth Forum, Peking University, Beijing, China, December 2018.
- 7/2018 *Statistical Response in Uncertainty Quantification through Reduced-order Models*, SIAM Annual Meeting, Portland, OR, July 2018.
- 4/2018 *Predicting Statistical Responses and Extreme Events in Turbulent Systems through Low-Dimensional Reduced-Order Models*, SIAM Conference on Uncertainty Quantification, Garden Grove, CA, April 2018.
- 12/2017 *Low-Dimensional Reduced-Order Models for Statistical Response and Uncertainty Quantification in Turbulent Systems*, AGU Fall Meeting, New Orleans, LA, December 2017.
- 5/2017 *Predicting Extreme Events for Passive Scalar Turbulence through Reduced-Order Models*, SIAM Conference on Applications of Dynamical Systems (DS17), Snowbird, Utah, May 2017.
- 12/2016 *Statistical Response in Two-layer Baroclinic Turbulence for Uncertainty Quantification* (Poster), AGU Fall Meeting, San Francisco, CA, December 2016.
- 10/2016 *Low-Dimensional Reduced-Order Models for Statistical Response and Uncertainty Quantification*, MURI 2016 workshop, New York University, October 2016.
- 5/2016 *Preventing Catastrophic Filter Divergence Using Adaptive Additive Inflation for Baroclinic Turbulence* (Poster), The seventh EnKF Data Assimilation Workshop, State College, PA, May 2016.
- 4/2016

Improving Prediction Skill of Imperfect Turbulent Models through Empirical Information Theory, SIAM Conference on Uncertainty Quantification, EPFL, Lausanne, Switzerland, April 2016.

- 8/2015 *Blended Particle Filters for Large Dimensional Chaotic Dynamical Systems*, Mathematics of Geophysical Flows and Turbulence, Fudan University, Shanghai, August 2015.
- 8/2015 *Improving prediction skill of imperfect turbulent models through statistical response and information theory*, Mathematics of Geophysical Flows and Turbulence, Fudan University, Shanghai, August 2015.
- 8/2015 *Developing Imperfect Turbulent Models through Statistical Response and Information Theory*, The eighth International Congress on Industrial and Applied Mathematics, Beijing, China, August 2015.
- 6/2014 *Filtering Turbulent Signals in Fourier Space: Fourier Domain Kalman Filter*, Short Course in High Dimensional Filtering, University of Warwick, UK, June 2014.
- 3/2014 *Blended Particle Filters for Large Dimensional Chaotic Dynamical Systems*, SIAM Conference on Uncertainty Quantification, Savannah, Georgia, March 2014.
- 1/2014 *Blended Particle Filters for Large Dimensional Chaotic Dynamical Systems*, MURI 2014 workshop, New York University, NY, January 2014.

Seminar Talks

- 10/2018 *Rigorous statistical bounds in uncertainty quantification for turbulent geophysical flows*, Graduate Student / Postdoc Seminar, Courant Institute.
- 5/2017 *Predicting Extreme Events for Passive Scalar Turbulence through Reduced-Order Models*, CAOS Student Seminar, Courant Institute
- 2/2016 *Low-Dimensional Reduced-Order Models for Statistical Response and UQ*, CAOS Student Seminar, Courant Institute.
- 2/2015 *Improving Prediction Skill of Imperfect Turbulent Models through Statistical Response and Information Theory*, CAOS Student Seminar, Courant Institute.
- 2/2014 *Blended Particle Filter for Large Dimensional Chaotic Dynamical Systems*, CAOS Student Seminar, Courant Institute.
- 10/2013 *Statistical Dynamics For Uncertainty Quantification Of Quadratic System*, CAOS Monday Lunch Seminar.
years8/2013 *Filtering Linear Systems and Observability*, Summer Discussion Group, Courant Institute.
- 4/2013 *Blended reduced subspace algorithms for uncertainty quantification*, CAOS Student Seminar, Courant Institute.

Thesis

D. Qi, *Strategies for Reduced-Order Models in Uncertainty Quantification of Complex Turbulent Dynamical Systems*. PhD Dissertation, New York University. May 2017.

Academic Services

JOURNAL REFEREE:

SIAM Journal on Scientific Computing • Nonlinear Dynamics • Entropy • Journal of the Atmospheric Sciences • IEEE Access • Water • Mathematics • Stats • International Journal of Financial Studies • Applied Sciences

REVIEWER FOR MATHEMATICAL REVIEWS (AMS)

Teaching Experiences

- Fall 2018 *Co-Instructor*
Advanced Topics in Applied Math: Filtering Turbulent Signals in Complex Systems
Courant Institute, New York University
- Fall 2016 *Co-Instructor*
Advanced Topics in Applied Math: Turbulent Dynamical Systems
Courant Institute, New York University
- Fall 2015 *Co-Instructor*
Advanced Topics in Applied Math: Quantifying Uncertainty in Complex Turbulent Systems
Courant Institute, New York University
- Fall 2014 *Co-Instructor*
Advanced Topics in Applied Math: Filtering Turbulent Signals in Complex Systems
Courant Institute, New York University

Press Release

- 11/2018 Strategies for Predicting Statistical Responses in Complex Turbulent Systems
CAOS News & Research
<https://caos.cims.nyu.edu/dynamic/news/10/>

Honors & Awards

- 2017 Kurt O. Friedrichs prize for an outstanding dissertation in mathematics, New York University
- 2012–2017 New York University MacCracken Graduate Scholarship, New York University
- 2011 China Undergraduate Mathematical Contest in Modeling (first Class Prize)
- 2010 Mathematical Contest in Modeling (Meritorious Winner)
- 2008–2010 Academic Excellence Scholarship (A class), Shanghai Jiao Tong University
- 2008 Samsung scholarship (1st Class), Shanghai Jiao Tong University