Nan Chen

✉ chennan@math.wisc.edu • www.math.wisc.edu/~nchen29

(Last updated on 2024/12/17)

Current Position

Associate Professor **2024/08–**
Department of Mathematics, University of Wisconsin-Madison,

Faculty Affiliate **2020/08–**
Institute for Foundations of Data Science, University of Wisconsin-Madison,

Previous Appointments

Assistant Professor **2018/08–2024/07**
Department of Mathematics, University of Wisconsin-Madison,

Postdoc Research Associate **2016/06–2018/05**
Courant Institute of Mathematical Sciences, New York University,
Mentor - Professor Andrew J. Majda

Graduate Research Assistant **2011/09–2016/05**
Courant Institute of Mathematical Sciences, New York University
Thesis Advisor - Professor Andrew J. Majda

Visiting Scholar **2008/09–2009/08**
Department of Scientific Computing, Florida State University
Host - Professor Max Gunzburger and Professor Xiaoming Wang

Education

Ph.D. in Mathematics/Atmosphere and Ocean Science **2011/09–2016/05**
Courant Institute of Mathematical Sciences, New York University,
Thesis Advisor - Professor Andrew. J. Majda

M.S. in Computational Mathematics **2007/09–2011/06**
The School of Mathematical Sciences, Fudan University,
Thesis Advisor - Professor Jin Cheng and Professor Xiaoming Wang

B.S. in Theoretical and Applied Mechanics **2004/09–2007/06**
Department of Mechanics and Engineering Science, Fudan University,

Research Interests

Modeling, Analyzing, and Predicting Complex Systems
Uncertainty Quantification and Prediction, Stochastic Dynamical and Statistical Models
Machine Learning, Information Theory, Data Assimilation, Lagrangian Tracers
Madden-Julian Oscillation, Monsoon, El Niño Southern Oscillation, Sea Ice

Data-Driven Methods, High Dimensional Statistical and Data Analysis
Multiscale Analysis, Fluids and Geophysical Flows, Inverse Problems

Academic Services

1. Conference and Workshop Organizers:

19. **Special session co-organizer at AIMS 2024** **2024/12**
Recent Advances in Data Assimilation with Machine Learning
Co-organizer: Jinlong Wu (UW-Madison), and Yeyu Zhang (SUFE). December 16–20, 2024, Abu Dhabi, UAE

18. **Special session co-organizer at AGU 2024** **2024/12**
Applied Math Perspectives on Complex Nonlinear Geophysical Systems
Co-organizer: Reza Malek-Madani (USNA), and Di Qi (Purdue University). December 9–13, 2024, Washington D.C.

17. **Workshop** **2024/08**
Data-Driven Causal Inference: Information Theory Meets Dynamical Systems
Co-organizer: Justin Koo (AFOSR), and Robert Martin (ARO). August 22–23, 2024, Washington D.C.

16. **Minisymposium co-organizer at 16th WCCM** **2024/07**
Hybrid techniques in data-driven modeling, forecasting, and UQ
Co-organizer: Di Qi (Purdue University) Mustafa Mohamad (U. Calgary). July 21–26, 2024, Vancouver, Canada

15. **Minisymposium co-organizer at SIAM UQ** **2024/02**
Statistical and Data-Assisted Modeling Approaches for Forecasting and UQ
Co-organizer: Di Qi (Purdue University) Mustafa Mohamad (U. Calgary). February 27–March 1, 2024, Trieste, Italy

14. **Special session co-organizer at AGU 2023** **2023/12**
Advances in Computational Analysis in Geophysical Processes
Co-organizer: Reza Malek-Madani (USNA), and Di Qi (Purdue University). December 11–15, 2023, San Francisco, CA

13. **Minisymposium co-organizer at ICIAM 2023** **2023/08**
Combining ML and Stochastic Methods for Modeling and Forecasting Complex Systems
Co-organizer: Di Qi (Purdue University). August 20–25, 2023, Tokyo, Japan

12. **Minisymposium co-organizer at SIAM MPE** **2022/07**
New advances in developing subgrid-scale closures and reducing model errors
Co-organizer: Pedram Hassanzadeh (Rice U) and Reza Malek-Madani (USNA). July 13–15, 2022, Pittsburgh, PA

11. **Minisymposium co-organizer at SIAM UQ** **2022/04**
Information Theory, Data Assimilation and Stochastic Models for Multiscale Nonlinear Systems
Co-organizer: Honghu Liu (Virgnia Tech). April 12–15, 2022, Atlanta, GA

10. **Special Session co-organizer at AMS Spring Central Sectional Meeting** **2022/03**
Modeling and Forecasting Complex Turbulent Systems
Co-organizer: Di Qi (Purdue University). March 26–27, 2022, West Lafayette, IN

9. **Special session co-organizer at AGU 2021** **2021/12**
Advances in Computational Analysis in Geophysical Processes
Co-organizer: Reza Malek-Madani (USNA), Boualem Khouider (U. Victoria), and Samuel Stechmann (UW-Madison). December 13–17, 2021, New Orleans, LA

8. **Minisymposium co-organizer at SIAM UQ** **2020/03**
Optimal Control Methods for Nonlinear Filtering and Data Assimilation
Co-organizer: Prashant Mehta (UIUC). March 24–27, 2020, Garching, Germany

7. **Special Session co-organizer at AMS Fall Central Sectional Meeting** **2019/09**
Classical and Geophysical Fluid Dynamics: Modeling, Reduction and Simulation
Co-organizer: Honghu Liu (Virginia Tech). September 14–15, 2019, Madison, WI

6. **Minisymposium co-organizer at Applied Inverse Problems** **2019/09**
Data Assimilation and Prediction in Complex Dynamical System
Co-organizer: Xin Tong (NUS). July 08–12, 2019, Saint-Martin-dHeres, France

5. **Minisymposium co-organizer at ICIAM 2019** **2019/07**
Data Assimilation, Prediction, and Uncertainty Quantification for Complex Systems
Co-organizer: Samual Stechmann (UW-Madison). July 15–19, 2019, Valencia, Spain

4. **Conference co-organizer at Celebrate the 70th Birthday of A. J. Majda** **2019/03**
Prediction, State Estimation, and Uncertainty Quantification in Complex Systems
Co-organizers: Samual Stechmann (UW-Madison), Esteban Tabak (Courant), Shafer Smith (Courant), John Harlim (Penn State U), March 15–17, 2019, New York, NY

3. **Minisymposium co-organizer at SIAM UQ** **2018/04**
Nonlinear Filtering and Data Assimilation in Complex Dynamical Systems
Co-organizer: Xin Tong (NUS). April 16–19, 2018, Garden Grove, California

2. **Workshop co-organizer** **2017/06**
Workshop on Data Assimilation and Information Theory
Co-organizer: Jin Cheng and Shuai Lu (Fudan Univ). June 07, 2017, Shanghai, China

1. **Minisymposium co-organizer at Applied Inverse Problems** **2017/05**
Parameter identification of statistical inverse problems and dynamic systems
Co-organizer: Shuai Lu (Fudan Univ). May 29–June 02, 2017, Hangzhou, China

2. Editorial Work:

Guest Editor: Entropy **2021-2022**
Special Issue: Info Theory, DA and Stochastics for Multiscale Nonlinear Systems
Co-Editors: Honghu Liu (VTech) and Evelyn Lunasin (USNA)

Co-Guest Editor: Research in the Mathematical Sciences **2019-2020**
Special Issue: Modern Applied Mathematics and Scientific Grand Challenges
Co-Editors: Samuel Stechmann (UW-Madison) and John Harlim(PSU)

Co-Guest Editor: Entropy **2018-2019**
Special Issue: Information Theory and Stochastics for Multiscale Nonlinear Systems
Co-Editors: Andrew J Majda (NYU) and Markos Katsoulakis (UMass)

3. Journal Referee: • Advances in Atmospheric Sciences, • Applied Mathematics and Computation, • Advances in Nonlinear Sciences, • Advances in Oceanography and Limnology,

• Atmosphere, • Atmosphere Science Letters, • Applied Geography, • Applied Sciences, • Axioms, • Chaos: An Interdisciplinary Journal of Nonlinear Science, • Chinese Annals of Mathematics, Series B, • Communications in Mathematical Sciences, • Communications in Nonlinear Science and Numerical Simulation, • Computational and Applied Mathematics, • Computational Geosciences, • Computer Physics Communications, • Energies, • Entropy, • ESAIM: Mathematical Modelling and Numerical Analysis, • Foundations of Data Science, • Frontiers of Information Technology & Electronic Engineering, • Frontiers in Marine Science, • Geophysical Research Letters, • IEEE Access, • IEEE Transactions on Neural Networks and Learning Systems, • International Journal of Plasticity, • Journal of Applied Meteorology and Climatology, • Journal of Atmospheric and Oceanic Technology, • Journal of the Atmospheric Sciences, • Journal of Climate, • Journal of Computational and Nonlinear Dynamics, • Journal of Computational Physics, • Journal of Geophysical Research – Atmospheres, • Journal of Mathematical Analysis and Applications, • Journal of Nonlinear Science, • Journal of Statistical Theory and Applications, • Journal of The Franklin Institute, • Mathematical Biosciences and Engineering, • Mathematical Methods in the Applied Sciences, • Mathematical Modelling and Numerical Analysis, • Mathematical Problems in Engineering, • Mathematics, • Mathematics of Climate and Weather Forecasting, • Monthly Weather Review, • Nature Communications, • npj Climate and Atmospheric Science, • Nonlinear Dynamics, • Nonlinearity, • Numerical Methods for Partial Differential Equations, • Ocean Modeling, • Philosophical Transactions A, • Physica D: Nonlinear Phenomena, • Physics Letters A, • Physics of Fluids, • PLOS ONE, • Remote Sensing, • Research in Mathematical Sciences, • Sensors, • SIAM Journal on Applied Mathematics, • SIAM Journal on Applied Dynamical Systems, • SIAM Journal on Scientific Computing, • SIAM/ASA Journal on Uncertainty Quantification, • SIAM Undergraduate Research Online, • Scientific Reports, • Symmetry, • Tellus A: Dynamic Meteorology & Oceanography, • Water Resources Research.

4. Reviewer/Panelist for Funding Agencies: National Science Foundation (NSF), Department of Defense (DOD), American Chemical Society Petroleum Research Fund (ACS PRF), Natural Sciences and Engineering Research Council of Canada (NSERC), Ralph E Powe Junior Faculty Award Application Review at Oak Ridge Associated Universities (ORAU), MIT Sea Grant.

5. Reviewer for Mathematical Reviews (AMS)

6. Other Conference Services:
    1. **American Geophysical Union 2022 fall meeting**
        (a). Judge for the Outstanding Student Paper Award (OSPA) program
    2. **American Geophysical Union 2019 fall meeting**
        (a). Judge for the Outstanding Student Paper Award (OSPA) program
    3. **American Geophysical Union 2017 fall meeting**
        (a). Judge for the Outstanding Student Paper Award (OSPA) program

4. **American Geophysical Union 2016 fall meeting**
   (a). Judge for the Outstanding Student Paper Award (OSPA) program
   (b). Mentor of Career and Research Advice Mentorship (CRAM) program

7. PhD thesis committee for: Jason Torchinsky (UW-Madison, 2023), Yeyu Zhang (UW-Madison, 2020), Ying Li (UW-Madison, 2020), David Marsico (UW-Madison, 2020), Thomas K Edwards (UW-Madison, 2019), Yuhua Zhu (UW-Madison, 2019), Di Fang (UW-Madison, 2019), Ke Chen (UW-Madison, 2019)

Society Service

- Member, US CLIVAR Working Group on ENSO Conceptual Models

Students and Postdocs

Current students and postdocs:
Postdocs (1):

- Pouria Behnoudfar (2024 – current)

PhD students (4):

- Charlotte Moser (2024 – Current)
- Zhongrui Wang (2023 – current)
- Marios Andreou (2022 – current)
- Yinling Zhang (2021 – current)

Undergraduate students (1):

- Ruiqi Li (2024-now; she's currently working with me on a project related to reinforcement learning; from WISCERS)

Past students and postdocs:
Postdocs (5):

- Jeffrey Covington (Jeff was my PhD student. He stayed, after graduation, for one semester (2024 Spring) as a temporal postdoc, Now he is a senior research scientist at Northern Arizona University)
- Changhong Mou (2021 – 2024, Now he is a postdoc at Purdue University, Co-mentoring with Sam Stechmann)
- Jiuhua Hu (2021 – 2024, Now he is a postdoc at Virginia Tech, Co-mentoring with Sam Stechmann)

- Shubin Fu (2020 – 2022; Now he is an Assistant Professor at Eastern Institute for Advanced Study)
- Quanling Deng (2020 – 2021, Now he is a Lecturer at Australian National University, Co-mentored with Sam Stechmann)

PhD students (3):

- Jeffrey Covington (2019 – 2023, Now he is a senior research scientist at Northern Arizona University)
- Yingda Li (2018 – 2021, Now she is in Meta/Facebook)
- Xiao Hou (2018 – 2021, Now she is in industry)

Undergraduate students (12):

- Evelyn Tollar (2023-2024; now she is in industy; from WISCERS; co-mentor with Sam Stechmann)
- Marrisa Zhang (2023-2024; she graduated; from WISCERS; co-mentor with Sam Stechmann)
- Melisa Erman (2023-2024; she graduated; from WISCERS; co-mentor with Sam Stechmann)
- Yuhan Shi (2022-2023; now she is a PhD student at Harvard Univesrity)
- Noah Blum (2022-2023; now he is an actuarial analyst at ascensus)
- Jack Maloney (2022-2023; now he is a software engineer at Epic)
- Hanzhang Mao (2022-2023; now he is a PhD student at UW-Madison)
- Zihong Xu (2022-2023; now he is a PhD student at UW-Madison)
- Ziheng Zhang (2020-2021; now he is a PhD student at UT Austin)
- Diya Yang (2020; now she is a PhD student at U. Michigan)
- Sitao Zhang (2018-2019; now he is a PhD student at PSU)
- Yuchen Li (2018-2019; now he is a PhD student at UW-Madison)

Grants

- (Current) Senior Personnel, NSF TRIPODS: Institute for Foundations of Data Science, ($50,000), 2024/09-2025/08
  Supplement grant with collaboration of the XTRIPODS at BYU

- (Current) PI, ONR, ($742,962), 2024/03-2027/02
  Multi-Model Data Assimilation and Uncertainty Quantification
- (Current) PI, ARO, ($387,768), 2023/07-2027/06
  Stochastic Modeling and Data Assimilation of Complex Systems
- (Current) Collaborator, ARL, 2023/07-2026/06
  Center for Extreme Events in Structurally Evolving Materials (CEESEM)
- (Current) Co-PI, NSF DMREF Collaborative Research, (total amount of subaward $382,833), 2022/01-2025/12
  Grain Interface Functional Design to Create Damage Resistance in Polycrystalline Metallic Materials
- (Current; extended) Co-PI, ONR MURI, (total amount of subaward $1,760,627 shared with Samuel Stechmann at UW-Madison), 2019/06-2024/09
  Mathematics and Data Science for Improved Physical Modeling and Prediction of Arctic Sea Ice
- (Past) PI, US Army, ($16,947), 2024/08, Conference grant
  Data-Driven Causal Inference: Information Theory Meets Dynamical Systems
- (Past) PI, ONR, ($246,554), 2021/09-2023/09
  Predicting Complex Nonlinear Turbulent Systems with Uncertainty Quantification
- (Past) PI, Fall Research Competition, UW-Madison, (total amount $22,065), 2019/07-2020/06
  A Conditional Gaussian Framework for High-Dimensional Complex Multiscale Nonlinear Turbulent Dynamical Systems: Uncertainty Quantification, Data Assimilation, Data-Driven Model Reduction and Prediction

Awards and Fellowships

2024 Office of Naval Research Young Investigators Award **2023**
Office of Naval Research, 2023

Sophomore Research Fellowships (supporting undergraduate research) **2020**
University of Wisconsin-Madison, 2020 Summer

Honored Instructor Award **2019**
University of Wisconsin-Madison, 2019 Spring

Honored Instructor Award **2018**
University of Wisconsin-Madison, 2018 Fall

2017 Editors' Citations for Excellence in Refereeing **2018**
American Geophysical Union (AGU) journals

Silver Medal of Doctor Thesis for New World Mathematics Awards 2017 **2018**
Awards for worldwide Chinese and Chinese descendants

SIAM early career travel funding **2016**

Kurt O. Friedrichs prize for an outstanding dissertation in mathematics **2016**
Courant Institute of Mathematical Sciences, New York University

McCracken scholarship **2011-2016**
New York University

The excellent master dissertation of Shanghai municipality **2011**
Fudan University

Towers Perrin Fellowship **2009-2010**

3rd/1st/2nd Prize **2005-2007**
7th/8th/9th East China Mathematical Invitation Contest in Modeling

1st Prize in Shanghai and National 2nd Prize **2006**
China Undergraduate Mathematical Contest in Modeling (*CUMCM*)

Teaching Experience

Instructor **Spring 2024**
Data-Driven Dynamical Systems, Stochastic Modeling and Prediction (*Math 491*)
Department of Mathematics, University of Wisconsin-Madison

Instructor **Spring 2024**
Stochastic Computational Method (*Math 717*)
Department of Mathematics, University of Wisconsin-Madison

Instructor **Fall 2022**
Stochastic Computational Method (*Math 717*)
Department of Mathematics, University of Wisconsin-Madison

Instructor **Fall 2021**
Stochastic Computational Method (*Math 833*)
Department of Mathematics, University of Wisconsin-Madison

Instructor **Fall 2021**
Mathematical Methods in Data Science (*MATH 535*)
Department of Mathematics, University of Wisconsin-Madison

Instructor **Spring 2021**
Calculus and Analytic Geometry II (*MATH 222*)
Department of Mathematics, University of Wisconsin-Madison

Instructor **Fall 2020**
Topics in Applied Mathematics (*MATH 801*)
Department of Mathematics, University of Wisconsin-Madison

Instructor **Spring 2020**
Topics in Applied Mathematics (*MATH 801*)
Department of Mathematics, University of Wisconsin-Madison

Instructor **Spring 2019**
Topics in Applied Mathematics (*MATH 801*)
Department of Mathematics, University of Wisconsin-Madison

Instructor **Fall 2018**
Calculus - Functions of Several Variables (*MATH 234*)

Department of Mathematics, University of Wisconsin-Madison

Instructor **Fall 2018**
Methods of Computational Mathematics I (MATH 714)
Department of Mathematics, University of Wisconsin-Madison

Co-Instructor **Fall 2017**
Simple Dynamical Stochastic Models Capturing the Observed Diversity of the El Niño
Courant Institute, New York University

Co-Instructor **Fall 2015**
Quantifying Uncertainty in Complex Turbulent Systems
Courant Institute, New York University

Co-Instructor **Fall 2014**
Filtering Turbulent Signals in Complex Systems
Courant Institute, New York University

Instructor **Winter 2013**
Introduction to Uncertainty Quantification for Complex Nonlinear Systems
Mini course series at Fudan University

Co-Instructor **Fall 2013**
Quantifying Uncertainty in Complex Turbulent Systems
Courant Institute, New York University

Outreach

1. I am involved in Madison Experimental Mathematics Lab (MXM Lab) to enhance and support undergraduate research within the Department of Mathematics and the University of Wisconsin, and in line with the Wisconsin Idea, to support departmental efforts to engage local, state and national communities through outreach.

2. I participate in the Wisconsin Science and Computing Emerging Research Stars (WISCERS) program, which is an undergraduate mentorship program that specifically helps support students from historically underrepresented groups in computing.

3. I was the lead instructor in the "UW Advance Data Analytics and Informatics" program, which was a three-week opportunity for undergraduate students to get a glimpse into the academic programs at UW-Madison from January 11 to February 5, 2021, and from July 12 to July 30, 2021. I gave several one-hour talks and interacted with students.

4. I am the leading author of two articles in Elsevier's Reference Module in Earth Systems and Environmental Sciences. These articles aim at explaining scientific concepts to the public and general audience using plain language. The contents belong to my research — the interdisciplinary area between applied mathematics and atmosphere and ocean science.

    - El Niño and the Southern Oscillation: Theory, with Sulian Thual and Malte F Stuecker.
    - El Niño and the Southern Oscillation: Observation, with Sulian Thual and Shineng Hu.

5. I mentor undergrad students for research during the semesters and in summer time every year. I also support undergrad student to present the research work with me at UW-Madison undergrad symposium (and other related conferences).

University- and Department-Level Services

- 2024-2025: (Sabbatical).
- 2023-2024: Graduate Advising; Alternate Senator; Graduate Admissions; VISP/MA Program; Data Science Program Committee (University-level).
- 2022-2023: Graduate Advising; Alternate Senator; Applied Math Masters; VISP/MA Program.
- 2021-2022: Graduate Advising; Alternate Senator; Graduate Program; VISP/MA Program; UW Advance Data Analytics and Informatics (University-level).
- 2020-2021: Graduate Advising; Continuing MA Advisors; VISP/MA Program Committee; Doctoral Exams-Computational Math; UW Advance Data Analytics and Informatics (University-level).
- 2019-2020: Doctoral Exams-Computational Math, Graduate Admissions; VISP/MA Program.
- 2018-2019: New Institute; Expansion; Graduate Admissions; VISP/MA Program.

Publications

Books

1. **Nan Chen***, Stochastic Methods for Modeling and Predicting Complex Dynamical Systems — Uncertainty Quantification, State Estimation and Reduced-Order Models, *Synthesis Lectures on Mathematics & Statistics*, Springer, 2023.

Journal Articles (* indicates the corresponding author; underline indicates the students and postdocs I supervised. Usually a student/postdoc of mine will be given the first or corresponding author. The first author and the corresponding author are usually the main contributors.)

2024 (including under revision)

2. Noah J. Schmelzer, Evan J. Lieberman, **Nan Chen**, Curt A. Bronkhorst*, Quantifying power partitioning during void growth for dynamic mechanical loading in reduced form, Submitted, 2024.
3. Zhongrui Wang, **Nan Chen***, Di Qi, A Closed-Form Nonlinear Data Assimilation Algorithm for Multi-Layer Flow Fields, Submitted, 2024.

4. Yinling Zhang, Samuel D. Dunham, Curt A. Bronkhorst, **Nan Chen***, Physics-Assisted Data-Driven Statistical Reduced-Order Models for Attribution of Heterogeneous Stress Distributions in Low-Grain Polycrystals, Submitted, 2024.

5. Samuel D. Dunham, Yinling Zhang, **Nan Chen**, Coleman Alleman, Curt A. Bronkhorst*, Attribution of heterogeneous stress distributions in low-grain polycrystals under conditions leading to damage, Under Revision, 2024.

6. Noah J. Schmelzer, Evan J. Lieberman, **Nan Chen**, Samuel D. Dunham, Veronica Anghel, George T. Gray III, Curt A. Bronkhorst*, Statistical evaluation of microscale stress conditions leading to void nucleation in the weak shock regime, Submitted, 2024.

7. Charlotte Moser, **Nan Chen***, Yinling Zhang, A Stochastic Conceptual Model for the Coupled ENSO and MJO, Submitted, 2024.

8. Changhong Mou, Samuel Stechmann, **Nan Chen***, Simulation and Data Assimilation in an Idealized Coupled Atmosphere-Ocean-Sea Ice Floe Model with Cloud Effects, Submitted, 2024.

9. Marios Andreou*, **Nan Chen**, and Yingda Li, An Adaptive Online Smoother with Closed-Form Solutions and Information-Theoretic Lag Selection for Conditional Gaussian Nonlinear Systems, Submitted, 2024.

10. Marios Andreou*, **Nan Chen**, A Martingale-Free Introduction to Conditional Gaussian Nonlinear Systems, Submitted, 2024.

11. Chuanqi Chen, **Nan Chen**, Yinling Zhang, and Jin-Long Wu*, CGKN: A Deep Learning Framework for Modeling Complex Dynamical Systems and Efficient Data Assimilation, Submitted, 2024.

12. **Nan Chen** and Honghu Liu*. Minimum Reduced-Order Models via Causal Inference. Submitted, 2024.

13. Vialard J.*, F-F. Jin, M.J. McPhaden, A. Fedorov, W. Cai, S-I. An, D. Dommenget11 , X. Fang, M.F. Stuecker, C. Wang, A. Wittenberg, S. Zhao, F. Liu, S-K. Kim, Y. Planton, T. Geng, M. Lengaigne, A. Capotondi, **N. Chen**, L. Geng, S. Hu, T. Izumo, J-S. Kug, J-J. Luo, S. McGregor, B. Pagli , P. Priya , S. Stevenson , S. Thual, The El Niño Southern Oscillation (ENSO) Recharge Oscillator Conceptual Model : Achievements and Future Prospects, Under Revision, *Review of Geophysics*, 2024.

14. Jeffrey Covington, **Nan Chen***, Stephen Wiggins, and Evelyn Lunasin. Probabilistic Eddy Identification with Uncertainty Quantification. Under Revision, 2024.

15. Quanling Deng, **Nan Chen***, Samuel Stechmann, and Jiuhua Hu, LEMDA: A Lagrangian-Eulerian Multiscale Data Assimilation Framework, *Journal of Advances in Modeling Earth Systems*, Under revision, 2024.

16. **Nan Chen***, Stephen Wiggins, and Marios Andreou, Taming Uncertainty in a Complex World: The Rise of Uncertainty Quantification — A Tutorial for Beginners, *Notices Of The American Mathematical Society*, Accepted, 2024.

17. **Nan Chen**, Changhong Mou*, Leslie M. Smith and Yeyu Zhang, Stochastic Precipitating Quasi-Geostrophic Model, *Physics of Fluids* 36.11 (2024).

18. Jinyu Wang, Xianghui Fang*, **Nan Chen**, Mu Mu, Insights of Dynamic Forcing Effects of MJO on ENSO from a Shallow Water Model, *Journal of Climate*, 37.23 (2024): 6143-6166.

19. Yinling Zhang, **Nan Chen***, Jerome Vialard, and Xianghui Fang, A Physics-Informed Auto-Learning Framework for Developing Stochastic Conceptual Models for ENSO Diversity, *Journal of Climate*, 37.23 (2024): 6323–6347.

20. Marios Andreou* and **Nan Chen**. Statistical Response of ENSO Complexity to Initial Value and Model Parameter Perturbations, *Journal of Climate*, 37(21), 5629–5651, 2024.

21. Erik Bollt, **Nan Chen***, Stephen Wiggins, A Causation-Based Computationally Efficient Strategy for Deploying Lagrangian Drifters to Improve Real-Time State Estimation, *Physica D*, (2024): 134283.

22. Chuanqi Chen, **Nan Chen***, and Jin-Long Wu. CGNSDE: Conditional Gaussian Neural Stochastic Differential Equation for Modeling Complex Systems and Data Assimilation, *Computer Physics Communications* (2024): 109302.

23. **Nan Chen***, Evelyn Lunasin, and Stephen Wiggins. Lagrangian Descriptors with Uncertainty. *Physica D*, (2024): 134282.

24. **Nan Chen** and Di Qi*, A Physics-Informed Data-Driven Algorithm for Ensemble Forecast of Complex Turbulent Systems, *Applied Mathematics and Computation*, Applied Mathematics and Computation 466 (2024): 128480.

25. **Nan Chen***, Evelyn Lunasin, and Stephen Wiggins. Launching Drifter Observations in the Presence of Uncertainty, *Physica D*, (2024): 134086.

26. Quanling Deng*, Samuel N. Stechmann, and **Nan Chen**, Particle-Continuum Multiscale Modeling of Sea Ice Floes, *SIAM Multiscale Modeling & Simulation* 22.1 (2024): 230-255.

2023

27. Jeffrey Covington, Di Qi*, and **Nan Chen**. Effective Statistical Control Strategies for Complex Turbulent Dynamical Systems. *Proceedings of the Royal Society A*, 479 (2279), 2023.

28. Changhong Mou, **Nan Chen***, and Traian Iliescu, An Efficient Data-Driven Multiscale Stochastic Reduced Order Modeling Framework for Complex Turbulent Systems, *Journal of Computational Physics*, 493 (2023): 112450.

29. Changhong Mou, Leslie Smith, **Nan Chen***, Combining Stochastic Parameterized Reduced-Order Models with Machine Learning for Data Assimilation and Uncertainty Quantification with Partial Observations, *Journal of Advances in Modeling Earth Systems*, 15.10 (2023): e2022MS003597.

30. Xianghui Fang and **Nan Chen***, Quantifying the Predictability of ENSO Complexity Using a Statistically Accurate Multiscale Stochastic Model and Information Theory, *Journal of Climate*, (2023): 2681-2702.

31. **Nan Chen** and Yinling Zhang*, A Causality-Based Learning Approach for Discovering the Underlying Dynamics of Complex Systems from Partial Observations with Stochastic Parameterization, *Physica D: Nonlinear Phenomena*, 449 (2023): 133743.

32. **Nan Chen** and Xianghui Fang*, A Simple Multiscale Intermediate Coupled Stochastic Model for El Niño Diversity and Complexity, *Journal of Advances in Modeling Earth Systems*, 15.4 (2023): e2022MS003469.

33. **Nan Chen** and Shubin Fu*, Nonlinear Lagrangian Data Assimilation with Linear Stochastic Forecast Model,*Physica D: Nonlinear Phenomena* (*2023*) 133784.

34. **Nan Chen** and Yinling Zhang*, Rigorous Derivation of Stochastic Conceptual Models for the El Niño-Southern Oscillation from a Spatially-Extended Dynamical System, *Physica D: Nonlinear Phenomena*, (2023): 133842.

35. Yinling Zhang, **Nan Chen***, Curt A. Bronkhorst, Hansohl Cho, and Robert Argus, Data-Driven Statistical Reduced-Order Modeling and Quantification of Polycrystal Mechanics Leading to Porosity-Based Ductile Damage, *Journal of the Mechanics and Physics of Solids*, 179, 105386, 2023

36. Chuanqi Chen, **Nan Chen**, and Jinlong Wu*, CEBoosting: Online Sparse Identification of Dynamical Systems with Regime Switching by Causation Entropy Boosting, *Chaos* 33, 083114 (2023)

2022

37. **Nan Chen***, Xianghui Fang and Jin-Yi Yu, A Multiscale Model for El Niño Complexity, *Nature Partner Journals Climate and Atmospheric Science*, 5.1 (2022): 1-13.

38. Tabea Gleiter, Tijana Janjic* and **Nan Chen**, Ensemble Kalman Filter based Data Assimilation for Tropical Waves in the MJO Skeleton Model, *Quarterly Journal of the Royal Meteorological Society*, 148.743 (2022): 1035-1056.

39. **Nan Chen**, Shubin Fu* and Georgy Manucharyan, An efficient and statistically accurate Lagrangian data assimilation algorithm with applications to discrete element sea ice models, *Journal of Computational Physics*, 455 (2022): 111000.

40. **Nan Chen**, Honghu Liu, and Fei Lu*, Shock trace prediction by reduced models for a viscous stochastic Burgers equation, *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 32.4 (2022): 043109.

41. Ludovico T Giorgini, Woosok Moon, **Nan Chen**, John S Wettlaufer*, A Non-Gaussian Stochastic Model for the El Niño Southern Oscillation, *Physical Review Research*, 4, L022065, 2022.

42. **Nan Chen**, Yingda Li*, and Honghu Liu, Conditional Gaussian Nonlinear System: a Fast Preconditioner and a Cheap Surrogate Model For Complex Nonlinear Systems, *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 32.5 (2022): 053122. **[Editor's Pick]**

43. **Nan Chen**, Quanling Deng* and Samuel Stechmann, Lagrangian Data Assimilation and Uncertainty Quantification for Sea Ice Floes with Efficient Superfloe Parameterization, *SIAM/ASA Journal of Uncertainty Quantification*, Vol. 10, Iss. 4 (2022)10.1137/21M1428777.

44. Jeffrey Covington, **Nan Chen***, and Monica M. Wilhelmus, Bridging Gaps in the Climate Observation Network: A Physics-based Nonlinear Dynamical Interpolation of Lagrangian Ice Floe Measurements via Data-Driven Stochastic Models, *Journal of Advances in Modeling Earth Systems*, 14(9), 2022MS003218, 2022.

45. **Nan Chen** and Aseel Farhat* and Evelyn Lunasin, Data Assimilation With Model Error: Analytical and Computational Study for Sabra Shell Model, *Physica D: Nonlinear Phenomena*, (2022): 133552.

2021

46. Qiu Yang*, Andrew J Majda, and **Nan Chen**, ENSO Diversity in a Tropical Stochastic Skeleton Model for the MJO, El Niño, and Dynamic Walker Circulation, 1-56, *Journal of Climate*, 2021.

47. Xiao Hou, Song Gao*, Qin Li, Yuhao Kang, **Nan Chen**, Kaiping Chen, Jinmeng Rao, Jordan S. Ellenberg, and Jonathan A. Patz, Intra-county modeling of COVID-19 infection with human mobility: assessing spatial heterogeneity with business traffic, age and race, *Proceedings of the National Academy of Science*, Accepted and In Press, 2021.

48. **Nan Chen***, Faheem Gilani and J Harlim, A Bayesian Machine Learning Algorithm for Predicting ENSO Using Short Observational Time Series, Under Revision, *Geophysical Research Letters*,48(17), e2021GL093704, 2021.

49. Ziheng Zhang, and **Nan Chen***. Parameter Estimation of Partially Observed Turbulent Systems Using Conditional Gaussian Path-Wise Sampler. *Computation* 9.8 2021.

50. **Nan Chen**, Shubin Fu* and Georgy Manucharyan, Lagrangian Data Assimilation and Parameter Estimation of a Simple Sea Ice Floe Model, *Journal of Advances in Modeling Earth Systems*, 13.10 (2021): e2021MS002513.

51. **Nan Chen**, Yuchen Li and Evelyn Lunasin*, An Efficient Continuous Time Data Assimilation Algorithm for the Sabra Shell Models, *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 31, 103123, 2021.

52. **Nan Chen*** and Yingda Li, BAMCAFE: A BAyesian MaChine learning Advanced Forecast Ensemble method for complex nonlinear systems with partial observations, *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 31, 113114, 2021.

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53. **Nan Chen***, Can Short and Partial Observations Reduce Model Error and Facilitate Machine Learning Prediction? *Entropy*, 22.10 (2020): 1075.

54. **Nan Chen***, An Information Criterion for Choosing Observation Locations in Data Assimilation and Prediction, *SIAM/ASA Uncertainty Quantification*, 8.4 (2020): 1548-1573.

55. **Nan Chen***, Learning Nonlinear Turbulent Dynamics from Partial Observations via Analytically Solvable Conditional Statistics, *Journal of Computational Physics*, 418, 109635, 2020.

56. **Nan Chen***, Improving the Prediction Skill of Complex Nonlinear Dynamical Systems Using Nonlinear Smoothing and Filtering Techniques, *Research in the Mathematical Sciences*, 7(18), 2020.

57. **Nan Chen*** and Andrew J Majda, Efficient Nonlinear Optimal Smoothing and Sampling Algorithms for Complex Turbulent Nonlinear Dynamical Systems with Partial Observations, *Journal of Computational Physics*, 109381., 2020.

58. **Nan Chen*** and Andrew J Majda, Predicting Observed and Hidden Extreme Events in Complex Nonlinear Dynamical Systems with Partial Observations and Short Training Time Series, *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 30.3: 033101., 2020.

2019

59. **Nan Chen*** and Andrew J Majda, A New Efficient Parameter Estimation Algorithm for High-Dimensional Complex Nonlinear Turbulent Dynamical Systems with Partial Observations, *Journal of Computational Physics*, 397: 108836., 2019.

60. Reed. H. Ogrosky*, Samuel. N. Stechmann, **Nan Chen** and Andrew J Majda, Singular Spectrum Analysis with Conditional Predictions for Real-Time State Estimation and Forecasting, *Geophysical Research Letters*, 46.3 (2019): 1851-1860.

61. **Nan Chen***, Xiao Hou, Qin Li and Yingda Li, Understanding and Predicting Nonlinear Turbulent Dynamical Systems with Information Theory, *Atmosphere*, 10.5: 248, 2019.

62. **Nan Chen***, Andrew J Majda and Xin Tong, Spatial Localization for Nonlinear Dynamical Stochastic Models for Excitable Media, *Chinese Annals of Mathematics, Series B* (*Special volume on the occasion of Professor Andrew Majda's 70th birthday*), 40.6: 891-924., 2019

63. C. T. Sabeerali, Ajayamohan Ravindran*, Hamza Kunhu Bangalath and **Nan Chen**, Atlantic Zonal Mode: An emerging source of Indian summer monsoon variability in a warming world, *Geophysical Research Letters*, 46.8: 4460-4467., 2019

64. Sulian Thual, Andrew J. Majda, **Nan Chen***. Statistical occurrence and mechanisms of the 2014–2016 delayed super El Niño captured by a simple dynamical model. *Climate Dynamics*, 52 (2019): 2351-2366.

2018

65. **Nan Chen*** and Andrew J. Majda, Conditional Gaussian Systems for Multiscale Nonlinear Stochastic Systems: Prediction, State Estimation and Uncertainty Quantification, *Entropy*, 2018, 20(7), 509. [***Editor's Choice Article***]

66. Andrew J. Majda and **Nan Chen***, Model Error, Information Barriers, State Estimation and Prediction in Complex Multiscale Systems, *Entropy*, 2018, 20(9), 644.

67. Sulian Thual, Andrew J. Majda, **Nan Chen***, A Tropical Stochastic Skeleton Model for the MJO, El Niño and Dynamic Walker Circulation: A Simplified GCM, *Journal of Climate*, 31.22 (2018): 9261-9282.

68. **Nan Chen***, Andrew J. Majda and Xin Tong, Rigorous Analysis for Efficient Statistically Accurate Algorithms for the Fokker-Planck Equation in Large Dimensions, *SIAM/ASA Journal on Uncertainty Quantification* 6.3 (2018): 1198-1223.

69. **Nan Chen***, Andrew J. Majda, C. T. Sabeerali and Ajayamohan S. Ravindran, Predicting Monsoon Intraseasonal Precipitation using a Low-Order Nonlinear Stochastic Model, *Journal of Climate*, 31.11 (2018): 4403-4427.

70. **Nan Chen***, Andrew J. Majda and Sulian Thual, Observations and Mechanisms of a Simple Stochastic Dynamical Model Capturing El Niño Diversity, *Journal of Climate*, 2018, 31.1 (2018): 449-471.

71. **Nan Chen*** and Andrew J. Majda, Efficient Statistically Accurate Algorithms for the Fokker-Planck Equation in Large Dimensions, *Journal of Computational Physics*, 354 (2018): 242-268.

2017

72. **Nan Chen*** and Andrew J. Majda, Beating the Curse of Dimension with Accurate Statistics for the Fokker-Planck Equation in Complex Turbulent Systems, *Proceedings of the National Academy of Science*, 2017: 201717017.

73. Sulian Thual*, Andrew J. Majda, **Nan Chen**, Seasonal Synchronization of a Simple Stochastic Dynamical Model Capturing El Niño Diversity, *Journal of Climate*, 30.24 (2017): 10047-10066.

74. **Nan Chen*** and Andrew J. Majda, A Simple Stochastic Dynamical Model Capturing the Statistical Diversity of El Niño Southern Oscillation, *Proceedings of the National Academy of Science*, 114(7), pp. 1468-1473, 2017.

2016

75. **Nan Chen*** and Andrew J. Majda, A Simple Dynamical Model Capturing the Key Features of the Central Pacific El Niño, *Proceedings of the National Academy of Science*, 113(42), pp. 11732-11737, 2016.

76. Sulian Thual, Andrew J. Majda, **Nan Chen*** and Samuel N. Stechmann, A Simple Stochastic Model for El Niño with Westerly Wind Bursts, *Proceedings of the National Academy of Science*, 113(37), pp. 10245-10250, 2016.

77. **Nan Chen*** and Andrew J. Majda, Filtering the Stochastic Skeleton Model for the Madden-Julian Oscillation, *Monthly Weather Review*, 144(2), pp. 501-527, 2016.

78. **Nan Chen*** and Andrew J. Majda, Filtering Nonlinear Turbulent Dynamical Systems through Conditional Gaussian Statistics, *Monthly Weather Review*, 144(12), pp. 4885-4917, 2016.

79. **Nan Chen*** and Andrew J. Majda, Model Error in Filtering Random Compressible Flows Using Noisy Lagrangian Tracers, *Monthly Weather Review*, 144(11), pp. 4037-4061, 2016.

80. **Nan Chen**, Cheng Wang*, and Steven Wise, Global in time Gevrey regularity solution for a class of bistable gradient flows, *Discrete and Continuous Dynamical System - B*, 21(6), pp. 1689-1711, 2016.

2015

81. **Nan Chen*** and Andrew J. Majda, Predicting the Cloud Patterns for the Boreal Summer Intraseasonal Oscillation through a Low-Order Nonlinear Stochastic Model, *Mathematics of Climate and Weather Forecasting*, 1(1), pp. 1-20, 2015.

82. **Nan Chen*** and Andrew J. Majda, Predicting the Real-time Multivariate Index for the Madden-Julian Oscillation through a Low-Order Nonlinear Stochastic Model, *Monthly Weather Review*, 143(6), pp. 2148-2169, 2015.

83. **Nan Chen**, Andrew J. Majda and Xin Tong*, Noisy Lagrangian Tracers for Filtering Random Rotating Compressible Flows, *Journal of Nonlinear Science*, 25(3), pp. 451-488, 2015.

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84. **Nan Chen***, Andrew J. Majda, Dimitris Giannakis, Predicting the Cloud Patterns for the Madden-Julian Oscillation through a Low-Order Nonlinear Stochastic Model, *Geophysical Research Letters*, 41(15), pp. 5612-5619, 2014.

85. **Nan Chen**, Andrew J. Majda and Xin Tong*, Information Barriers for Noisy Lagrangian Tracers in Filtering Random Incompressible Flows, *Nonlinearity*, 27(9), pp. 2133-2163, 2014.

86. **Nan Chen***, Dimitris Giannakis, Radu Herbei and Andrew J. Majda, An MCMC Algorithm for Parameter Estimation of Signals with Hidden Intermittent Instability, *SIAM/ASA Journal of Uncertainty Quantification*, 2(1), pp. 647-669, 2014.

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87. Michal Branicki*, **Nan Chen**, and Andrew Majda, Non-Gaussian Test Models for Prediction and State Estimation with Model Errors, *Chinese Annals of Mathematics*, Series B,

Volume 34 (Special volume in honor of the scientific heritage of Jacques-Louis Lions), 1, pp. 29-64, 2013.

88. Wei Yao*, Yabei Li, and **Nan Chen**, Analytic solutions of the interstitial fluid flow models, *Journal of Hydrodynamics*, Ser. B, Vol. 25(5), pp. 683-694, 2013.

2012

89. **Nan Chen**, Max Gunzburger, Bill Hu, Xiaoming Wang*, and Celestine Woodruff, Calibrating the exchange coefficient in the modified coupled continuum pipe-flow model for flows in karst aquifers, *Journal of Hydrology*, 414, pp. 294-301, 2012.

90. Shuai Lu*, **Nan Chen**, Bang Hu and Jin Cheng, On the Inverse Problems for the Coupled Continuum Pipe Flow model for flows in karst aquifer, *Inverse Problems*, 28(6), 065003, 2012.

91. **Nan Chen***, Min Zhong, Boxi Xu, Clustering Method with Regularization for Time Series Data and Its Application, *Journal of Fudan University* (*Natural Science*), Vol. 51(4) pp. 450-457, 2012 (Chinese).

Before 2011

92. Zuicha Deng*, Liu Yang and **Nan Chen**, Uniqueness and stability of the minimizer for a binary functional arising in an inverse heat conduction problem, *Journal of Mathematical Analysis and Applications*, 382(1), pp 474-486, 2011.

93. **Nan Chen***, Max Gunzburger, and Xiaoming Wang, Asymptotic Analysis of the Differences between the Stokes-Darcy System with Different Interface Conditions and the Stokes-Brinkman System, *Journal of Mathematical Analysis and Applications*, Vol. 368(2), 2010, pp. 658-676.

94. Wei Yao*, **Nan Chen**, and Guanghong Ding, Numerical simulation of interstitial fluid based on a new view of starling's hypothesis of capillary wall, *Chinese Journal of Theoretic and Applied Mechanics*, Vol. 41(1), pp. 35-40, 2009 (Chinese).

Book Chapters

95. **Nan Chen**, Sulian Thual and Malte F. Stuecker, El Niño and the Southern Oscillation: Theory, Elsevier Earth Systems and Environmental Sciences, 2019.

96. **Nan Chen**, Sulian Thual and Shineng Hu, El Niño and the Southern Oscillation: Observations, Elsevier Earth Systems and Environmental Sciences, 2019.

97. Michal Branicki, **Nan Chen** and Andrew Majda, Page 99-138. P. G. Ciarlet, T. Li and Y. Maday, Partial Differential Equations: Theory, Control and Approximation. Springer, 2014.

Translated Books

98. **Nan Chen**, Xiaoming Wang, Jin Cheng, and Yu Jiang, Introduction to PDEs and Waves for the Atmosphere and Ocean (written by Prof. A. J. Majda), Translated Chinese version, Science Press, Oct 2009.

Conference Papers

99. Noah J. Schmelzer, Evan J. Lieberman, Curt A. Bronkhorst*, **Nan Chen**, Veronica Anghel, George T. Gray, III, Towards statistical representation of dynamic porosity-based ductile damage, 23rd Biennial Conference of the APS Topical Group on Shock Compression of Condensed Matter, 2024.

100. Ludovico Giorgini*, Soon Hoe Lim, Woosok Moon, **Nan Chen** and John Wettlaufer, Modeling the El Niño Southern Oscillation with Neural Differential Equations, *ICML 2021 Time Series Workshop*.

Talks

Invited talks

1. Integrating Data Assimilation with Machine Learning for Advancing Extreme Event Modeling (Lightning talk), NSF Workshop on Data-driven Modeling and Prediction of Rare and Extreme Events, IMSI Chicago, November 21-22, 2024.

2. Introduction to Uncertainty Quantification, UW-Madison ACMS, September 13, 2024.

3. Causal Inference and Data Assimilation, 2024 Data-Driven Causal Inference: Information Theory Meets Dynamical Systems, Basic Research Innovation Collaboration Center (BRICC), Arlington, VA, August 22-23, 2024

4. Uncertainty Quantification in Dynamical Systems and Data Assimilation, Applied Nonlinear Dynamical Systems and Chaos – Celebrating Stephen Wiggins' 65th birthday Royal Academy of Sciences, Madrid, Spain, 1-3 July 2024.

5. Lagrangian Data Assimilation and Uncertainty Quantification, SIAG MPE Online Seminar April 25, 2024.

6. Data Assimilation: Dynamical Interpolation, State Estimation, and Model Identification, Online Applied Data Assimilation & Parameter Tracking (ADAPT) Seminar, November 13, 2023.

7. Stochastic and Statistical Reduced-Order Models, Numerical Analysis of Galerkin ROMs seminar series, October 31, 2023.

8. Data Assimilation: Dynamical Interpolation, State Estimation, and Model Identification, Department of Mathematics and Statistics, Missouri University of Science and Technology, October 27, 2023.

9. When Model Meets Data — Challenges and Opportunities with Uncertainty Quantification (UQ), Brave New Worlds: Mapping Uncharted Waters in Uncertainty Quantification and Machine Learning, United States Naval Academy, October 26, 2023.

10. Data Assimilation: Dynamical Interpolation, State Estimation, and Model Identification, Mathematics of Machine Learning Seminar, Department of Mathematics and Statistics, University of Massachusetts Amherst, October 20, 2023.

11. Data Assimilation: Dynamical Interpolation, State Estimation, and Model Identification, Computational Mathematics, Laboratory for Applied Mathematics, Numerical Software, and Statistics (LANS) at Argonne National Laboratory, June 21, 2023.

12. Data Assimilation: Dynamical Interpolation, State Estimation, and Model Identification, Computational Mathematics, Science and Engineering (CMSE) Colloquium Michigan State University, March 27, 2023.

13. A Physics-Informed Data-Driven Algorithm for Ensemble Forecast of Complex Turbulent Systems, CAM Colloquium, University of Chicago, November 3, 2022.

14. Combining Stochastic Parameterized Reduced Order Models with Machine Learning for Data Assimilation and Uncertainty Quantification with Partial Observations, Machine Learning for Climate and Weather Applications, IMSI Chicago, October 31 - November 4, 2022.

15. Combining a Stochastic Parameterized Filter with Machine Learning to Assimilate Complex Turbulent Systems Using Partial Observations, 2022 Fall Western Sectional Meeting, October 22-23, 2022, University of Utah, Salt Lake City, UT.

16. A Physics-Informed Data-Driven Algorithm for Ensemble Forecast of Complex Turbulent Systems, SIAM Conference on Mathematics of Planet Earth (MPE22), July 13-15, 2022, Pittsburgh, PA.

17. BAMCAFE: A Bayesian Machine Learning Advanced Forecast Ensemble Method for Complex Turbulent Systems with Partial Observations, SIAM Annual Meeting, July 11-15, 2022, Pittsburgh, PA.

18. A Physics-Informed Data-Driven Statistical Reduced Order Model for Ensemble Forecast of Complex Turbulent Systems, Accurate ROMs for Industrial Applications at Virginia Tech (ARIA@VT), Virginia Tech, July 6-8, 2022.

19. A Physics-Informed Data-Driven Algorithm for Ensemble Forecast of Complex Turbulent Systems, One World Mathematics of Climate Seminar, June 7, 2022, Online.

20. A Physics-Informed Data-Driven Algorithm for Ensemble Forecast of Complex Turbulent Systems, AMS Spring Western Sectional Meeting, May 14 – 15, 2022, Online.

21. A Physics-Informed Data-Driven Algorithm for Ensemble Forecast of Complex Turbulent Systems, SIAM UQ conference, April 12 - 15, 2022, Atlanta, GA.

22. BAMCAFE: A Bayesian Machine Learning Advanced Forecast Ensemble Method for Complex Turbulent Systems with Partial Observations, AMS Spring Central Sectional Meeting, Apr. 2 – 3, 2022, Purdue University, IN.

23. A Simple Multiscale Stochastic Model for Large-Scale ENSO Complexity and Its Predictability Using Information Theory, Atmosphere, Oceans, Climate Dynamics Seminar, March 3, 2022, Yale University.

24. A Stochastic Multiscale Model for El Niño Complexity, 102nd AMS Annual Meeting, Feb. 24 – Mar. 4, 2022, Honolulu, HI.

25. Conditional Gaussian Nonlinear System: a Fast Preconditioner and a Cheap Surrogate Model For Complex Nonlinear Systems, Jan 25, 2022, Numerical Analysis Seminar, NCSU (Remote Talk).

26. Can Short and Partial Observations Reduce Model Error and Facilitate Machine Learning Prediction for Extreme Events? May 23-27, 2021, SIAM Conference on Applications of Dynamical Systems, SIAM DS21 (Remote talk).

27. Using nonlinear data assimilation to improve the machine learning training and forecasts. Geophysical/Astrophysical Fluid Dynamics Seminar, University of Colorado Boulder, April 6, 2021 (Remote talk).

28. A Simple Multi-region and Multiscale Stochastic Model for ENSO Diversity and Its Machine Learning Forecast, 2021, March 29, Applied & Computational Math seminar, BiCMR (Remote talk).

29. An Efficient Conditional Sampling Algorithm for Nonlinear Stochastic Model Trajectories with Applications to Machine Learning Prediction using Short Observations, March 1-5, 2021, SIAM Conference on Computational Science and Engineering (SIAM CSE 21; Remote talk).

30. Can Short and Partial Observations Reduce Model Error and Facilitate Machine Learning Prediction for Machine Learning Prediction? Dec 7-11, 2020, AGU Fall Meeting (Remote talk).

31. Efficient Nonlinear Optimal Smoothing and Sampling Algorithms for Complex Turbulent Nonlinear Dynamical Systems with Partial Observations, June 30, 2020, SIAM MDS Conference (Remote talk)

32. Efficient Nonlinear Optimal Smoothing and Sampling Algorithms for Complex Turbulent Nonlinear Dynamical Systems with Partial Observations, March 2, 2020, Mathematics Seminar, Southern University of Science and Technology (Remote talk)

33. A Conditional Gaussian Framework for Data Assimilation and Prediction of Nonlinear Turbulent Dynamical Systems, January 06, 2019, Mathematics Seminar, Fudan University

34. A Conditional Gaussian Framework for Data Assimilation and Prediction of Nonlinear Turbulent Dynamical Systems, April 10, 2019, Data Science Seminar, Johns Hopkins University

35. A Conditional Gaussian Framework for Data Assimilation and Prediction of Nonlinear Turbulent Dynamical Systems, April 5, 2019, MIT seminar, MIT

36. A Conditional Gaussian Framework for Data Assimilation and Prediction of Nonlinear Turbulent Dynamical Systems, April 4, 2019, Brandeis-Harvard-MIT-Northeastern Joint Mathematics Colloquium, Northeastern University

37. A Conditional Gaussian Framework for Data Assimilation and Prediction of Nonlinear Turbulent Dynamical Systems, March 15, 2019, A Conference to Celebrate the 70th Birthday of Professor Andrew Majda, New York University

38. A Conditional Gaussian Framework for Data Assimilation and Prediction of Nonlinear Turbulent Dynamical Systems, February 14, 2019, Computational and Applied Mathematics Colloquium, University of Chicago

39. A Conditional Gaussian Framework for Data Assimilation and Prediction of Nonlinear Turbulent Dynamical Systems, November 9, 2018, Research Seminars: Applied and Computational Mathematics, Tulane University.

40. A Conditional Gaussian Framework for Data Assimilation and Prediction of Nonlinear Turbulent Dynamical Systems, October 24, 2018, Systems, Information, Learning and Optimization (SILO) Seminar, University of Wisconsin-Madison.

41. A Conditional Gaussian Framework for Data Assimilation and Prediction of Nonlinear Turbulent Dynamical Systems, October 10, 2018, Department Seminar at Statistics Department, University of Wisconsin-Madison.

42. A Simple Dynamical Model for El Niño with Stochastic Wind Bursts, September 25, 2018, Applied Math Seminar, University of Wisconsin-Madison.

43. A Conditional Gaussian Framework for Data Assimilation and Prediction of Nonlinear Turbulent Dynamical Systems, SIAM conference on Uncertainty Quantification, April 16-19, 2018, Garden Grove, CA.

44. A Conditional Gaussian Framework for Data Assimilation and Prediction of Nonlinear Turbulent Dynamical Systems, April 5, 2018, U.S. Naval Academy.

45. A Conditional Gaussian Framework for Uncertainty Quantification, Data Assimilation and Predicting Complex Nonlinear Dynamical Systems, February 26, 2018, Colloquium talk at Courant Institute of Mathematical Sciences, New York University.

46. A Conditional Gaussian Framework for Uncertainty Quantification, Data Assimilation and Predicting Complex Nonlinear Dynamical Systems, February 5, 2018, Colloquium talk at Caltech.

47. A Conditional Gaussian Framework for Uncertainty Quantification, Data Assimilation and Predicting Complex Nonlinear Dynamical Systems, January 29, 2018, Colloquium talk at Florida State University.

48. A Conditional Gaussian Framework for Uncertainty Quantification, Data Assimilation and Predicting Complex Nonlinear Dynamical Systems, December 19, 2017, Shanghai Math Center, China.

49. Efficient Statistically Accurate Algorithms for the Fokker-Planck Equation in Large Dimensions, 2017 AGU Fall Meeting, December 11-15, New Orleans, LA.

50. A Conditional Gaussian Framework for Uncertainty Quantification, Data Assimilation and Predicting Complex Nonlinear Dynamical Systems, December 8, 2017, Colloquium talk at University of Wisconsin-Madison.

51. A Conditional Gaussian Framework for Uncertainty Quantification, Data Assimilation and Predicting Complex Nonlinear Dynamical Systems, November 29, 2017, Colloquium talk at Bath University, UK.

52. A conditional Gaussian framework for filtering and predicting complex nonlinear dynamical systems, Nonlinear and Stochastic Problems in Atmospheric and Oceanic Prediction, Meetings at Banff International Research Station 2017, November 19-24, Banff, Canada.

53. A conditional Gaussian framework for filtering and predicting complex nonlinear dynamical systems, SIAM Annual Meeting 2017, July 9 – July 15, Pittsburgh, PA.

54. Simple stochastic dynamical models capturing the diversity of El Niño Southern Oscillation, Conference on Classical and Geophysical Fluid Dynamics: Modeling, Reduction and Simulation, Virginia Tech, June 26 – 28, 2017.

55. A Simple Dynamical Model for El Niño with Wind Bursts and the Mechanisms of the 2014-2016 Delayed Super El Niño, Frontier of Applied and Computational Mathematics, New Jersey Institute of Technology, June 24-25, 2017.

56. A conditional Gaussian framework for filtering and predicting complex nonlinear dynamical systems, Applied Inverse Problems 2017, May 29 – June 2, Hangzhou, China.

57. Prediction of the Indian Monsoon Precipitation, SIAM Conference on Applications of Dynamical Systems (DS17), Snowbird, Utah, May 21 – 25, 2017.

58. Simple stochastic dynamical models capturing the diversity of El Niño Southern Oscillation, CAOS Colloquium, New York University, Mar. 1, 2017.

59. Simple stochastic dynamical models capturing the diversity of El Niño Southern Oscillation, Applied PDE seminar (joint with GFDI seminar), Florida State University, Feb. 24, 2017.

60. An Applied Math Perspective on Climate Science, Turbulence, and Other Complex Systems, Shanghai Jiaotong University, Jan. 04, 2017.

61. An Applied Math Perspective on Climate Science, Turbulence, and Other Complex Systems, Fudan-Guanghua International Forum for Young Scholars, Fudan University, Dec. 29, 2016.

62. Simple stochastic dynamical models capturing the diversity of El Niño Southern Oscillation, Workshop on data assimilation and inverse problems, Shanghai University of Finance and Economics, Dec. 23, 2016.

63. A conditional Gaussian framework for filtering and predicting complex turbulent systems, Seminar on Data assimilation and filtering dynamics systems, Fudan University, Dec. 19, 2016.

64. A simple model for the El Niño-Southern Oscillation, 2nd NYU Postdoc Interdisciplinary Symposium, New York, Nov. 14, 2016.

65. A simple stochastic dynamical model capturing the diversity of El Niño Southern Oscillation, 2016 MURI workshop, New York University, Oct. 21, 2016.

66. Filtering Compressible and Incompressible Turbulent Flows with Noisy Lagrangian Tracers, SIAM UQ conference, Lausanne, Apr. 7, 2016.

67. Predicting the Cloud Patterns for the Madden-Julian Oscillation through a Low-Order Nonlinear Stochastic Model, Department of Mathematical Sciences, New Jersey Institute of Technology, Mar. 21, 2016.

68. Conditional Gaussian Filter for Nonlinear Dynamics, 2016 MURI workshop, New York University, Jan 30, 2016.

69. Physics-Constrained Low-Order Prediction Model for the MJO and Monsoon, 2016 MURI workshop, New York University, Jan. 30, 2016.

70. Filtering Stochastic Skeleton Model for the Madden-Julian oscillation (MJO), 2016 MURI workshop, New York University, Jan. 29, 2016.

71. Predicting the Cloud Patterns for the Madden-Julian Oscillation through a Low-Order Nonlinear Stochastic Model, Columbia University, Oct. 21, 2015.

72. Predicting the Madden-Julian oscillation (MJO) and boreal summer intraseasonal oscillation (BSISO) through low-order nonlinear stochastic models, Mathematics of Geophysical Flows and Turbulence, Aug. 17 – 19, 2015, Shanghai, China.

73. Filtering turbulent fluid flows with noisy Lagrangian tracers, Mathematics of Geophysical Flows and Turbulence, Shanghai, China, Aug. 17 – 19, 2015.

74. Predicting the Cloud Patterns for the Madden-Julian Oscillation through a Low-Order Nonlinear Stochastic Model, International Council for Industrial and Applied Mathematics, Beijing, China, Aug. 10 – 14, 2015.

75. Predicting the Cloud Patterns for the Madden-Julian Oscillation through a Low-Order Nonlinear Stochastic Model, Stochasticity and Organization of Tropical Convection, Banff, Canada, Apr. 27, 2015.

76. Predicting the Cloud Patterns for the Madden-Julian Oscillation through a Low-Order Nonlinear Stochastic Model, University College London, UK, Jan. 16, 2015.

77. Predicting the Cloud Patterns for the Madden-Julian Oscillation through a Low-Order Nonlinear Stochastic Model, Lishui University, China, Dec. 25, 2014.

78. Predicting the Cloud Patterns for the Madden-Julian Oscillation through a Low-Order Nonlinear Stochastic Model, Zhejiang University, China, Dec. 22, 2014.

79. Introduction to Stochastic Models for Turbulence and Filtering with Instability and Model Error, Short Course in High Dimensional Filtering, University of Warwick, UK, June 29, 2014.

80. An MCMC Algorithm for Parameter Estimation of Signals with Hidden Intermittent Instability, SIAM Conference on UQ, Savannah, Georgia, Mar. 31, 2014.

81. An MCMC Algorithm for Parameter Estimation of Signals with Hidden Intermittent Instability, 2014 MURI workshop, New York University, Jan. 21, 2014.

82. Filtering the Turbulent Signals with Gaussian and non-Gaussian Filters, 2013 Interdisciplinary Summer School: Data Assimilation in Geosciences, University of Maryland College Park, June. 13, 2013.

83. Non-Gaussian Test Models for Prediction and Filtering with Model Errors, Invited talk in Fudan University, Shanghai, China, Dec. 27, 2012.

84. Asymptotic analysis of the differences between the Stokes-Darcy system with different interface conditions and the Stokes-Brinkman system, Doctorial Forum of Mathematics between Fudan and Kyoto Universities, Fudan University, Shanghai, China, Nov. 1-5, 2010.

85. Modeling, analysis and simulation of fluid flows in karst aquifer, Youth academic forum of Department of Mechanics and Engineering Science, Fudan University, Shanghai, China, May. 25, 2010.

86. Numerical simulation of interstitial fluid based on a new view of the Starling's hypothesis of capillary wall, Thirteenth National", Boundary value problems, integral equations and related problems" academic conference, Zhongshan University, Guangzhou, China, Jan. 4-6, 2008.

Postdoc/graduate seminar talks

87. Predicting the Cloud Patterns for the Madden-Julian Oscillation, Courant Postdoc and Graduate Student Seminar, Courant Institute of Mathematical Sciences, New York University, Nov. 18, 2016.

88. An introduction to the El Niño Southern Oscillation, CAOS Tuesday Lunch Seminar, Courant Institute of Mathematical Sciences, New York University, Oct. 18, 2016.

89. Filtering Nonlinear Turbulent Dynamical Systems through Conditional Gaussian Statistics, CAOS Student Seminar, Courant Institute of Mathematical Sciences, New York University, Feb. 05, 2016.

90. Filtering the Stochastic Skeleton Model for the Madden-Julian Oscillation, CAOS Student Seminar, Courant Institute of Mathematical Sciences, New York University, Sep. 11, 2015.

91. Predicting the Real-time Multivariate Index for the Madden-Julian Oscillation through a Low-Order Nonlinear Stochastic Model, CAOS Student Seminar, Courant Institute of Mathematical Sciences, New York University, Feb. 13, 2015.

92. Introduction to model selection, CAOS Monday Lunch Seminar, Feb. 9, 2015.

93. Stochastic toolkits for uncertainty quantification, CAOS Monday Lunch Seminar, Nov. 17, 2014.

94. Predicting the Cloud Patterns for the Madden-Julian Oscillation through a Low-Order Nonlinear Stochastic Model, CAOS Student Seminar, Courant Institute of Mathematical Sciences, New York University, Sep. 26, 2014.

95. Information Barriers for Noisy Lagrangian Tracers in Filtering Random Incompressible Flows, CAOS Student Seminar, Courant Institute of Mathematical Sciences, New York University, Feb. 28, 2014.

96. An MCMC Algorithm for Parameter Estimation of Signals with Hidden Intermittent Instability, CAOS Student Seminar, Courant Institute of Mathematical Sciences, New York University, Dec. 06, 2013.

97. Filtering the Turbulent Signals with Gaussian and non-Gaussian Filters, CAOS Student Seminar, Courant Institute of Mathematical Sciences, New York University, Feb. 22, 2013.

98. Non-Gaussian Test Models for Prediction and State Estimation with Model Errors, CAOS Student Seminar, Courant Institute of Mathematical Sciences, New York University, Sep. 21, 2012.

99. Gaussian and Non-Gaussian Closures with Model Error for Simple Model with Complex Features, CAOS Student Seminar, Courant Institute of Mathematical Sciences, New York University, Apr. 20, 2012.

100. Regularized Averaged Clustering Method, CAOS Monday Lunch Seminar, Courant Institute of Mathematical Sciences, New York University, Feb. 6, 2012.

Posters

101. Uncertainty Quantification (UQ) — A Tutorial for Beginners, AGU Fall 2024 Meeting, Dec. 9 – 13, Washington D.C.

102. Statistically Accurate Stochastic-Dynamical Models for ENSO Complexity, AGU Fall 2024 Meeting, Dec. 9 – 13, Washington D.C.

103. Integrating Data Assimilation with Machine Learning for Advancing Extreme Event Modeling, NSF Workshop on Data-driven Modeling and Prediction of Rare and Extreme Events, November 21-22, 2024, IMSI Chicago, IL.

104. Launching Drifter Observations in the Presence of Uncertainty, AGU Fall 2023 Meeting, Dec. 11 – 15, San Francisco, CA.

105. A Multiscale Model for El Nino Complexity, AGU Fall 2023 Meeting, Dec. 11 – 15, San Francisco, CA.

106. A Multiscale Model for El Nino Complexity, AGU Fall 2022 Meeting, Dec. 12 – 16, Chicago, IL.

107. A Physics-Informed Data-Driven Algorithm for Ensemble Forecast of Complex Turbulent Systems, AGU Fall 2022 Meeting, Dec. 12 – 16, Chicago, IL.

108. A Stochastic Multiscale Model for El Niño Complexity, 102nd AMS Annual Meeting, Jan. 23 – 27, 2022, Houston, TX.

109. A Stochastic Multiscale Model for El Niño Complexity, AGU Fall 2021 Meeting, Dec. 13 – 17, New Orleans, LA.

110. BAMCAFE: A Bayesian Machine Learning Advanced Forecast Ensemble Method for Complex Turbulent Systems with Partial Observations, AGU Fall 2021 Meeting, Dec. 13 – 17, New Orleans, LA.

111. A simple stochastic dynamical model capturing the statistical diversity of El Niño Southern Oscillation, AGU Fall 2019 Meeting, Dec. 9 – 12, 2019, San Francisco.

112. Predicting Extreme Events in Complex Nonlinear Dynamical Systems using Partial Observations and Short Training Data, with Applications to Monsoon Intraseasonal Variability, AGU Fall 2019 Meeting, Dec. 9 – 12, 2019, San Francisco.

113. Simple Dynamical Models Capturing the Key Features of the Central Pacific El Niño, AGU Fall 2016 Meeting, Dec. 12 – 16, 2016, San Francisco.

114. Filtering Nonlinear Turbulent Dynamical Systems through Conditional Gaussian Statistics, Frontiers in Applied & Computational Mathematics, June 3–4, 2016, New Jersey Institute of Technology, Newark, NJ.

115. Filtering Nonlinear Turbulent Dynamical Systems through Conditional Gaussian Statistics, Uncertainty Quantification for Multiscale Stochastic Systems and Applications, Jan. 19 – 22, 2016, UCLA.

Press Release

Modeling COVID-19 infection based on movement **2021/06**
Miragnews, Medicalxpress and a few other news outlets
https://www.miragenews.com/modeling-covid-19-infection-based-on-movement-579003/

New weather model to spot India's massive monsoons coming **2019/05**
The National and other 20+ news
https://www.thenational.ae/uae/science/new-weather-model-to-spot-india-s-massive-monsoons-coming-1.862462

El Niño Diversity **2016/12**
X-Mol
http://www.x-mol.com/news/4231

Central Pacific El Niño **2016/11**
Futurity News
http://www.futurity.org/central-pacific-el-nino-1303912-2/

Central Pacific El Niño **2016/11**
NYU Abu Dhabi News
http://nyuad.nyu.edu/en/news/press-room/press-releases/new-climate-model-captures-key-features-of-central-pacific-el-nino.html

Memberships

American Mathematical Society (AMS)
Society for Industrial and Applied Mathematics (SIAM)
American Geophysical Union (AGU)
New York Academy of Sciences (NYAS)