Norman M. Cao

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APPOINTMENTS HELD

Research Fellow, Institute for Fusion Studies, University of Texas at Austin *Sep. 2023 – current*

Courant Instructor / Assistant Professor (Non-Tenure Track), New York University *Sep 2020 – Aug 2023*
***Joseph B. Keller Fellow (2022-23)**, Faculty Fellow in the Simons Collaboration on Wave Turbulence*

Research Assistant, MIT Plasma Science and Fusion Center *Aug 2016 – Jun 2020*

TEACHING AND MENTORING EXPERIENCE

Courses Taught:

- NYU Courant MATH-UA 140 (Linear Algebra), 148 (Honors Linear Algebra), 325 (Analysis).
- NYU Tandon MA-UY 4414 (Applied Partial Differential Equations)
- Sample syllabi available at https://maplenormandy.github.io/teaching/

Students Mentored:

- Weiyu Lin (UT Austin undergrad. *Sep 2023 – current)*
- Tanuj Sistla (NYU undergrad. *Jan – May 2023*): *Using Computer Vision to Track Coherent Vortices in Fusion Plasma Turbulence*
- Sander Miller (high school student. *Oct 2020 – Nov 2021*): *The Effects of Core-Edge Temperature Gradients on Intrinsic Rotation during H-Mode in Tokamak Reactors*

TA for MIT 22.63 (Engineering Principles for Fusion Reactors) *Sep – Dec 2018*

EDUCATION

Ph.D. in Applied Plasma Physics from Nuclear Science and Engineering Dept *June 2020*

- Massachusetts Institute of Technology, Cambridge, MA
- Thesis title: *Characterization of a turbulence bifurcation underlying L-mode confinement transitions on Alcator C-Mod*

Bachelor of Science in Aerospace Engineering and Physics, Minor in Mathematics *June 2015*

- Massachusetts Institute of Technology, Cambridge, MA

SELECTED PUBLICATIONS BY TOPIC

Complete bibliography available online: https://scholar.google.com/citations?user=WQRmB8MAAAAJ

Turbulence in basic fluid and plasma systems

- **Cao N M** and Qi D 2023 Nearly integrable flows and chaotic tangles in the Dimits shift regime of plasma edge turbulence *Phys. Plasmas* **30** 092307
- **Cao N M** 2023 Rossby waves past the breaking point in zonally-dominated turbulence *J. Fluid Mech.* **958** A28

Turbulence in tokamak plasmas

- **Cao N M**, Rice J E, Diamond P H, White A E, Chilenski M A, Ennever P C, Hughes J W, Irby J, Reinke M L and Rodriguez-Fernandez P 2020 Evidence and modeling of turbulence bifurcation in L-mode confinement transitions on Alcator C-Mod *Phys. Plasmas* **27** 052303
- **Cao N M**, Rice J E, Diamond P H, White A E, Baek S G, Chilenski M A, Hughes J W, Irby J, Reinke M L and Rodriguez-Fernandez P 2019 Hysteresis as a probe of turbulent bifurcation in intrinsic rotation reversals on Alcator C-Mod *Nucl. Fusion* 59 104001

Computational statistics

- **Cao N M** and Sciortino F 2020 Bayesian Spectral Moment Estimation and Uncertainty Quantification *IEEE Trans. Plasma Sci.* **48** 22–30

Fusion reactor engineering

- Kuang A Q, **Cao N M**, Creely A J, Dennett C A, Hecla J, LaBombard B, Tinguely R A, Tolman E A, Hoffman H, Major M, Ruiz Ruiz J, Brunner D, Grover P, Laughman C, Sorbom B N and Whyte D G 2018

Conceptual design study for heat exhaust management in the ARC fusion pilot plant *Fusion Eng. Des.* **137** 221–42
(Note: This was a group paper from MIT 22.63 Engineering Principles for Fusion Reactors, Spring 2016)

SELECTED PRESENTATIONS

Seminar: "Rossby Waves on the Edge of Chaos in Zonally-Dominated Flows", SoCal Plasma Zoom; November 11, 2021; Online

Invited Talk: "Hysteresis as a Probe of Turbulent Bifurcation in Intrinsic Rotation Reversals on Alcator C-Mod", 61st APS-DPP Meeting; October 21-25, 2019; Fort Lauderdale, Florida

***Best Student Poster Prize Winner**:* "Observation and Quasilinear Modeling of Rotation Reversal Hysteresis in Alcator C-Mod Plasmas", 24th Joint US-EU Transport Task Force Meeting; March 18-21, 2019; Austin, Texas

Invited Talk: "Observation and Quasilinear Modeling of Rotation Reversal Hysteresis in Alcator C-Mod Plasmas", 2nd Asia-Pacific Conference on Plasma Physics; November 12-17, 2018; Kanazawa, Japan

HONORS AND AWARDS

- Joseph B. Keller Postdoctoral Fellowship *Sep. 2022*
- Promising Young Scientist Prize at 10th Festival de Théorie in Aix-en-Provence *Jul. 2019*
- Best Student Poster Prize at 24th Joint US-EU Transport Task Force Meeting *Mar. 2019*
- Student Festival Fellow at 9th Festival de Théorie in Aix-en-Provence *Jul. 2017*
- U.S. NRC Nuclear Education Graduate Fellowship Recipient *Sep. 2016*
- Inducted into Sigma Pi Sigma and Phi Beta Kappa Society *Jun. 2015*

COMMUNITY ACTIVITIES

MIT Plasma Science and Fusion Center Outreach *Sep. 2015 – June 2020*
- Regularly lead tours and engaged in other fusion energy outreach activities

Attendee at APS-DPP Community Planning Workshop in Austin, TX *Dec. 2017*
- Participated in community workshop discussion sessions

Teacher for MIT Educational Studies Program *Jan. 2012 – Nov. 2019*
- Taught one- to two-hour courses on different topics in physics and math to middle and high schoolers

PROFESSIONAL ENGINEERING EXPERIENCE

Mission Assurance Intern at SpaceX *June – Aug. 2014*
- Developed integrated probabilistic risk analyses (PRA) for Crew Dragon systems
- Assisted in investigations of major F9 anomalies
- Designed and implemented metrics for tracking component and system reliability