

Xu, Yufan - CV

CONTACT yufanxu@g.ucla.edu yufanxu.com (608)886-7181

- RESEARCH INTERESTS
- Liquid metal magnetohydrodynamics
 - Geophysical and astrophysical fluid dynamics
 - Planetary and stellar magnetic field generation
 - Turbulent and chaotic systems

EDUCATION **University of California, Los Angeles** Jun 2023

Ph.D., Geophysics and Space Physics, completed Jun 2023

- Thesis Topic: *Laboratory Experiments on Planetary Core Dynamics: Magnetoconvection and Rotating Magnetoconvection*
- Advisor: Prof. Jonathan M. Aurnou

M.S., Geophysics and Space Physics, Jun 2019

University of Wisconsin-Madison Jun 2017

B.S., Applied Mathematics, Engineering, and Physics (AMEP), Jun 2017

- Honor Thesis: *Hardening of Metals Using Plasma Immersion Ion Implantation (PIII)*
- Advisor: Prof. Cary B. Forest

RESEARCH EXPERIENCE **Graduate Researcher** Aug 2017 – Jun 2023

Department of Earth, Planetary, and Space Sciences (EPSS), UCLA

- Developed theoretical and experimental models for thermoelectric magnetoconvection. Proposed novel core-mantle coupling mechanisms
- Characterized heat transfer and behavior regimes in liquid metal magnetoconvection
- Designed, prototyped, and upgraded the data acquisition system, diagnostics, and mechanical parts on the UCLA RoMag device
- Led laboratory experimental studies of planetary dynamo processes. Experimentally investigated liquid metal rotating convection, rotating magnetoconvection and magnetostrophic modes

Undergraduate Research Assistant Jun 2014 – May 2017

Department of Physics, University of Wisconsin-Madison

- Carried out mechanical, electrical, and electronic works on the water cooling support system for the Madison Plasma Dynamo Experiment
- Participated in Plasma Couette Experiment and led individual research on plasma immersion ion implantation

TEACHING & MENTOR EXPERIENCE	Teaching Assistant: EPSS, UCLA; six quarters	
	• Introduction to Oceanography (EPS SCI 15)	Spring 2020, 2021, 2022
	Instructor: Prof. David Jewitt; Prof. Edwin Schauble	
	• Astrobiology (EPS SCI 3)	Fall 2020
	Instructor: Prof. Jean-Luc Margot; Prof. Tina Treude	
• Introduction to Computing for Geoscientists (EPS SCI 71)	Fall 2018	
Instructor: Prof. Jonathan M. Aurnou		
• Earthquakes (EPS SCI 8)	Spring 2018	
Instructor: Prof. Gilles Peltzer		

Lab Undergraduate Mentor

• Jake Ehret: Mechanics and electronic Training	Fall 2019 - Spring 2022
• Miranda Chang: Mechanics and CAD Training	Spring 2022 - Present

AWARDS **Fellowships**

• UCLA Dissertation Year Fellowship	Sep 2022 – Jun 2023
• UCLA Graduate Student Fellowship Award	Sep 2017 – Present
• Hilldale Undergraduate/Faculty Research Fellowship University of Wisconsin - Madison	Feb 2015 – Aug 2016

Departmental Awards

• UCLA EPSS Department Fellowship Award	Winter 2021
• UCLA EPSS Department Outreach Award	Jun 2021
• UCLA EPSS Department Teaching Award	Jun 2020

Other Awards

• Outstanding Student Presentation Award, AGU 2022 Fall Meeting	Feb 2023
• The International Mathematical Contest in Modeling	Feb 2016

CONFERENCES & SEMINARS	Princeton Plasma Physics Laboratory	Nov 2022
	The 17th Symposium of Study of the Earth's Deep Interior (SEDI)	Jul 2022
	2022 Goldschmidt Conference	Jul 2022
	EGU General Assembly 2022	May 2022
	American Geophysical Union 2021 Fall Meeting	Nov 2021
	American Physical Society – Division of Fluid Dynamics (DFD)	Nov 2020
	American Physical Society – DFD	Nov 2019
	The 13th Southern California Flow Physics Symposium	Apr 2019
	The 16th SEDI	Jul 2018
	American Physical Society – Division of Plasma Physics (DPP)	Nov 2016
	University of Rochester (invited talk)	Sep 2022
	Royal Astronomical Society UKSEDI (invited talk)	Nov 2021
	- Collaborative study of Earth's core-mantle boundary region Nanjing University, China (invited talk)	Dec 2019
	Departmental Student Symposium	May 2021
	Departmental Geophysics Seminar	Dec 2020
	Departmental Planetary Seminar	Feb 2019

OUTREACH & SERVICES **Department Student Organization**

- VP for event planning 2020-2021

University Outreach Events

- EPSS outreach for Charles Drew University K-12 Mar 2023
- The Annual Exploring Your Universe (EYU) Nov 2017-2020, 2022
Booth Member, led experiments for public audiences
- UCLA Day for Geffen Academy Middle School Apr 2019
Helped perform experiments for middle school science students

Documentary Film

- “The Solar System”, Bigger Bang Productions (BBC) Apr 2019

SPINlab Geoscience Film Series

- “Evaporative Convection in Glorious Time-Lapse” May 2019
- “OID Film #3: Making ‘Barbasoloscope’ Visualization Fluid” Jun 2019
- Music production in “Calimero’s Uprising!” Sep 2019
- “Kinematically-Reversible Magneto-Couette Flow: The Movie!” Nov 2019
- Professor Dave Explains Nov 2019
- “Get to Know a UCLA Scientist #1: Geophysicist Jon Aurnou”
On-camera interview

SKILLS **Data Analysis & Numerical Simulations**

- Julia, MATLAB, Python, Mathematica, Java, L^AT_EX.
- Code: Dedalus Project.

Fabrication & Diagnostics

- LabView, Fusion 360, SolidWorks, Moldex3D, CNC and power tools.
- Thermometry, Ultrasonic Doppler Velocimetry, Magnetometry.

PEER-REVIEWED PUBLICATIONS

1. **Xu, Y.**, Horn, S., & Aurnou, J. (2022). Thermoelectric Precession in Turbulent Magnetoconvection. *Journal of Fluid Mechanics*, 930, A8. [Link]
2. Grannan, A., Cheng, J., Aggarwal, A., Hawkins, E., **Xu, Y.**, Horn, S., Sanchez-Alvarez, J., & Aurnou, J. (2022). Experimental pub crawl from Rayleigh-Bénard to magnetostrophic convection. *Journal of Fluid Mechanics*, 939, R1. [Link]
3. **Xu, Y.**, Horn, S., & Aurnou, J. (2023). The Transition from Wall Mode to Multimodal Magnetoconvection in Liquid Gallium *Physics Review Fluids*. In Review.
4. **Xu, Y.**, Abbate, J., David, C., Horn, S., Vogt, T., & Aurnou, J. (2023). Large-scale vortices in liquid metal rotating convection. *Science*. In-prep.
5. Abbate, J., **Xu, Y.**, Vogt, T., Horn, S., Julien, K. & Aurnou, J. (2023). Diffusivity-free heat and momentum transfer in liquid metal rotating convection experiments. In prep.
6. David, C. S., Hester, E. W., **Xu, Y.**, & Aurnou, J. M. (2023). Magneto-Stokes Flow in a Shallow Free-Surface Annulus. *Journal of Fluid Mechanics*. In prep.

CONFERENCE
PUBLICATIONS

1. **Xu, Y.**, Horn, S., & Aurnou, J. (2022). On the hunt for magnetostrophic modes in liquid metal rotating magnetoconvection. *AGU Fall Meeting Abstracts 2022*.
2. Cheng, J., Grannan, A., Aggarwal, A., Hawkins, E., **Xu, Y.**, Horn, S., Sanchez-Alvarez, J., & Aurnou, J. (2022). Experimental Pub Crawl from Rayleigh-Bénard to Magnetostrophic Convection. *AGU Fall Meeting Abstracts 2022*.
3. **Xu, Y.**, Horn, S., & Aurnou, J. (2022). Thermoelectric Liquid Metal Magnetoconvection. *The 17th Symposium of SEDI*.
4. **Xu, Y.**, Horn, S., & Aurnou, J. (2022). On the possibility of CMB thermoelectric dynamics. *2022 Goldschmidt Conference*.
5. **Xu, Y.**, Horn, S., & Aurnou, J. (2022). A laboratory study of turbulent magnetoconvection: Could thermoelectricity induce asymmetry in geo-magnetic secular variation? *EGU General Assembly 2022*.
6. **Xu, Y.**, Horn, S., & Aurnou, J. (2021). Thermoelectric Liquid Metal Magnetoconvection. *AGU Fall Meeting Abstracts 2021*.
7. **Xu, Y.**, Horn, S., & Aurnou, J. (2020). Laboratory Heat Transfer Measurements of Magnetoconvection (MC) in Liquid Gallium: Near-onset Behaviors. *Bulletin of the American Physical Society*.
8. **Xu, Y.**, Horn, S., & Aurnou, J. (2019). Laboratory Measurement of Non-Rotating Magnetoconvection in Liquid Gallium: Wall-mode Onset and Supercritical Precessional Mode. *Bulletin of the American Physical Society*.
9. **Xu, Y.**, Hawkins, E., Horn, S., & Aurnou, J. (2018). Magnetoconvection: Laboratory Experiments in Liquid Gallium. *The 16th Symposium of SEDI*.
10. **Xu, Y.**, Clark, M., Flanagan, K., Milhone, J., Nonn, P., & Forest, C. (2016). Hardening of Metallic Materials Using Plasma Immersion Ion Implantation (PIII). *Bulletin of the American Physical Society*, 61.

REFERENCES Jonathan M. Aurnou

Professor
Department of EPSS
University of California, Los Angeles

Phone: (310)825-2054
E-mail: jona@epss.ucla.edu

Carolina Lithgow-Bertelloni

Professor, Chair
Department of EPSS
University of California, Los Angeles

Phone: (310)267-4719
E-mail: clb@epss.ucla.edu

David Jewitt

Distinguished Professor
Department of EPSS
University of California, Los Angeles

Phone: (310)825-2521
E-mail: jewitt@epss.ucla.edu

James C. McWilliams

Professor
Department of Atmospheric and Oceanic Sciences
University of California, Los Angeles

Phone: (310) 206-2829
E-mail: jcm@atmos.ucla.edu

Cary B. Forest
Professor
Physics Department
University of Wisconsin-Madison

Phone: (608)263-0486
E-mail: cbforest@wisc.edu

Susanne Horn
Associate Professor
Centre for Fluid and Complex Systems
Coventry University, Coventry, UK

E-mail: susanne.horn@coventry.ac.uk