Junyan Zhang

CONTACT INFORMATION

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EMPLOYMENT

National University of Singapore (NUS)

Peng Tsu Ann Assistant Professor (Postdoc), August 1, 2022 $\sim$ July 31, 2025.

- Mentor: Professor Yao Yao.

EDUCATION

Johns Hopkins University (JHU)

Ph.D. in Mathematics, August 27, 2017$\sim$May 22, 2022.

- Dissertation: The Free-Boundary Problems in Inviscid Magnetohydrodynamics with or without Surface Tension.
- Advisor: Professor Hans Lindblad.

University of Science and Technology of China (USTC)

B.Sc. in Mathematics, August 14, 2013$\sim$June 21, 2017.

- Thesis: Inviscid dampimg and Asymptotic Stability of PDEs in fluids.
- Advisor: Professor Lifeng Zhao.

RESEARCH INTERESTS

I study fluid PDEs, especially the free-boundary problems of inviscid fluids, such as water waves with vorticity, MHD, elastodynamics, relativistic fluids, liquid crystals, etc.

- Nonlinear stability of compressible vortex sheets in various kinds of fluids with or without surface tension.
- Incompressible limit of free-surface inviscid fluids, including the case of ill-prepared initial data. This is also viewed as the singular limit of hyperbolic systems whose (free) boundaries are characteristic.
- Singularity or long-time evolution of free-surface inviscid fluids.

PUBLICATIONS & PREPRINTS

1. Junyan Zhang. *Nonlinear Stability and Incompressible Limit of Current-Vortex Sheets with or without Surface Tension in Ideal MHD.* In preparation.
2. Jiawei Wang, Junyan Zhang. *Incompressible Limit of Compressible Ideal MHD with Tangential Magnetic Fields.* Preprint.
3. Chenyun Luo, Junyan Zhang. *Compressible Gravity-Capillary Water Waves with Vorticity: Local Well-posedness, Incompressible and Zero-Surface-Tension Limits.* arxiv: 2211.03600 preprint.
4. Xumin Gu, Chenyun Luo, Junyan Zhang. *Zero Surface Tension Limit of the Free-Boundary Problem in Incompressible Magnetodynamics.* **Nonlinearity**, 35(12), 6349-6398 (2022).
5. Hans Lindblad, Junyan Zhang. *Anisotropic Regularity of the Free-Boundary Problem in Compressible Ideal Magnetohydrodynamics.* Accepted by **Arch. Rational Mech. Anal.** arxiv: 2106.12173.
6. Xumin Gu, Chenyun Luo, Junyan Zhang. *Local Well-posedness of the Free-Boundary Incompressible Magnetohydrodynamics with Surface Tension.* Accepted by **J. Math. Pures Appl.** arxiv: 2105.00596.
7. Junyan Zhang. *Local Well-posedness and Incompressible Limit of the Free-Boundary*

Problem in Compressible Elastodynamics. **Arch. Rational Mech. Anal.**, 244(3), 599-697 (2022).

8. Junyan Zhang. *Local Well-posedness of the Free-Boundary Problem in Compressible Resistive Magnetohydrodynamics.* **Calc. Var. Partial Differ. Equ.**, 62(4):124 (2023).
9. Chenyun Luo, Junyan Zhang. *Local Well-posedness for the Motion of a Compressible Gravity Water Wave with Vorticity.* **J. Differ. Eq.**, Vol. 332, 333-403 (2022). (This paper was first released and submitted on April 12, 2020.)
10. Junyan Zhang. *A priori Estimates for the Free-Boundary problem of Compressible Resistive MHD Equations and Incompressible Limit.* arxiv: 1911.04928 preprint.
11. Chenyun Luo, Junyan Zhang. *A priori Estimates for the Incompressible Free-Boundary Magnetohydrodynamics Equations with Surface Tension.* **SIAM J. Math. Anal.**, 53(2), 2595-2630 (2021).
12. Chenyun Luo, Junyan Zhang. *A Regularity Result for the Incompressible Magnetohydrodynamics Equations with Free Surface Boundary.* **Nonlinearity**, 33(4), 1499-1527 (2020).

Referee Services

So far I have been a reviewer for the following journals.

- Arch. Rational Mech. Anal.(2), SIAM J. Math. Anal.(1), Nonlinearity(2).

Invited Talks and Mini-Courses

- *The Free-boundary Problems in Inviscid Compressible Fluids (Mini-Course)*, University of Science and Technology of China, June 28–29 2023.
- *On the motion of compressible gravity-capillary water waves with vorticity*:
  PDE & Scientific computing seminar, National University of Singapore, Aug 26 2022.
  Institute of Mathematical Sciences, The Chinese University of Hong Kong, May 19 2023.
- *Local well-posedness of incompressible ideal MHD with surface tension*. PDE seminar organised by Looi Shi-Zhuo, March 23 2022.
- *Anisotropic regularity of free-boundary compressible ideal MHD*:
  Institute of Mathematical Sciences, The Chinese University of Hong Kong, Oct 14 2021;
  Analysis & PDE Seminar, UC Berkeley, Oct 25 2021;
  PDE Seminar, Vanderbilt University, Nov 5 2021;
  Analysis of Fluids Seminar, Princeton University, Feb 17 2021.
- *Local well-posedness and incompressible limit of free-boundary compressible elastodynamics*, Webinar on APDE, June 5 2021.
- *Local well-posedness and incompressible limit of the free-boundary compressible resistive MHD equations*, Wuhan University, Jan 10 2021.
- *Local well-posedness for the motion of compressible gravity water wave*, University of Science and Technology of China, Nov 6 2020.
- *On the free-boundary problem of MHD equations with or without surface tension*, University of Science and Technology of China, Dec 23 2019.
- *On the Incompressible MHD with or without Surface Tension*, Institute of Mathematics, Chinese Academy of Sciences, May 23 2019.

Academic Visiting

- The Chinese University of Hong Kong. May 10 2023-June 10 2023.

Conferences & Workshops Attended

- *Mathematics of Fluid Dynamics program*, UC Berkeley MSRI, Jan-May 2021 (online due to the COVID-19 pandemic).
- *Long Time Behavior and Singularity Formation in PDEs*, New York University Abu Dhabi, May 2020 and Dec 2020 (online due to the COVID-19 pandemic).
- *2019 Southern California Analysis and PDE Conference*, UCSD, November 2019.
- *Summer School on Mathematical General Relativity and the Geometric Analysis of Waves of Fluids*, MIT, June 2018.

TEACHING

National University of Singapore (Instructor)

2023 Spring	Partial Differential Equations
2024 Spring	Partial Differential Equations

Johns Hopkins University (TA/Grader)

2022 Spring	Honor Analysis II, ODE
2021 Fall	Introduction to Proofs, Graduate Real Analysis
2020 Fall	Honor Analysis I, ODE
2020 Spring	Honor Analysis II, Undergrad PDE
2019 Fall	Honor Analysis I, Graduate Real Analysis
2019 Spring	Honor Analysis II, Calculus II (Engineering)
2018 Fall	Calculus II (Engineering)
2018 Spring	Undergrad PDE
2017 Fall	Undergrad Complex Analysis, Calculus I (Engineering)

University of Science and Technology of China (TA)

2017 Spring	Differential Equations II (Graduate)
2016 Fall	Advanced Real Analysis (Graduate)
2016 Spring	Honor Real Analysis

HONORS AND AWARDS

Johns Hopkins University

2021	Professor Joel Dean Excellence in Teaching Award for TAs.
2017-Now	Full tuition fellowship and Teaching assistantship.

University of Science and Technology of China

2017	Outstanding Undergraduates
2016, 2017	Outstanding Teaching Assistant
2016	Huang Yu Honored Scholarship
2015	First Prize in The Chinese Mathematics Competitions
	Zhang Zong-zhi Sci-Tech Scholarship
2013, 2014	Silver Prize, Outstanding Freshmen/Undergraduates Scholarship

CITIZENSHIP

Chinese (The People's Republic of China).

RELEVANT SKILLS

Languages: Chinese(native), English(fluent)

REFERENCES

- **Zhouping Xin** (leading expert), Executive Director & William M. W. Mong Professor of Mathematics, The Chinese University of Hong Kong.
  Email: `zpxin@ims.cuhk.edu.hk`
- **Yao Yao** (postdoc mentor), Associate Professor of Department of Mathematics, National University of Singapore.
  Email: `yaoyao@nus.edu.sg`
- **Hans Lindblad** (Ph.D. advisor), Professor of Department of Mathematics, Johns Hopkins University.
  Email: `lindblad@math.jhu.edu`
- **Chenyun Luo** (collaborator), Assistant Professor of Department of Mathematics, The Chinese University of Hong Kong.
  Email: `cluo@math.cuhk.edu.hk`