

Junyan Zhang

CONTACT INFORMATION

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University of Singapore, Singapore 119076.
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EMPLOYMENT

National University of Singapore (NUS)

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

- Mentor: Professor Yao Yao.

EDUCATION

Johns Hopkins University (JHU)

Ph.D. in Mathematics, August 27, 2017~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~June 21, 2017.

- Thesis: Inviscid damping 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](https://arxiv.org/abs/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*. [arxiv: 2106.12173](https://arxiv.org/abs/2106.12173) preprint.
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](https://arxiv.org/abs/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)

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| 2023 Spring | Partial Differential Equations |
| 2024 Spring | Partial Differential Equations |

Johns Hopkins University (TA/Grader)

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| 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)

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

HONORS AND AWARDS

Johns Hopkins University

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| 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

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| 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 |

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| CITIZENSHIP | Chinese (The People's Republic of China). |
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| RELEVANT SKILLS | Languages: Chinese(native), English(fluent) |
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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