

Hanpu Liu

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Education

Peking University

BSc PHYSICS (EXPECTED IN SPRING 2024)

- Major GPA: 3.92/4.00

University of California, Berkeley

EXCHANGE PROGRAM

China

Aug 2020 - Present

California, USA

Aug 2022 - Dec 2022

Research Experience

Hydrodynamical Instabilities in Protoplanetary Disks

ADVISOR: PROF. XUE-NING BAI

- Calculated unstable linear wave modes in turbulent dust-trapping rings
- Conducted Athena++ multifluid dust simulations in 2D and 3D
- Demonstrated links between the instabilities and planet formation

Tsinghua Univ., Beijing, China

2022 - 2023

Parametric Inference with Machine-Learning-Based Disk Image Prediction Models

ADVISOR: DR. GASPARD DUCHÊNE

- Evaluated high-dimensional and multi-modal posteriors with parallel tempering MCMC
- Designed Gaussian process kernels to handle correlated image fitting residuals
- Developed a full physical parameter estimation pipeline of disks imaged by HST, with extensions to ALMA and JWST

Univ. of California, Berkeley, CA

2022 - 2023

Observational Diagnostics of Outbursting Protoplanetary Disks

ADVISOR: PROF. GREGORY J. HERCZEG

- Built multi-component emission models of viscously heated disks
- Synthesized model photometry & spectra and fit to data
- Proposed color- and spectral line-based criteria to search for outbursting disk candidates

Peking Univ., Beijing, China

2021 - 2022

Publications

PUBLISHED

Liu, H., Herczeg, G.J., Johnstone, D., et al. 2022, ApJ, 936, 152: *Diagnosing FU Ori-like Sources: The Parameter Space of Viscously Heated Disks in the Optical and Near-infrared*

Contreras Peña, C., Herczeg, G.J., Ashraf, M., ..., **Liu, H.**, et al. 2023, MNRAS, 521, 4: *Photometric and spectroscopic monitoring of YSOs in nearby star-forming regions - I. Eruptive YSOs*

IN REVIEW

Liu, H., Bai, X.-N. 2023, MNRAS: *The Dusty Rossby Wave Instability (DRWI): Linear Analysis and Simulations of Turbulent Dust-Trapping Rings in Protoplanetary Discs*

IN PREP

Ashraf, M., Jose, J., Herczeg, G.J., ..., **Liu, H.**, et al. 2023, MNRAS: *An Outburst and FUor-like Disk of a Former Low Luminosity Protostar*

Coursework & Skills

Physics - Classical Mechanics, Electromagnetism, Quantum Mechanics, Statistical Mechanics and Thermal Physics, Optics

Astrophysics - Fluid Dynamics, Protoplanetary Disks, Planet Formation, AGN-Black Hole Co-evolution (TBD)

Mathematics - Calculus, Ordinary & Partial Differential Equations, Linear Algebra, Complex Analysis, Numerical Analysis

Data Science & Statistics - Frequentist & Bayesian Statistics, Machine Learning, AI for Science

Computer Science - *Programming languages*: Python, C++, MATLAB - *Operating Systems*: Linux, Mac OS, Windows - *High-Performance Computing*: distributed/shared memory parallelization

Softwares - Astropy, Athena++, emcee, PyTorch, LaTeX, Git

Honors & Scholarships

2023	Outstanding Young Scholar (Top 1% in College) , Yuanpei College, Peking University Yang Jinfang Scholarship for International Exchange , Peking University	¥20,000
2022	Academic Innovation Award (Top 1% in Peking University) , Peking University Merit Student (Top 5% in Peking University) , Peking University Shu Qi Scholarship for Astronomy & Physics , Peking University	¥4,000
2021	Pacemaker to Merit Student (Top 1% in Peking University) , Peking University National Scholarship (Top 1% in Peking University) , Ministry of Education, China	¥8,000

Presentations

Poster: *Diagnosing FU Ori-like Sources: The Parameter Space of Viscously Heated Disks in the Optical and Near-infrared*. Protopostars and Planets VII (international conference), Kyoto, Japan, Apr 2023.

Poster: *AI for science: Super-Resolution Imaging*. School of Mathematical Sciences, Peking University, Beijing, China, Jun 2023.

Seminar: *Near-Infrared Interferometry of Protoplanetary Disks*. Department of Astronomy, Peking University, Beijing, China, Oct 2021.

Professional Service & Development

PEER REVIEW

2023 **MNRAS**, reviewer in training: contributed to quality and clarity assessment of a manuscript

OUTREACH

Student ambassador: *Peking University Open House*, counseled prospective students on physics studies and academic career, Jun - Jul 2023.

Interview: *Embracing the World as a Student Researcher*, presented experience in education abroad program on college official media, Apr 2023.

DEVELOPMENT

Summer school: *Protoplanetary disks and Planet Formation*, studied observational diagnostics, physical processes and latest techniques in depth, Aug 2022.