Shangjia Zhang

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EDUCATION

University of Nevada, Las Vegas, Nevada, USA

- Ph.D in Astronomy — Aug 2018 – Present
- Advisor: Prof. Zhaohuan Zhu

University of Michigan, Ann Arbor, Michigan, USA

- B.S. in Astronomy — Sep 2016 – Apr 2018
- B.S. in Physics
  - Cumulative GPA: 4.0 / 4.0, graduate with Highest Distinction
- Advisor: Prof. Lee Hartmann

Nanjing University, Nanjing, Jiangsu, China

- B.S. in Astronomy — Aug 2014 – Jul 2016
  - Overall GPA: 4.61 / 5.00
  - Rank No.1 at **School of Astronomy and Space Science** (1/46)

RESEARCH INTERESTS

I study *planet formation* by bridging observations and numerical simulations. I constrain *young planet populations* using statistical and *machine learning* techniques applied to observed substructures among hundreds of protoplanetary disks. I also explore the critical role of *self-consistent dust and thermal structures* in shaping disk morphology and kinematics using state-of-the-art *radiation-hydrodynamic* simulations.

PUBLICATIONS

First-author paper citations: 361, h-index: 6; **all paper citations**: 2597, h-index: 17.

As leading author:

[1] **Zhang S.**, Zhu, Z., Jiang, Y.-F., "Vertical Shear Instability with Stellar Irradiation in Protoplanetary Disks" 2023, *MNRAS*, in prep

[2] **Zhang S.**, Zhu, Z. et al. "Porous Particles in Protoplanetary Disks: Application to the HL Tau Disk" 2023, *ApJ*, 953, 96

[3] **Zhang S.**, Kalscheur, M. et al. "Substructures in Compact Disks of the Taurus Star-forming Region" 2023, *ApJ*, 952, 108

[4] **Zhang S.**, Zhu, Z. and Kang, M. "PGNets: Planet mass prediction using convolutional neural networks for radio continuum observations of protoplanetary disks" 2022, *MNRAS*, 510, 4473

[5] **Zhang S.**, Hu, X., Zhu, Z., and Bae, J. "Self-consistent ring model in protoplanetary disks: temperature dips and substructure formation" 2021, *ApJ*, 923, 70

[6] **Zhang S.** and Zhu, Z. "The effects of disk self-gravity and radiative cooling on the formation of gaps and spirals by young planets" 2020, *MNRAS*, 493, 2287

[7] Zhu, Z., **Zhang S.**, et al. "One Solution to the Mass Budget Problem for Planet Formation: Optically Thick Disks with Dust Scattering" 2019, *ApJL*, 877, L18

[8] **Zhang S.** and Zhu, Z. et al. "The Disk Substructures at High Angular Resolution Project (DSHARP). VII. The Planet–Disk Interactions Interpretation" 2018, *ApJL*, 869, L47

[9] **Zhang S.**, and Hartmann, L. and Zamora-Avilés, M. and Kuznetsova, A. "On estimating angular momenta of infalling protostellar cores from observations" 2018, *MNRAS*, 480, 5495

As contributing author:

[1] Wallack, N.et al., including **Zhang S.** "Survey of Protoplanetary Disks Using the Keck/NIRC2 Vortex Coronagraph" 2023, *ApJ*, in press

[2] Long, F., Andrews, S., **Zhang S.** et al. "ALMA Detection of Dust Trapping around Lagrangian Points in the LkCa 15 Disk" 2022, *ApJL*, 937, 1L

[3] Burrill, Benjamin P. et al., including **Zhang S.** "Investigating the Future Potential of an Upgraded ALMA to Image Planet-forming Disks at Sub-astronomical-unit Scales" 2022, *ApJ*, 928, 40

[4] Andrews, S., Elder, W., **Zhang S.**, et al. "Limits on Millimeter Continuum Emission from Circumplanetary Material in the DSHARP Disks" 2021, *ApJ*, 916, 51

[5] Ueda, T., Kataoka, A., **Zhang S.**, et al. "Impact of Differential Dust Settling on the SED and Polarization: Application to the Inner Region of the HL Tau Disk" 2021, *ApJ*, 913, 117

[6] Jorquera, S. et al., including **Zhang S.** "A search for companions via direct imaging in the DSHARP planet-forming disks" 2021, *AJ*, 161, 146

[7] Harter, S., Ricci, L., **Zhang S.**, Zhu, Z. "Imaging the Dusty Substructures due to Terrestrial Planets in Planet-forming Disks with ALMA and the Next-generation Very Large Array" 2020, *ApJ*, 891, 48

[8] Huang, J. et al., including **Zhang S.** "A Multifrequency ALMA Characterization of Substructures in the GM Aur Protoplanetary Disk" 2020, *ApJ*, 891, 48

[9] Andrews, S. M. et al., including **Zhang S.** "The Disk Substructures at High Angular Resolution Project (DSHARP). I. Motivation, Sample, Calibration, and Overview" 2018, *ApJL*, 869, L41

[10] Huang, J. et al., including **Zhang S.** "The Disk Substructures at High Angular Resolution Project (DSHARP). II. Characteristics of Annular Substructures" 2018, *ApJL*, 869, L42

[11] Huang, J. et al., including **Zhang S.** "The Disk Substructures at High Angular Resolution Project (DSHARP). III. Spiral Structures in the Millimeter Continuum of the Elias 27, IM Lup, and WaOph 6 Disks" 2018, *ApJL*, 869, L43

[12] Kurtovic, N. and Pérez, L. M. et al., including **Zhang S.** "The Disk Substructures at High Angular Resolution Project (DSHARP). IV. Characterizing Substructures and Interactions in Disks around Multiple Star Systems" 2018, *ApJL*, 869, L44

[13] Birnstiel, T. et al. including **Zhang S.** "The Disk Substructures at High Angular Resolution Project (DSHARP). V. Interpreting ALMA Maps of Protoplanetary Disks in Terms of a Dust Model" 2018, *ApJL*, 869, L45

[14] Dullemond, C. P. et al. including **Zhang S.** "The Disk Substructures at High Angular Resolution Project (DSHARP). VI. Dust Trapping in Thin-ringed Protoplanetary Disks" 2018, *ApJL*, 869, L46

[15] Guzmán et al., V. V. et al., including **Zhang S.** "The Disk Substructures at High Angular Resolution Program (DSHARP). VIII. The Rich Ringed Substructures in the AS 209 Disk" 2018, *ApJL*, 869, L48

[16] Isella et al., A., et al., including **Zhang S.** "The Disk Substructures at High Angular Resolution Project (DSHARP). IX. A High-definition Study of the HD 163296 Planet-forming Disk" 2018, *ApJL*, 869, L49

[17] Pérez et al., L. et al., including **Zhang S.** "The Disk Substructures at High Angular Resolution Project (DSHARP). X. Multiple Rings, a Misaligned Inner Disk, and a Bright Arc in the Disk around the T Tauri star HD 143006" 2018, *ApJL*, 869, L50

[18] Li J.-T., Bregman J. N., Wang Q. D., Crain R. A., Anderson M. E. & **Zhang S.** "The Circum-Galactic Medium of MASsive Spirals II: Probing the Nature of Hot Gaseous Halo around the Most Massive Isolated Spiral Galaxies." 2017, *ApJS*, 233, 20

SELECTED TALKS

[1] *Princeton Thunch*, Princeton, NJ, Oct 2023.
[2] *U. of Hawaii SPLAT Talk*, Honolulu, HI, Sep 2023.
[2] *CfA SMA Seminars*, Cambridge, MA, Sep 2023.
[3] *Harvard ITC Lunch Talk*, Cambridge, MA, Sep 2023.
[4] *Origin Seminars at University of Arizona*, Tuscon, AZ, Sep 2023.
[5] *Emerging Researchers in Exoplanet Science (ERES)*, Yale, New Haven, CT, Jun 2023.
[6] *Athena++ workshop*, Flatiron Institute, New York, NY, May 2023.
[7] *Planet Formation Group Meeting*, Flatiron Institute, New York, NY, (online) Jan 2023.
[8] *Planet Formation Group Meeting*, Victoria, BC, Canada, (online) Feb 2022.
[9] *Planet Formation Group Meeting*, Flatiron Institute, New York, NY, (online) Feb 2022.
[10] *Star and Planet Formation Seminar*, Ann Arbor, MI (online) Jan 2022.
[11] *Caltech Direct Imaging Group*, Pasadena, CA (online) Dec 2021.
[12] *New paradigms for radiatively efficient accretion disks*, New York, NY, Dec 2021.
[13] *STAR FORMATION: FROM CLOUDS TO DISCS - A Tribute to the Career of Lee Hartmann*, Malahide, Ireland, Oct 2021.
[14] *Five years after HL Tau: a new era in planet formation*, online, Dec 2020.
[15] *New Horizons in Planetary Systems*, Victoria, BC, Canada, May 2019.
[16] *233st AAS Meeting Circumstellar Disks Session I*, Seattle, WA, Jan 2019.
[17] *SPF Group Meeting*, , KIAA, Peking University, Beijing, Dec 2018.

SELECTED POSTERS

[1] *GRC and GRS Origins of Solar Systems*, South Hadley, MA, Apr 2023.
[2] *Protostars and Planets VII*, Kyoto, Japan, Apr 2023.
[3] *Exoplanet IV*, Las Vegas, NV, May 2022.
[4] *Kepler and K2 Science Conference V*, Glendale, CA, Mar 2019.
[5] *231st AAS Meeting Poster Session*, Washington, DC, Jan 2018.
[6] *Astronomy Undergraduate Poster Session*, University of Michigan, Ann Arbor, MI, Apr 2017.

SELECTED PRESS RELEASE

[1] "New Evidence Of A Baby Planet In The Making", SpaceRef
[2] "It's a Planet: New Evidence of Baby Planet in the Making", CfA News
[3] "The Birth of Worlds Stunning new images of young planetary systems create a profound cosmic perspective", Scientific American

[4] "Stunning high-resolution images of disks swirling around 20 young stars outside of our solar system reveal new clues on planet formation", Daily Mail
[5] The Epoch of Planet Formation, Times Twenty, NRAO News
[6] "UNLV Study Unlocks Clues to How Planets Form" UNLV News

OUTREACH & SERVICES

Referee of ApJL, ApJ, MNRAS, PASJ Jan 2019 – present (5 in total)
ApJL (The Astrophysical Journal Letters)
ApJ (The Astrophysical Journal)
MNRAS (Monthly Notices of the Royal Astronomical Society)
PASJ (Publications of the Astronomical Society of Japan)
Co-founder, Speaker and Webmaster, Astronomy on Tap, Las Vegas (∼1/season) Oct 2018 – present
Judge of Beal Bank Science Fair, UNLV Mar 2022, Mar 2023
Visualization Specialist, Helping render grid-based simulations to planetarium shows, Beijing Planetarium Sep 2020- Mar 2021
Speaker at Public Outreach Science Seminar, "Mars exploration and planet formation" (in Chinese ∼200 general public audience), Beijing Planetarium Feb 2021
Author for Amateur Astronomer Magazine (in Chinese), "GW Ori: ALMA observation of an interesting three-body system" Oct 2020
Sole Organizer of Astro Coffee and Astro Journal Club, UNLV Aug 2019 – Aug 2020
Presenter at Art in Science Exhibition, UNLV Jan 2020
AAS Astronomy Ambassador Program Class of 2019
Sole Organizer of Lunar Eclipse on the Strip, , Las Vegas Jan 2019
Member, Student Astronomical Society, University of Michigan Sep 2016 – Apr 2018
Student Instructor, International Astronomy Olympiad National Team Intense Training, Beijing Jul 2016
Class President, School of Astronomy and Space Science, Nanjing University Aug 2014 – Jun 2016

SELECTED AWARDS & GRANTS

- UNLV GPSA Travel Fund 2023
- UNLV Office of International Students and Scholars Distinguished Contribution Award 2023
- AAS International Travel Grant 2023
- Russell L. and Brenda Frank Scholarship, University of Nevada, Las Vegas 2022 – 2023
- Future Investigators in NASA Earth and Space Science and Technology (FINESST) 2021 – 2024
  135,000 USD + 75,000 SBU supercomputer hours
- Barrick Graduate Fellowship, University of Nevada, Las Vegas 2020 – 2021
  30,000 USD
- University Honors, University of Michigan 2016 – 2018
- Outstanding Student, Nanjing University 2014 – 2016
- Outstanding Student Leader, Nanjing University 2015 – 2016
  For engaging in class affair as class president.
- Renmin Scholarship, First Prize, Nanjing University Mar 2016
  For top 5% GPA ranking, 3,000 RMB.

- NAOC Scholarship, National Astronomical Observatory, Chinese Academy of Science Mar 2015
  For outstanding astronomy student in China, 3,000 RMB.
- Bronze Medal, 7th International Olympiad on Astronomy and Astrophysics, Volos, Greece Jul 2013
- Gold Medal, VII Asian-Pacific Astronomy Olympiad, Aktobe, Kazakhstan Nov 2011

TEACHING

Physics 151 L General Physics I (Mechanics and Thermal Physics), Lecturer and Grader Spring 2019

Astro 105 Introductory Astronomy Laboratory, Lecturer, Grader and Proctor Spring 2020

SKILLS

(Astrophysical) Computational (Radiation) Fluid Dynamics, Monte Carlo Radiative Transfer, Deep Neural Networks | C, C++ | Python, Tensorflow, IDL | LaTeX, Linux/Unix | MPI, OpenMP, CUDA

SIMULATIONS

Athena++, FARGO, FLASH, LIME, RADMC3D.

STUDENT ADVISING

- **Sarah Harter** Undergraduate student at CSUN (now graduate student at U. Rochester)
  Project: *Imaging the Dusty Substructures due to Terrestrial Planets in Planet-forming Disks with ALMA and the Next-generation Very Large Array*. Co-advised with Prof. Luca Ricci, led to a publication in ApJ.
- **Fiona Han** Undergraduate student at University of Michigan
  Project: *Producing synthetic observations of protosellar cores using global simulations*. Co-advised with Prof. Lee Hartmann and resulted in a poster presentation at the Astronomy Undergraduate Poster Session at the University of Michigan.
- **Stanley Baronett** PhD student at UNLV
  Project: *On multi-band radiation-hydrodynamics in protoplanetary disks*. Starting from the frequency-integrated radiation transport I worked on and exploring the multi-frequency nature of protoplanetary disk thermodynamics. Co-advised with Prof. Zhaohuan Zhu and Dr. Yan-Fei Jiang.

REFERENCES

Prof. Zhaohuan Zhu (PhD Advisor)
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Prof. Lee Hartmann
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Prof. Akimasa Kataoka
National Observatory of Japan
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