# Lingrui Lin, Ph.D. student

I am currently a Ph.D. student in the School of Astronomy and Space Science at Nanjing University. I am very easy-going and open-minded, so please feel free to contact me.


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## Education

2021 – present **Ph.D. student, School of Astronomy and Space Science, Nanjing University**
Goal: *Gas dynamics and star formation of galaxies across the near and far Cosmic time*
Supervisor: *Zhi-Yu Zhang (NJU), Federico Lelli (INAF), Carlos De Breuck (ESO)*

2017 – 2021 **B.Sc., School of Astronomy and Space Science, Nanjing University**
Thesis: *Kinematics of atomic gas in supernova remnant IC 443*
Supervisor: *Zhi-Yu Zhang*

## Research Experience

Sep 23, 2023 – Sep 30, 2023 **Visitor,** Arcetri Astrophysical Observatory, Florence, Italy
Topic: *[C I] kinematics of a high-z radio galaxy: PKS 0529-549*
Host: *Federico Lelli*

Oct 1, 2023 – Dec 22, 2023 **Early-Career Scientific Visitor,** European Southern Observatory (ESO), Garching bei München, Germany
Topic: *[C I] kinematics of a high-z radio galaxy: PKS 0529-549*
Host: *Carlos De Breuck*

## Awards

2018-2020 Top Talent Program Scholarship × 3
2018 National Encouragement Scholarship
National College Mathematics Competition (Second prize, Non-Mathematics Major)
2019 Annual Scholarship of National Astronomical Observatory, Chinese Academy of Sciences
Renmin Scholarship
2021 Linqiao Scholarship (Linbridge Fund, Douglas Nelson Chao Lin)
Outstanding Undergraduate Graduate
President's Special Scholarship for Doctoral Students

## Responsibilities

2017 – 2018 Publicity Department Member, Student Union of NJU Astronomy
Representative for Studies, NJU Astronomy Class 2017
2018 – 2021 Monitor, NJU Astronomy Class 2017
2018 – 2019 Leader, Academic Division of NJU Great Astronomy Fans Association (NJU GAFA)
Captain, NJU Astronomy Table Tennis team

## Responsibilities (continued)

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| 2022 – 2023 | Organization Member, Graduate Student Committee of NJU Astronomy |
| 2024 Spring | Teaching Assistant of Interstellar Medium Lecture, NJU Astronomy |
| 2025 Spring | Teaching Assistant of Astronomical Literature — Reading and Writing, NJU Astronomy |

## Publications

### Refereed papers

1. **L. Lin**, F. Lelli, C. De Breuck, A. Man, Z.-Y. Zhang, P. Santini, A. Marasco, M. Castellano, N. Nesvadba, T. G. Bisbas, H.-T. Huang, and M. Lehnert, "Gas dynamics in an AGN-host galaxy at z $\simeq$ 2.6: Regular rotation, noncircular motions, and mass models," *Astron. Astrophys.*, vol. 693, A91, A91, Jan. 2025. DOI: 10.1051/0004-6361/202450814. arXiv: 2411.08958 [astro-ph.GA].

2. **L. Lin**, Z.-Y. Zhang, J. Wang, P. P. Papadopoulos, Y. Shi, Y. Gong, Y. Sun, Y. Sun, T. G. Bisbas, D. Romano, D. Li, H. B. Liu, K. Qiu, L. Liu, G. Luo, C.-W. Tsai, J. Wu, S. Feng, and B. Zhang, "Inadequate turbulent support in low-metallicity molecular clouds," *Nature Astronomy*, vol. 9, pp. 406–416, Mar. 2025. DOI: 10.1038/s41550-024-02440-3. arXiv: 2501.07636 [astro-ph.GA].

3. W. Wang, C. De Breuck, D. Wylezalek, J. Vernet, M. D. Lehnert, D. Stern, D. S. N. Rupke, N. P. H. Nesvadba, A. Vayner, N. L. Zakamska, **L. Lin**, P. Kukreti, B. Dall'Agnol de Oliveira, and J. T. Groth, "JWST + ALMA ubiquitously discover companion systems within 18 kpc around four z $\approx$ 3.5 luminous radio-loud AGN," *Astron. Astrophys.*, vol. 696, A88, A88, Apr. 2025. DOI: 10.1051/0004-6361/202553668. arXiv: 2502.20442 [astro-ph.GA].

4. H.-T. Huang, A. W. S. Man, F. Lelli, C. De Breuck, L. Ghodsi, Z.-Y. Zhang, **L. Lin**, J. Zhou, T. G. Bisbas, and N. P. H. Nesvadba, "Molecular Gas Mass Measurements of an Active, Starburst Galaxy at z $\approx$ 2.6 Using ALMA Observations of the [C I], CO, and Dust Emission," *Astrophys. J.*, vol. 977, no. 2, 251, p. 251, Dec. 2024. DOI: 10.3847/1538-4357/ad9021. arXiv: 2411.04290 [astro-ph.GA].

5. F. Li, Z.-Y. Zhang, J. Wang, G. Luo, **L. Lin**, and J. Zhou, "Dense gas properties around the centre of the Circinus galaxy," *Mon. Not. R. Astron. Soc.*, vol. 527, no. 1, pp. 531–543, Jan. 2024. DOI: 10.1093/mnras/stad3241.

6. G. Luo, D. Li, Z.-Y. Zhang, T. G. Bisbas, N. Tang, **L. Lin**, Y. Sun, P. Zuo, and J. Zhou, "The CO-dark molecular gas in the cold H I arc," *Astron. Astrophys.*, vol. 685, L12, p. L12, May 2024. DOI: 10.1051/0004-6361/202450067. arXiv: 2405.02055 [astro-ph.GA].

7. Y. Sun, Z.-Y. Zhang, J. Wang, **L. Lin**, P. P. Papadopoulos, D. Romano, S. Feng, Y. Sun, B. Zhang, and F. Matteucci, "An improved method to measure $^{12}C/^{13}C$ and $^{14}N/^{15}N$ abundance ratios: revisiting CN isotopologues in the Galactic outer disc," *Mon. Not. R. Astron. Soc.*, vol. 527, no. 3, pp. 8151–8192, Jan. 2024. DOI: 10.1093/mnras/stad3643. arXiv: 2311.12971 [astro-ph.GA].

8. Y. Deng, Z.-Y. Zhang, P. Zhou, J. Wang, M. Fang, **L. Lin**, F. Bian, Z. Chen, Y. Shi, G. Chen, and H. Li, "Multiple gas phases in supernova remnant IC 443: mapping shocked $H_2$ with VLT/KMOS," *Mon. Not. R. Astron. Soc.*, vol. 518, no. 2, pp. 2320–2340, Jan. 2023. DOI: 10.1093/mnras/stac3139. arXiv: 2210.16909 [astro-ph.GA].

9. F. Lelli, Z.-Y. Zhang, T. G. Bisbas, **L. Lin**, P. Papadopoulos, J. M. Schombert, E. Di Teodoro, A. Marasco, and S. S. McGaugh, "Cold gas disks in main-sequence galaxies at cosmic noon: Low turbulence, flat rotation curves, and disk-halo degeneracy," *Astron. Astrophys.*, vol. 672, A106, A106, Apr. 2023. DOI: 10.1051/0004-6361/202245105. arXiv: 2302.00030 [astro-ph.GA].

10. G. Luo, Z.-Y. Zhang, T. G. Bisbas, D. Li, N. Tang, J. Wang, P. Zhou, P. Zuo, N. Yue, J. Zhou, and **L. Lin**, "Dependence of Chemical Abundance on the Cosmic-Ray Ionization Rate in IC 348," *Astrophys. J.*, vol. 942, no. 2, 101, p. 101, Jan. 2023. DOI: 10.3847/1538-4357/aca657. arXiv: 2211.13380 [astro-ph.GA].

11 L. Zhang, Z.-Y. Zhang, J. W. Nightingale, Z.-C. Zou, X. Cao, C.-W. Tsai, C. Yang, Y. Shi, J. Wang, D. Xu, **L.-R. Lin**, J. Zhou, and R. Li, "Discovery of a radio jet in the Cloverleaf quasar at z = 2.56," *Mon. Not. R. Astron. Soc.*, vol. 524, no. 3, pp. 3671–3682, Sep. 2023. DOI: 10.1093/mnras/stad2069. arXiv: 2212.07027 [astro-ph.GA].

### Conference Proceedings

1 C. De Breuck, B. Emonts, W. Wang, D. Wylezalek, **L. Lin**, H. H. T. Huang, A. W. S. Man, and S. Kolwa, "ALMA observations of high redshift radio galaxies," in *ALMA at 10 years: Past, Present, and Future*, Dec. 2023, 50, p. 50. DOI: 10.5281/zenodo.10244516.

## Telescope Projects

### As the leading contributor

| | |
|---|---|
| ALMA | *An ACA census of Galactic metal-poor molecular clouds (2021)* |
| IRAM NOEMA | *Resolving the gravity-dominated molecular clouds in the outer Galaxy (2023)* |
| SMA | *Galactic metal-poor molecular clouds on sub-pc scales (2022)* |
| IRAM 30-m | *Pebble-sized dust grains in Galactic metal-poor molecular clouds (2020)* |
| | *Dynamic states of molecular clouds in the outer Galaxy (2022)* |
| JCMT | *Exploring the low dust emissivity index of Galactic metal-poor molecular clouds (2021)* |
| | *Dust in shocked regions of Supernova remnant IC 443 (2022)* |
| | *Sub-virial molecular clouds in the outer Milky Way on core to parsec scales: Short-spacing for the SMA (2022)* |
| SMT | *Dynamic states of molecular clouds in the outer Galaxy (2022)* |
| FAST | *Measuring H I Fraction in Galactic Metal-poor Molecular Clouds (2021)* |
| | *A HINSA census towards metal-poor molecular clouds in the Galactic far outer disk (2024)* |
| | *First measurement of HINSA Zeeman effect in the metal-poor Galactic outer disk (2024)* |
| GBT 100-m | *Mapping the CO-dark molecular gas in the outer Galaxy (2023)* |
| | *Resolving the turbulence-deficient molecular clouds in the outer Galaxy (2024)* |
| Effelsberg 100-m | *CO-dark molecular gas in the outer Galaxy (2023)* |

### As an active collaborator (selected)

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| ALMA | *Cold gas and dark matter in massive galaxies at* $z = 4 - 5$ |
| | *Ultradeep C II observations of rotating gas disks at* $z = 4 - 5$ |
| | *Measuring CNO isotopic ratios in the Galactic Outer Disk* |
| FAST | *Atomic Clouds Driven by Galactic Nuclear Wind* |
| VLA | *Cold gas and dark matter in massive galaxies at* $z = 4 - 5$ |
| GBT 100-m | *An OH and CH survey of the molecular clouds in the outer-disk of the Milky Way* |

## Skills

### Astronomical Expertise

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| Radio astronomy | Observation (online experience for SMT, GBT, and Effelsberg) |
| | Data reduction (spectrometer and bolometer; single dish and interferometer) |
| | Single dish and interferometry data combination in U-V plane |

## Skills (continued)

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| Astronomical Tools | *Proficient usage:* GILDAS/CLASS, CASA, CARTA, DS9, $^{3D}$BAROLO, `vcdisk`, Astropy, Photutils, MONTAGE |
| | *Basic usage:* GILDAS/PIIC, Starlink, MIR, Glue |
| Code development | **See more on GitHub: Astronlin**<br>*Highlight: (a)* A Python-based pipeline (FAST InterStellar H I, FISH) to calibrate the raw data of FAST 500-m telescope; *(b)* An MCMC-based H I NSA fitting code; |

### Technical Skills

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| Coding | Python (proficient), Fortran (basic), C++ (basic), IDL (basic), HTML (basic) |
| Operating System | Linux (maintainer for the Ubuntu/CentOS servers and the remote connection in the NJU group), Mac OS (PC), Windows (PC) |
| Text Editor | Vim (proficient), LaTeX (proficient), Microsoft Word (proficient) |

### Miscellaneous

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|---|---|
| Languages | Mandarin Chinese (Native), English (Fluent) |
| Sports | Table tennis/ping-pong (advanced), Swimming (proficient), Basketball (competent), Badminton (competent), Tennis (novice) |
| Photograph | Adobe Photoshop/Camera Raw, Adobe Premiere |