

Hengyue Zhang

PhD student, sub-department of Astrophysics, University of Oxford

Email: hengyue.zhang@physics.ox.ac.uk

Personal website: <https://hengyuez.github.io/>

Education

DPhil in Astrophysics, University of Oxford

10/2022 - Present

- Balliol College JT Hamilton Scholarship
- STFC studentship
- Supervisor: Martin Bureau
- Thesis: Weighing supermassive black holes
- Visiting researcher at the University of Montreal from 09/2024 to 12/2024

B.S. in Physics, University of California, Santa Barbara

09/2018 - 03/2022

- GPA: 4.00/4.00
 - 2022 Arnold Nordsieck Memorial Award (for one graduating senior who shows research promise)
 - Honors student of College of Letters and Science
 - Dean's Honors
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Research Summary

Current research focus: (1) Dynamical measurements of SMBH masses from the local universe to high redshifts using molecular-gas-dynamical modelling of high-resolution ALMA observations. (2) Co-evolution of SMBHs and galaxies across cosmic time.

Ongoing projects: (1) The most precise SMBH mass measurements in the local universe from high-resolution ALMA observations; (2) The first dynamical SMBH mass measurements at high redshifts enabled by strong gravitational lensing.

Other interests: (1) Detecting extrasolar planets via direct imaging; (2) Measuring dynamical masses of directly imaged stellar binaries; (3) Developing novel data analysis tools for astronomy.

Publication summary: 12 papers in peer-reviewed academic journals, including five first-author papers.

Publications

First author:

1. *WISDOM Project - XXV. Improving the CO-dynamical supermassive black hole mass measurement in the galaxy NGC 1574 using high spatial resolution ALMA observations*
Zhang H., Bureau M., Ruffa I., Davis T. A., Dominiak P., Elford J. S., Lelli F., Williams T. G., 2025, MNRAS, 541, 2540
2. *WISDOM Project - XXII. A 5% precision CO-dynamical supermassive black hole mass measurement in the galaxy NGC 383*
Zhang H., Bureau M., Ruffa I., Cappellari M., Davis T. A., Dominiak P., Elford J. S., Iguchi S., Lelli F., Sarzi M., Williams T. G., 2025, MNRAS, 537, 520
3. *WISDOM Project - XIX. Figures of Merit for Supermassive Black Hole Mass Measurements Using Molecular Gas and/or Megamaser Kinematics*
Zhang H., Bureau M., Smith M. D., Cappellari M., Davis T. A., Dominiak P., Elford J. S., Liang F.-H., Ruffa I., Williams T. G., 2024, MNRAS, 530, 3240
4. *Dynamical Masses and Ages of Sirius-like Systems*
Zhang H., Brandt T. D., Kiman R., Venner A., An Q., Chen M., Li Y., 2023, MNRAS, 524, 695
5. *Cleaning Images with Gaussian Process Regression*
Zhang H. & Brandt T. D., 2021, AJ, 162, 139

Other:

1. *WISDOM Project - XXV. Cross-checking Supermassive Black Hole Mass Estimates from ALMA CO Gas Kinematics and SINFONI Stellar Kinematics in the Galaxy NGC4751*
Dominiak P., Cappellari M., Bureau M., Davis T. A., Sarzi M., Ruffa I., Iguchi S., Williams T. G., **Zhang H.**, 2025, MNRAS, 542, 2039
2. *WISDOM project - XXIII. Star-formation efficiencies of eight early-type galaxies and bulges observed with SITELLE and ALMA*
Lu A., Haggard D., Bureau M., Gensior J., Robert C., Williams T.G., Liang F.-H., Choi W., Davis T. A., Ruffa I., Babic S., Boyce H., Cappellari M., Cheung B., Drissen L., Elford J. S., Martin T., Rhea C., Rousseau-Nepton L., Sarzi M., **Zhang H.**, 2025, MNRAS, 540, 71
3. *A Fundamental Plane of Black Hole Accretion at Millimetre Wavelengths*
Ruffa I., Davis T. A., Elford J. S., Bureau M., Cappellari M., Gensior J., Haggard D., Iguchi S., Lelli F., Liang F.-H., Liu L., Sarzi M., Williams T. G., **Zhang H.**, 2024, MNRAS, 528, L76
4. *WISDOM Project - XVIII. Molecular Gas Distributions and Kinematics of Three Megamaser Galaxies*
Liang F.-H., Smith M. D., Bureau M., Gao F., Davis T. A., Cappellari M., Elford J. S., Greene J. E., Iguchi S., Lelli F., Lu A., Ruffa I., Williams T. G., **Zhang H.**, 2024, MNRAS, 527, 9343
5. *WISDOM Project - XVII. Beam-by-beam Properties of the Molecular Gas in Early-type Galaxies*
Williams T. G., Bureau M., Davis T. A., Cappellari M., Choi W., Elford J. S., Iguchi S., Gensior J., Liang F.-H., Lu A., Ruffa I., **Zhang H.**, 2023, MNRAS, 525, 4270
6. *Surveying nearby brown dwarfs with HGCA: direct imaging discovery of a faint, high-mass brown dwarf orbiting HD 176535 A*
Li Y., Brandt T. D., Brandt G. M., An Q., Franson K., Dupuy T. J., Chen M., Bowens-Rubin R., Lewis B. L., Bowler B. P., Gibbs A., Kiman R., Faherty J., Currie T., Jensen-Clem, R., **Zhang H.**, Contreras-Martinez E., Fitzgerald M. P., Mazin B. A., Millar-Blanchaer M., 2023, MNRAS, 522, 5622
7. *Precise dynamical masses of new directly imaged companions from combining relative astrometry, radial velocities, and HIPPARCOS-Gaia eDR3 accelerations*
Rickman E. L., Matthews E., Ceva W., Segransan D., Brandt G. M., **Zhang H.**, Brandt T. D., Forveille T., Hagelberg J., Udry S., 2022, A&A, 668, A140

Talks and Posters

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| IAU Symposium #396: Massive Galaxies across the Universe / Contributed poster | 06/2025 |
| <i>"Accurate supermassive black hole mass measurements from the local universe to high redshifts using ALMA molecular gas kinematics"</i> | |
| Shanghai Jiaotong University Department of Astronomy Seminar / Invited talk | 01/2025 |
| <i>"The most precise and the most distant supermassive black hole masses ever measured"</i> | |
| Shanghai Normal University Seminar / Invited talk | 01/2025 |
| <i>"The most precise and the most distant supermassive black hole masses ever measured"</i> | |
| Tsinghua University Department of Astronomy Seminar / Invited talk | 09/2024 |
| <i>"A precise measurement of the supermassive black hole mass in the galaxy NGC 383 using molecular gas kinematics down to the circumnuclear disc"</i> | |
| Shanghai Astronomical Observatory Astrophysics Colloquium / Invited talk | 09/2024 |
| <i>"A precise measurement of the supermassive black hole mass in the galaxy NGC 383 using molecular gas kinematics down to the circumnuclear disc"</i> | |
| 2024 National Astronomy Meeting / Contributed talk | 07/2024 |
| <i>"A precise measurement of the supermassive black hole mass in the galaxy NGC 383 using molecular gas kinematics down to the circumnuclear disc"</i> | |

Accepted Observing Programs

Principal Investigator / ALMA Project 2025.1.01248.S

Cycle 12 (5.3 h)

*"A gas-dynamical SMBH mass measurement at $z=4.23$: probing the sphere of influence of SPT0113 at ~ 50 pc resolution"***Principal Investigator** / ALMA Project 2025.1.00772.S

Cycle 12 (1.1 h)

*"First dynamical supermassive black hole mass measurement at $z \sim 4$: resolving the lensed sphere of influence of ID141"***Principal Investigator** / ALMA Project 2024.1.01711.S

Cycle 11 (8.6 h)

*"First dynamical supermassive black hole mass measurement at $z \sim 4$: resolving the sphere of influence of a $z=4.24$ galaxy"***Co-Investigator** / ALMA Project 2023.1.01084.S

Cycle 10 (18.2 h)

"Identifying targets for cross-checking black hole mass measurements"

Telescope Experience

ALMA: proposal planning, data reduction, imaging, visibility-space modelling, data analysis**JWST**: proposal planning, multi-filter image analysis**HST**: multi-filter image analysis**Keck / NIRC2**: angular differential imaging, coronagraph imaging

Coding Experience

Programming languages: Python (proficient), R (intermediate), SQL (intermediate), IDL (intermediate)**Packages developed**: Supermage, astrofix**OS**: macOS, Linux, Windows

Awards and Scholarships

- STFC LTA Travel Funding 2024
 - Balliol College JT Hamilton Scholarship 2022 - 2026
 - STFC studentship 2022 - 2026
 - UCSB Arnold Nordsieck Memorial Award (for one graduating senior student who shows research promise) 2022
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Professional Services

Local Organising Committee member / SMBH and Blue Notes Meeting

07/2025 - Present

Proposal peer reviewer / ALMA

2023, 2024, 2025

Volunteer / Strong Gravitational Lensing Science with LSST Meeting03/2024

Teaching and Outreach

Teaching Fellow / GEC Academy Summer Research Program

06/2023 - 08/2024

Introduced cutting-edge astrophysics research to high-school students, helped them develop scientific research and presentation skills, and tutored them to perform small research projects.

Course titles: (1) Simulating the universe; (2) Orbital motion and detection of extrasolar planets; (3) Quantum Physics

Learning Assistant / UCSB Physics Department

04/2019 - 03/2022

Assisted students with solving worksheet problems and reviewing course material in undergraduate physics discussion sections. Organized group discussions and presentation activities.

Volunteer / UCSB Physics Circus

10/2018 - 03/2022

Presented physics demonstration experiments at local primary schools in Santa Barbara. Created a fun and welcoming space for children to enjoy and learn about science.