Yuhan Yao

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Primary Research Interests

Time domain astronomy, high energy astrophysics, sky surveys

Tidal disruption events, deaths of massive stars; accretion and jet physics; intermediate-mass black holes

Education & Appointments

Miller Postdoctoral Fellow, University of California, Berkeley, USA 2023–Present

Ph.D., Astrophysics, California Institute of Technology, USA 2020–2023

- Thesis: High Energy Transients Powered by Black Holes
- Advisors: Prof. Shrinivas R. Kulkarni & Prof. Fiona A. Harrison

M. Sc., Astrophysics, California Institute of Technology, USA 2018–2020

B. Sc., Astronomy, Peking University, China 2014–2018

Selected Honors & Awards

Miller Fellowship Award, University of California, Berkeley 2023

Garmire Scholarship, Caltech 2021

Study Abroad Scholarship for Outstanding Students, China Scholarship Council 2017

Summer Undergraduate Research Fellowship, Caltech 2017

Successful Observing Proposals as Principal Investigator

Total grants obtained as PI: **$513k**

X-ray 15 proposals: 7 NuSTAR (560 ks), 2 NICER (600 ks), 3 XMM-Newton (293 ks), 3 Chandra (135 ks)

- NuSTAR GO: three (2 × Cycle 7, Cycle 10): totaling 260 ks
- NuSTAR DDT: four (2 × Cycle 6, 2 × Cycle 7): totaling 300 ks
- XMM-Newton GO: two (AO-21, AO-23), totaling 253 ks
- XMM-Newton DDT: one (AO-22), totaling 40 ks
- Chandra GO: one (Cycle 23), totaling 75 ks
- Chandra DDT: two (Cycle 22, Cycle 26), totaling 60 ks
- NICER GO: two (Cycle 4, 5), totaling 600 ks
- NICER DDT: a few, > 100 ks
- Swift ToO: numerous, >400 ks

Optical 2 proposals: P48, Shane (5 nights)

- Palomar 48-inch telescope: ZTF Shadowing SRG survey (5% of ZTF time, 2020/07—2022/02)
- Lick Observatory 3-meter Shane telescope, Kast spectrograph (2024B)

Radio 10 proposals: 9 VLA (92.3 hr), 1 ATCA (78.2 hr)

- VLA Regular: four (23A, 24A, 2 × 25A): totaling 69.3 hr
- VLA DDT: five (2 × 20B, 23B, 2 × 24A): totaling 23 hr
- ATCA: one (2024OCT): totaling 78.2 hr

Press Coverage

NuSTAR Story featuring my study of the jetted TDE AT2022cmc 2024

Caltech magazine featuring my TDE studies in honor of NASA black hole week 2023

NASA-JPL news release and yahoo!news report my study of the TDE AT2021ehb 2022

My presentation on AT2020mrf at the 239th AAS press conference [video] garnered media attention (e.g., Scientific American, Caltech News, Science News, IFLScience, BigThink, spacecom) 2022

Leadership & Professional Service

Scientific Leadership and Membership Roles

Co-chair, LS4 Massive Black Hole science working group	2023-present
Member, Rubin LSST Transients and Variable Stars (TVS) Science Collaboration	2023-present
Member, Advanced X-ray Imaging Satellite (AXIS), NASA APEX Concept	2022-present
Member, UltraViolet EXplorer (UVEX) Mission, NASA MIDEX: launch 2030	2021-present
Member, Zwicky Transient Facility (ZTF)	2018-present

Service

Referee (total ∼10) for Nature, ApJ, ApJ Letters, MNRAS, Open Research Europe	2022-present
Time Allocation committee: Chandra, ALMA	2024
UCB Astronomy Diversity, Equity, Inclusion & Climate Committee Postdoc Representative	2023–2024
Time Allocation Committee: Palomar Hale Telescope, Liverpool Telescope	2020
Co-organizer, Caltech X-ray Club (34 lectures given by PIs or members of X-ray missions)	2020
Student Representative, Caltech Astronomy Colloquium Committee	2019–2021

Publication Summary & Selected Highlights

- **As first author: 12**
- Total: 83 (including 1 white paper and 6 submitted under review)
- Citations: >3000 / >**400**
- h-index: 33 / **11**

First Author Journal Publications

12. **Yao, Y.**, Guolo, M., Tombesi, F., et al., 2024, *Subrelativistic Outflow and Hours-timescale Large-amplitude X-Ray Dips during Super-Eddington Accretion onto a Low-mass Massive Black Hole in the Tidal Disruption Event AT2022lri*, ApJ, 976, 1, PDF
11. **Yao, Y.**, Lu, W., Harrison, F., et al., 2024, *The On-axis Jetted Tidal Disruption Event AT2022cmc: X-Ray Observations and Broadband Spectral Modeling*, ApJ, 965, 1, PDF
10. **Yao, Y.**, Ravi, V., Gezari, S., et al., 2023, *Tidal Disruption Event Demographics with the Zwicky Transient Facility: Volumetric Rates, Luminosity Function, and Implications for the Local Black Hole Mass Function*, ApJL, 955, 1, PDF
9. **Yao, Y.**, Lu, W., Guolo, M., et al., 2022, *The Tidal Disruption Event AT2021ehb: Evidence of Relativistic Disk Reflection, and Rapid Evolution of the Disk-Corona System*, ApJ, 937, 1, PDF
8. **Yao, Y.**, Ho, A., Medvedev, P., et al., 2022, *The X-Ray and Radio Loud Fast Blue Optical Transient AT2020mrf: Implications for an Emerging Class of Engine-driven Massive Star Explosions*, ApJ, 934, 2, PDF
7. **Yao, Y.**, Kulkarni, S., Gendreau, K., et al., 2021, *A Comprehensive X-Ray Report on AT2019wey*, ApJ, 920, 2, PDF
6. **Yao, Y.**, Kulkarni, S., Burdge, K., et al., 2021, *Multi-wavelength Observations of AT2019wey: a New Candidate Black Hole Low-mass X-ray Binary*, ApJ, 920, 2, PDF
5. **Yao, Y.**, De, K., Kasliwal, M., et al., 2020, *SN2019dge: A Helium-rich Ultra-stripped Envelope Supernova*, ApJ, 900, 1, PDF
4. **Yao, Y.**, Miller, A., Kulkarni, S., et al., 2019, *ZTF Early Observations of Type Ia Supernovae. I. Properties of the 2018 Sample*, ApJ, 886, 2, PDF
3. **Yao, Y.**, Feng, H., 2019, *A Wind-disk Self-irradiation Model for Supercritical Accretion*, ApJL, 884, 1, PDF
2. **Yao, Y.**, Meyer, M., Covey, K., et al., 2018, *IN-SYNC. VIII. Primordial Disk Frequencies in NGC 1333, IC 348, and the Orion A Molecular Cloud*, ApJ, 869, 1, PDF

1. **Yao, Y.**, Liu, C., Deng, L., et al., 2017, *Mira Variable Stars from LAMOST DR4 Data: Emission Features, Temperature Types, and Candidate Selection*, ApJS, 232, 1, PDF

Selected Co-author Publications (with Significant Contribution)

12. Somalwar, J., Ravi, V., **Yao, Y.**, et al., 2023, *The first systematically identified repeating partial tidal disruption event*, submitted, arXiv: 2310.03782, PDF
11. Guolo, M., Gezari, S., **Yao, Y.**, et al., 2024, *A Systematic Analysis of the X-Ray Emission in Optically Selected Tidal Disruption Events: Observational Evidence for the Unification of the Optically and X-Ray-selected Populations*, ApJ, 966, 2, PDF
10. Andreoni, I., Coughlin, M., Perley, D., **Yao, Y.**, et al., 2022, *A very luminous jet from the disruption of a star by a massive black hole*, nat, 612, 7940, PDF
9. Ho, A., Perley, D., **Yao, Y.**, et al., 2022, *Cosmological Fast Optical Transients with the Zwicky Transient Facility: A Search for Dirty Fireballs*, ApJ, 938, 1, PDF
8. Perley, D., Sollerman, J., Schulze, S., **Yao, Y.**, et al., 2022, *The Type Icn SN 2021csp: Implications for the Origins of the Fastest Supernovae and the Fates of Wolf-Rayet Stars*, ApJ, 927, 2, PDF
7. Sazonov, S., Gilfanov, M., Medvedev, P., **Yao, Y.**, et al., 2021, *First tidal disruption events discovered by SRG/eROSITA: X-ray/optical properties and X-ray luminosity function at $z < 0.6$*, MNRAS, 508, 3, PDF
6. Perley, D., Ho, A., **Yao, Y.**, et al., 2021, *Real-time discovery of AT2020xnd: a fast, luminous ultraviolet transient with minimal radioactive ejecta*, MNRAS, 508, 4, PDF
5. Yadlapalli, N., Ravi, V., **Yao, Y.**, et al., 2021, *VLBA Discovery of a Resolved Source in the Candidate Black Hole X-Ray Binary AT2019wey*, ApJL, 909, 2, PDF
4. Piro, A., Haynie, A., **Yao, Y.**, 2021, *Shock Cooling Emission from Extended Material Revisited*, ApJ, 909, 2, PDF
3. Miller, A., **Yao, Y.**, Bulla, M., et al., 2020, *ZTF Early Observations of Type Ia Supernovae. II. First Light, the Initial Rise, and Time to Reach Maximum Brightness*, ApJ, 902, 1, PDF
2. Bulla, M., Miller, A., **Yao, Y.**, et al., 2020, *ZTF Early Observations of Type Ia Supernovae. III. Early-time Colors As a Test for Explosion Models and Multiple Populations*, ApJ, 902, 1, PDF
1. Zhou, Y., Feng, H., Ho, L., **Yao, Y.**, et al., 2019, *Evidence for Optically Thick, Eddington-limited Winds Driven by Supercritical Accretion*, ApJ, 871, 1, PDF

Teaching & Mentoring

Teaching

TA for Ay125 at Caltech (graduate course, "High Energy Astrophysics")	Spring 2020
TA for Ay102 at Caltech (undergraduate course, "Physics of ISM", taught 2 lectures)	Winter 2020
TA for Ay121 at Caltech (graduate course, "Radiative Processes")	Fall 2019
TA, GROWTH Summer School)	2019–2020

Student Mentoring

Zoe Kan (pre-PhD student at Hong Kong University) *Late-time X-ray and UV evolution of TDE AT2021ehb*	2024–present
Vismaya Pillai (undergrad at Hong Kong University) *eROSITA and Chandra observations of X-ray loud TDEs* (Caltech SURF program)	2023–2024
David Oliveira (undergrad at Caltech) *Automation of photometric data reduction pipeline at the Kitt Peak 84-inch telescope*	2019–2020
Peer Mentor for Caltech graduate students Zhuyun Zhuang and Sam Ponnada	2019–2021

Selected Recent Invited Talks

Workshop *Towards a Physical Understanding of TDEs*, KITP, Santa Barbara, CA	2024
Conference *Anticipating the Rising Tide of TDEs*, KITP, Santa Barbara, CA	2024

The 21st HEAD Meeting, TDE Special Session, Horseshoe Bay, TX	2024
Cosmology and Astronomy Seminar, UC Davis, CA	2024
Colloquium, Department of Astronomy and Astrophysics, UC Santa Cruz, CA	2024
The 32nd Texas Symposium on Relativistic Astrophysics, Shanghai, China	2023
High Energy and Astrophysics Seminar, University of Utah, Salt Lake City, UT	2023
ZTF Theory Network, Santa Margarita, CA	2023
Workshop on Super-massive Black Holes, Cornell University, Ithaca, NY	2022
AXIS Seminar, Virtual	2022
Seminar, Theoretical Astrophysics Center, UC Berkeley, Berkeley, CA	2022
Seminar, Center for Cosmology and Astroparticle Physics, OSU, Columbus, OH	2022
Colloquium, Department of Astronomy, University of Maryland, College Park, MD	2022
ZTF Theory Network, Santa Margarita, CA	2022
NICER 2022 Proposal and Science Workshop, Online meeting	2022
NuSTAR 10-yr Anniversary Science Meeting, Cagliari, Sardinia, Italy (remote talk)	2022
Explosive Seminar, UC Berkeley, Berkeley, CA	2021

Public Outreach

Speaker, UC Berkeley Astronomy Night	2024
Speaker, Caltech Stargazing Lecture Series	2023
Speaker, 241st AAS AXIS Splinter Session	2023
Speaker, 240th AAS NASA Hyper-wall Booth	2022
Interviewee, KAZN AM1300 Radio Station (in Mandarin)	2021
Speaker, Astronomy on Tap (virtual, in Mandarin)	2021
Speaker, Amateur Astronomical Society	2020
Speaker, ZTF Summer Institute	2019
Volunteer, Caltech Astronomy Outreach Program	2018–2023

Observing Experience

Keck-I telescope, the Low Resolution Imaging Spectrometer (LRIS) – more than 20 nights
Palomar Hale telescope, the Double Spectrograph (DBSP) – more than 20 nights
Keck-II telescope, the Echellette Spectrograph and Imager (ESI) – 8 nights
Lick Shane telescope, the KAST spectrograph – 7 nights