Yuhan Yao

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PRIMARY RESEARCH INTERESTS:

- Time domain astronomy; Observational high energy astrophysics; Sky surveys
- Tidal disruption events; Deaths of massive stars; Accretion and jet physics; Intermediate-mass black holes

EDUCATION & APPOINTMENTS

2020-2023 Ph.D., Astrophysics, California Institute of Technology, USA
Thesis: *High Energy Transients Powered by Black Holes*
Advisors: Prof. Shrinivas R. Kulkarni & Prof. Fiona A. Harrison
2018-2020 M. Sc. Astrophysics, California Institute of Technology, USA
2014-2018 B. Sc. Astronomy, Peking University, China

SELECTED HONORS and AWARDS

2023 Miller Fellowship Award, University of California, Berkeley
2021 Garmire Scholarship, Caltech
2017 Study Abroad Scholarship for Outstanding Students, China Scholarship Council
2017 Summer Undergraduate Research Fellowship, Caltech

SUCCESSFUL PI OBSERVING PROPOSALS

2023 ***NICER*** Cycle 5; *NICER+NuSTAR* Observations of Tidal Disruption Events:
Opening a New Chapter in Black Hole Super-Eddington Accretion (300ks, ToO)
2022 **VLA 2023A:** Opening a New Chapter in Relativistic Tidal Disruption Events (28hr)
NICER Cycle 4 **($44k)**; *NICER* Observation of X-ray Bright Tidal Disruption Events (300ks, ToO)
NuSTAR (DDT); *NuSTAR* observations of the Jetted Tidal Disruption Event AT2022cmc (80ks)
2021 ***NuSTAR*** (DDT); *NuSTAR* observation of the Tidal Disruption Event AT2021ehb (80ks)
NICER (DDT); *NICER* observation of the Tidal Disruption Event AT2021ehb (100ks)
XMM-Newton AO-21 (**$105k**); A Systematic Exploration of Late-time X-rays from ZTF TDEs (298ks)
Chandra Cycle 23 (**$77k**); Late-time *Chandra* Observations of eROSITA Selected TDEs (75ks)
Chandra DDT (**$23k**); *Chandra* Observation of AT2020mrf: the Most X-ray Luminous FBOT (40ks)
NuSTAR Cycle 7 (**$81k**); *NuSTAR* Observations of Tidal Disruption Events" (80ks, ToO)
NuSTAR Cycle 7; Understanding the Central Engine of Luminous FBOTs (80ks, ToO)
2020 ***NuSTAR*** (DDT); *NuSTAR* Observation of the High-Mass X-ray Binary ZTF18abjpmzf (20ks)
NuSTAR (DDT); *NuSTAR* Observations of the Low-Mass X-ray Binary AT2019wey (120ks)
VLA (DDT); VLA observations of AT2019wey (6.3hr)
2018-23 ***Swift*** (ToO); Submitted >60 approved *Swift* observations (>400ks)

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) – 5 nights
Lick Shane telescope, the KAST spectrograph – 3 nights

INVITED CONFERENCE TALKS

2022/10 Workshop on Super-massive Black Holes, Cornell University, Ithaca, NY
Tidal Disruption Events: Recent Advances in X-ray Observations
2022/09 ZTF Theory Network, Santa Margarita, CA
The X-ray Bright Tidal Disruption Event AT2021ehb

2022/09 NICER 2022 Proposal and Science Workshop, Online meeting
Characterizing the Black Hole Candidate AT2019wey using NICER & Multi-wavelength Observations
2022/06 NuSTAR Science Meeting (10-yr Anniversary), Cagliari, Sardinia, Italy (remote talk)
NuSTAR Observations of Tidal Disruption Events

INVITED COLLOQUIUA / SEMINARS

2022/12 AXIS Seminar, Virtual
Studying Tidal Disruption Events and Luminous Fast Blue Optical Transients with AXIS
2022/10 Seminar, Theoretical Astrophysics Center, UC Berkeley, Berkeley, CA
Tidal Disruption Events: Probes of Accretion Physics and Black Hole Demographics
2022/10 Seminar, Center for Cosmology and Astroparticle Physics, Ohio State University, Columbus, OH
The X-ray Bright Tidal Disruption Event AT2021ehb
2022/09 Colloquium, Department of Astronomy, University of Maryland, College Park, MD
Tidal Disruption Events: Probes of Accretion Physics and Black Hole Demographics
2021/12 Explosive Seminar, UC Berkeley, Berkeley, CA
AT2020mrf: A Radio-loud Fast Blue Optical Transient with Luminous Variable X-ray Emission

SELECTION OF CONTRIBUTED TALKS

2023/03 *UVEX* Community Workshop, Pasadena, CA
Studying Tidal Disruption Events with UVEX
2023/01 PhD Dissertation Talk, 241th AAS Meeting, Seattle, WA
Tidal Disruption Events: Probes of Accretion Physics and Black Hole Demographics
2022/06 Theoretical High Energy Astrophysics Group Meeting, U. Columbia, New York, NY
The Spectacular X-ray Tidal Disruption Event AT2021ehb
2021/11 ZTF Collaboration Meeting, virtual
Tidal Disruption Events from ZTF and SRG
2020/10 ZTF Theory Network, virtual
Ultra-stripped Supernovae
2019/08 Hot Wiring Transient VI Meeting, Evanston, IL
Supernovae Experiments conducted by the Zwicky Transient Facility
2019/08 GROWTH Collaboration Meeting, San Diego, CA
Early observations of Type Ia Supernovae by the Zwicky Transient Facility

LEADERSHIP & PROFESSIONAL SERVICE

2022-present	Referee/reviewer for ApJ, MNRAS
2022-present	Member, Advanced X-ray Imaging Satellite (*AXIS*) TDA&MM working group
2021-present	Member, Ultraviolet Explorer (*UVEX*) AGN/TDE working group
2020-21	Organizer, Weekly ZTF AGN/TDE Science Working Group Discussion
2019-21	Co-organizer, Weekly ZTF Caltech Transient Discussion
2020	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)
2019-21	Peer Mentor, Caltech Astronomy Mentorship Program
2019-21	Student Representative, Caltech Astronomy Colloquium Committee

TEACHING

Spring 2020	TA for Ay125 at Caltech (graduate course, “High Energy Astrophysics”)
Winter 2020	TA for Ay102 at Caltech (undergraduate course, “Physics of ISM”, taught 2 lectures)
Fall 2019	TA for Ay121 at Caltech (graduate course, “Radiative Processes”)
2019-20	TA, GROWTH Summer School

PUBLIC OUTREACH

2023 Speaker, Caltech Stargazing Lecture Series, *Fireworks from Black Holes Devouring Stars*
2023 Speaker, 241th AAS AXIS Splinter Session, *Transient Science with the AXIS Probe Mission*
2022 Speaker, 240th AAS NASA Hyper-wall Booth, *NuSTAR: Ten Years of the High Energy Universe in Focus*
2021 Interviewee, KAZN AM1300 Radio Station (in Mandarin), *Life as a Scientist at Caltech*
2021 Speaker, Astronomy on Tap (virtual, in Mandarin), *Searching for Stars Ripped Apart by Black Holes*

2020 Speaker, Amateur Astronomical Society, *Finding Supernovae from Mt. Palomar*
2019 Speaker, ZTF Summer Institute, *Early Observations of Type Ia Supernovae by ZTF*
2018-22 Volunteer, Caltech Astronomy Outreach Program

PRESS CONVERAGE

2022/12 NASA-JPL news-release on my study of AT2021ehb (see a short writeup on yahoo!life)
2022/01 I presented AT2020mrf at the 239th AAS press conference [video], which received some media attention (e.g., Caltech News, Scientific American, Science News, IFLScience, BigThink, spacecom)

PUBLICATION SUMMARY & SELECTED HIGHLIGHTS

- Total / **as first author**: 61 (including 9 submitted under review) / **10 (including 1 submitted under review)**
- Citations: >1300 / **>180**
- h-index: 22 / **7**

First Author Journal Submission

[1] **Yao, Y.**, Ravi, V., Gezari, S., et al. 2023, submitted to ApJ, arxiv: 2303.06523
Tidal Disruption Event Demographics with the Zwicky Transient Facility:
Volumetric Rates, Luminosity Function, and Implications for the Local Black Hole Mass Function

First Author Journal Publications

[9] **Yao, Y.**, Lu, W., Guolo, M. et al. 2022, ApJ, **937**, 8
The Tidal Disruption Event AT2021ehb:
Evidence of Relativistic Disk Reflection, and Rapid Evolution of the Disk—Corona System

[8] **Yao, Y.**, Ho, Y. Q. A., Medvedev, P. et al., 2022, ApJ, **934**, 104
The X-ray and Radio Loud Fast Blue Optical Transient AT2020mrf:
Implications for an Emerging Class of Engine-driven Massive Star Explosions

[7] **Yao, Y.**, Kulkarni S. R., Gendreau, K. C. et al., 2021, ApJ, **920**, 121
A Comprehensive X-ray Report on AT2019wey

[6] **Yao, Y.**, Kulkarni, S. R., Burdge, K. B. et al., 2021, ApJ, **920**, 120
Multi-wavelength Observations of AT2019wey: a New Candidate Black Hole Low-mass X-Ray Binary

[5] **Yao, Y.**, De, K., Kasliwal, M. M. et al., 2020 August 31, ApJ, **900**, 46 (24 pages)
SN2019dge: a Helium-rich Ultra-Stripped Envelope Supernova

[4] **Yao, Y.**, Miller, A. A., Kulkarni, S. R. et al., 2019, ApJ, **886**, 152
ZTF Early Observations of Type Ia Supernovae. I. Properties of the 2018 Sample

[3] **Yao, Y.**, & Feng, H. 2019 October 3, ApJL, **884**, L3
A Wind-disk Self-irradiation model for Supercritical Accretion

[2] **Yao, Y.**, Meyer, M. R., Covey, K. R. et al., 2018, ApJ, **869**, 72
IN-SYNC. VIII. Primordial Disk Frequencies in NGC 1333, IC 348, and the Orion A Molecular Cloud

[1] **Yao, Y.**, Liu, C., Deng, L., et al. 2017, ApJS, **232**, 16
Mira Variable Stars from LAMOST DR4 Data:
Emission Features, Temperature Types, and Candidate Selection

Selected Co-author Publications (with Significant Contribution)

[11] Andreoni, I., Coughlin, M. W., Perley, D. A., **Yao, Y.** et al. 2022, Nature, **612**, 430
A very luminous jet from the disruption of a star by a massive black hole

[10] Ho, Y. Q. A., Perley, D. A., **Yao, Y.** et al. 2022 October 14, ApJ, **938**, 85
Cosmological Fast Optical Transients with the Zwicky Transient Facility: A Search for Dirty Fireballs

[9] Ho, Y. Q. A., Margalit, B., Bremer, M., Perley, D. A., **Yao, Y.** et al., 2022, ApJ, **932**, 116
Luminous Millimeter, Radio, and X-Ray Emission from ZTF 20acigmel (AT 2020xnd)

[8] Perley, D. A., Sollerman, J., Schulze, S., **Yao, Y.** et al., 2022, ApJ, **927**, 180
The Type Icn SN 2021csp:
Implications for the Origins of the Fastest Supernovae and the Fates of Wolf-Rayet Stars

[7] Sazonov, S., Gilfanov, M., Medvedev, P., **Yao, Y.** et al. 2021, MNRAS, **508**, 3820
First tidal disruption events discovered by SRG/eROSITA:

X-ray/optical properties and X-ray luminosity function at z<0.6

[6] Perley, D. A., Ho, Y. Q. A., **Yao, Y.** et al. 2021, MNRAS, **508**, 5138
Real-time Discovery of AT2020xnd: A Fast, Luminous Ultraviolet Transient with Minimal Radioactive Ejecta

[5] Yadlapalli, N., Ravi, V., **Yao, Y.** et al. 2021, ApJL, 909, L27
VLBA Discovery of a Resolved Source in the Candidate Black Hole X-ray Binary AT2019wey

[4] Piro, A. L., Haynie, A., **Yao, Y.** 2021, ApJ, **909**, 209
Shock Cooling Emission from Extended Material Revisited

[3] Bulla, M., Miller, A. A., **Yao, Y.** et al. 2020, ApJ, **902**, 48
ZTF Early Observations of Type Ia Supernovae III:
Early-Time Colors as a Test for Explosion Models and Multiple Populations

[2] Miller, A. A., **Yao, Y.**, Bulla, M. et al. 2020, ApJ, **902**, 47
ZTF Early Observations of Type Ia Supernovae II:
First Light, the Initial Rise, and Time to Reach Maximum Brightness

[1] Zhou, Y., Feng, H., Ho, L. C., **Yao, Y.** 2019, ApJ, **871**, 115
Evidence for Optically Thick, Eddington-limited Winds Driven by Supercritical Accretion