Yuhan Yao

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Research Interests: Time Domain Astronomy & Observational High Energy Astrophysics

- Tidal disruption events: emission mechanisms; rates and demographics; relativistic jets
- Extreme-mass ratio inspirals and gravitational waves with LISA
- Deaths of massive stars: engine-driven explosions; ultra-stripped events; interaction-powered supernovae
- Accretion of black holes across the mass scale; intermediate-mass black holes; seeding mechanisms

Education

PhD Astrophysics, California Institute of Technology, USA 2020-Expected 05/2023
- 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

Publication Record

h-index=**22**, i10-index=**38**. First author refereed papers = **9**: 170 citations
Total refereed papers = **58** (including 8 submitted under review): 1309 citations.

Honors and Awards

Garmire Scholarship, Caltech 2021
Study Abroad Scholarship for Outstanding Students, China Scholarship Council 2017
Benz Scholarship, Peking University 2017
Summer Undergraduate Research Fellowship, Caltech 2017
Kwang-Hua Scholarship, Peking University 2015-16
First Prize in Undergraduate Physics Tournament (8/238), School of Physics, Peking University 2015

Successful Observing Proposals

PI Proposals

NICER Cycle 5; *NICER+NuSTAR* Observations of Tidal Disruption Events: Opening a New Chapter in Black Hole Super-Eddington Accretion (300ks, ToO) 2023
VLA 2023A: *Opening a New Chapter in Relativistic Tidal Disruption Events* (28hr) 2022
NICER Cycle 4 **($44k)**; *NICER* Observation of X-ray Bright Tidal Disruption Events (300ks, ToO) 2022
NuSTAR (DDT); *NuSTAR* observations of the Jetted Tidal Disruption Event AT2022cmc (80ks) 2022
NuSTAR (DDT); *NuSTAR* observation of the Tidal Disruption Event AT2021ehb (80ks) 2022
NICER (DDT); *NICER* observation of the Tidal Disruption Event AT2021ehb (100ks) 2021
XMM-Newton AO-21 (**$105k**); A Systematic Exploration of Late-time X-rays from ZTF TDEs (298ks) 2021
Chandra Cycle 23 (**$77k**); Late-time *Chandra* Observations of eROSITA Selected TDEs (75ks) 2021
Chandra DDT (**$23k**); *Chandra* Observation of AT2020mrf: the Most X-ray Luminous FBOT (40ks) 2021
NuSTAR Cycle 7 (**$81k**); *NuSTAR* Observations of Tidal Disruption Events" (80ks, ToO) 2021
NuSTAR Cycle 7; Understanding the Central Engine of Luminous FBOTs (80ks, ToO) 2021
NuSTAR (DDT); *NuSTAR* Observation of the High-Mass X-ray Binary ZTF18abjpmzf (20ks) 2020
NuSTAR (DDT); *NuSTAR* Observations of the Low-Mass X-ray Binary AT2019wey (120ks) 2020
VLA (DDT); VLA observations of AT2019wey (6.3hr) 2020
Swift (ToO); Submitted >60 approved *Swift* observations (>400ks) 2018-22

Selected co-I Proposals

LRIS (ToO) Rapid Spectroscopy of Young and Fast ZTF Transients 2018-21

LRIS (15 nights)	Time Domain Astronomy with ZTF and *SRG*	2021-22
ESI (8 nights)	The Role of Black Hole Mass on the TDE phenomena	2021-22
Gemini (ToO)	A Rapid Response to the Youngest ZTF Explosions	2019-21
Palomar 48-inch (5% of ZTF time)	The ZTF-*SRG* shadowing survey	2021

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 Colloquia / 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

2023/01 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	Member, Advanced X-ray Imaging Satellite (*AXIS*) TDA&MM working group
2021-present	Member, Ultraviolet Explorer (*UVEX*) AGN/TDE working group
2022	Referee/reviewer for ApJ
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 Coverage

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)

Publications

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