

Yuhan Yao

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Research Interests: Time Domain Astronomy & Observational High Energy Astrophysics

- Tidal disruption events: Origin of X-ray/UV/optical emission; Luminosity function; Relativistic jets
- Deaths of massive stars: Engine-driven explosions; Ultra-stripped events; Interaction-powered supernovae
- Accretion of black holes across the mass scale

Education

PhD Astrophysics, California Institute of Technology, USA	Expected 2023
• Thesis: <i>High Energy Transients with ZTF in the Era of X-ray Missions</i>	
• Advisors: Prof. Shrinivas R. Kulkarni & Prof. Fiona A. Harrison	
M. Sc. Astrophysics, California Institute of Technology, USA	2020
B. Sc. Astronomy, Peking University, China	2018

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

<i>NICER</i> Cycle 4 (\$44k); <i>NICER</i> Observation of X-ray Bright Tidal Disruption Events” (300ks , ToO)	2022
<i>NuSTAR</i> (DDT); <i>NuSTAR</i> observations of the Jetted Tidal Disruption Event AT2022cmc (80ks)	2022
<i>NuSTAR</i> (DDT); <i>NuSTAR</i> observation of the Tidal Disruption Event AT2021ehb (80ks)	2022
<i>NICER</i> (DDT); <i>NICER</i> observation of the Tidal Disruption Event AT2021ehb (100ks)	2021
<i>XMM-Newton</i> AO-21; A Systematic Exploration of Late-time X-rays from ZTF TDEs (298ks)	2021
<i>Chandra</i> Cycle 23 (\$77k); Late-time <i>Chandra</i> Observations of eROSITA Selected TDEs (75ks)	2021
<i>Chandra</i> DDT (\$23k); <i>Chandra</i> Observation of AT2020mrf: the Most X-ray Luminous FBOT (40ks)	2021
<i>NuSTAR</i> Cycle 7 (\$81k); <i>NuSTAR</i> Observations of Tidal Disruption Events” (80ks , ToO)	2021
<i>NuSTAR</i> Cycle 7; Understanding the Central Engine of Luminous FBOTs (80ks , ToO)	2021
<i>NuSTAR</i> (DDT); <i>NuSTAR</i> Observation of the High-Mass X-ray Binary ZTF18abjpmzf (20ks)	2020
<i>NuSTAR</i> (DDT); <i>NuSTAR</i> Observations of the Low-Mass X-ray Binary AT2019wey (120ks)	2020
<i>VLA</i> (DDT); <i>VLA</i> observations of AT2019wey (6.3hr)	2020
<i>Swift</i> (ToO); Submitted >60 approved <i>Swift</i> 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 <i>SRG</i>	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- <i>SRG</i> 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

- 2022/09 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

- 2022/09 Colloquium, 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

- 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

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

- 2022 Volunteer, Caltech Astronomy Outreach Program
- 2022 Speaker, 240th AAS NASA Hyper-wall Booth, *NuSTAR: Ten Years of the High Energy Universe in Focus*
- 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*
- 2018-19 Volunteer, Caltech Astronomy Outreach Program

Press Coverage

- I presented AT2020mrf at the 239th AAS press conference [[video](#)], which received some media attention 2022
(e.g., [Caltech News](#), [Scientific American](#), [Science News](#), [IFLScience](#), [BigThink](#), [spacecom](#))

Publications

As of September 2022: First author refereed = 9

Total refereed = 53 (including 7 submitted under review).

Total citations = 1063. h-index=19. i10-index=33 (via [ADS Metrics](#))

First Author Journal Publications

- [9] **Yao, Y.**, Lu, W., Guolo, M. et al. 2022, [ApJ, 937, 8](#) (25 pages)
*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)

- [10] Ho, Y. Q. A., Perley, D. A., **Yao, Y.** et al., 2022, ApJ in press
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