

# 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

<b>PhD</b> Astrophysics, California Institute of Technology, USA	Expected 2023
<ul style="list-style-type: none"><li>• Thesis: <i>High Energy Transients with ZTF and X-ray Missions</i></li><li>• Advisors: Prof. Shrinivas R. Kulkarni &amp; Prof. Fiona A. Harrison</li></ul>	
<b>M. Sc.</b> Astrophysics, California Institute of Technology, USA	2020
<b>B. Sc.</b> Astronomy, Peking University, China	2018

## Publication Record

h-index=**20**, i10-index=**35**, m-index=**3.3**. First author refereed papers = **9**: 158 citations  
Total refereed papers = **55** (including 6 submitted under review): 1185 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

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

### Selected co-I Proposals

<b>LRIS</b> (ToO) Rapid Spectroscopy of Young and Fast ZTF Transients	2018-21
<b>LRIS</b> (15 nights) Time Domain Astronomy with ZTF and <i>SRG</i>	2021-22
<b>ESI</b> (8 nights) The Role of Black Hole Mass on the TDE phenomena	2021-22
<b>Gemini</b> (ToO) A Rapid Response to the Youngest ZTF Explosions	2019-21

## Observing Experience

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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

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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

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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

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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

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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

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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

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- 2022 Volunteer, Caltech Astronomy Outreach Program
- 2022 Speaker, 240<sup>th</sup> 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

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

## Publications

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### 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)

- [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*