



DESY Postdoctoral Fellow  
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## Research Interests

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- HE astrophysics (CR acceleration, transport and radiation processes): theoretical & numerical
- Multimessenger astrophysics (gamma rays, neutrinos and cosmic rays from extreme sources)

## Employment History

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2022 - **Postdoctoral Fellow**, Deutsches Elektronen-Synchrotron DESY, Germany  
2018 - 2022 **Research Assistant**, Dept. of Physics, Penn State, US  
2016 - 2022 **Teaching Assistant**, Dept. of Physics, Penn State, US  
Summer 2015 **REU Intern**, Dept. of Astronomy and Astrophysics, Penn State, US

## Education

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08/2022 **Ph.D. in Physics, Pennsylvania State University, US**  
Supervised by Prof. Péter Mészáros and Prof. Kohta Murase  
Thesis: *Neutrino and Electromagnetic Counterparts of Galaxy and Astrophysical Black Hole Mergers*

06/2016 **B.Sc. in Astronomy, Nanjing University, China**  
Supervised by Prof. Xiangyu Wang and Prof. Fayin Wang  
Undergraduate Thesis: *The origin of high-energy astrophysical neutrinos*

## Selected Honors & Awards

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2022 **TDLI Prize Postdoctoral Fellowship**, Tsung-Dao Lee Institute (declined)  
2021-2022 **W. Donald Miller Graduate Fellowship (x2)**, Pennsylvania State University  
2019-2022 **David C. Duncan Graduate Fellowship (x4)**, Pennsylvania State University  
2018 **APS Graduate Student Travel Grant**, American Physical Society  
2017 **Homer F. Braddock Scholarship**, Pennsylvania State University  
2016 **School of Astronomy and Space Science Dean's Scholarship**, Nanjing Univ.  
2016 **Outstanding Thesis Award**, Nanjing University  
2016 **Merit Student**, Education Department of Jiangsu Province  
2015 **REU Intern Travel Grant** (host institution: Penn State), Nanjing University  
2015 **Duxia Scholarship**, Nanjing University

## Conferences and Scientific Talks

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### Invited talks & seminars

- 12/2023 **HE Astrophysics Seminar, Nanjing University, "Neutrino and Multi-Messenger Signals from TDEs"**
- 12/2023 **Astrophysics Colloquium, USTC, "Multi-Messenger Signals from TDEs"**
- 11/2023 **DESY Astroparticle Seminar, "TDEs in the Era of Multi-Messenger Astrophysics"**
- 08/2023 **Panelist of HE Transients, NEMMA Workshop, Penn State Univ. "Multi-Messenger Modeling of Neutrino-Coincident TDEs"**
- 04/2023 **CP3 seminar, UCLouvain, Belgium "Multi-Messenger Signals of Tidal Disruption Events and Supermassive Black Hole Mergers"**
- 02/2023 **Lepto-Hadronic Workshop, Bochum, Germany "Modeling the Hadronic Cascade Emission from Neutrino-Emitting TDEs"**
- 11/2022 **DESY THAT Seminar "Neutrino and Electromagnetic Counterparts of Galaxy and Compact Binary Mergers"**
- 03/2022 **University of Maryland CTC talk series "The Multimessenger View of Galaxy and Compact Binary Mergers"**
- 12/2021 **Columbia University HEP Seminar "The Multimessenger View of Galaxy and Compact Binary Mergers"**
- 11/2021 **DESY THAT Seminar "The Multimessenger View of Galaxy and Compact Binary Mergers"**
- 10/2021 **UNLV Astronomy Colloquium "The Multimessenger View of Galaxy and Compact Binary Mergers"**
- 10/2020 **Tohoku University Astroparticle Seminar, Japan "Galaxy and Supermassive Black Hole Mergers in the Era of Multi-Messenger Astrophysics"**
- 10/2020 **CCAPP AstroParticle Lunch, Ohio State University "High-energy neutrino emission from super-massive black hole (SMBH) mergers"**
- 09/2020 **Penn State Astronomy Lunch Talk "High-energy neutrino emission subsequent to gravitational wave radiation from SMBH mergers"**
- 08/2020 **Time-Domain High-Energy Messenger Astrophysics Workshop, University of Kyoto, Japan (virtual) "High-energy neutrino emission subsequent to gravitational wave radiation from SMBH mergers"**
- 06/2019 **IGC@25: Multimessenger Universe Workshop "Neutrino and Secondary Electromagnetic Emissions from Galaxy Mergers"**
- 08/2015 **Penn State Astronomy Lunch Talk "High-Redshift Star-Forming Galaxies as Hidden Neutrino Sources"**

#### **Contributed conference talks & posters**

- 09/2023 **TeVPA 2023, Napoli, Italy "Neutrino and electromagnetic cascade models for tidal disruption events"**
- 07/2021 **EPS Conference on High Energy Physics "Jet-induced high-energy neutrino and electromagnetic counterparts of supermassive black hole mergers "**

- 04/2021      **APS April meeting (virtual)** *"Jet-induced high-energy neutrino and electromagnetic counterparts of supermassive black hole mergers"*
- 02/2021      **Institute for Gravitation and the Cosmos (IGC), Penn State (virtual)** *"High-energy neutrino emission subsequent to gravitational wave radiation from SMBH mergers"*
- 07/2019      **Poster: 36th International Cosmic Ray Conference (ICRC), Madison, WI** *"A Multimessenger Picture of Galaxy Mergers: Neutrinos and Electromagnetic Emissions"*
- 04/2018      **APS April meeting, Columbus, OH** *"Cumulative Neutrino and Gamma-ray Backgrounds from Halo and Galaxy Mergers"*

## Softwares

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### **Astrophysical Modeling with Multiple Messengers (AM<sup>3</sup>)**

*An open-source tool for time-dependent lepto-hadronic modelling of astrophysical sources*

- <https://gitlab.desy.de/am3/am3/>
- **Developers:** Shan Gao, Marc Klinger, Annika Rudolph, Xavier Rodrigues, Chengchao Yuan, Gaëtan Fichet de Clairfontaine, Anatoli Fedynitch, Walter Winter, Martin Pohl
- **Contribution:** radiating blob expansion implementation; TDE examples; code tests; C++ documentation.

### **Astrophysical Multimessenger Emission Simulator (AMES)**

*A numerical code for the production and propagation of high-energy cosmic rays, neutrinos, and gamma-rays in various astrophysical environments*

- **Developers:** Kohta Murase, Bing Theodore Zhang, Chengchao Yuan, Jose Carpio, Shigeo Kiruma
- **Contribution:** implementing the photo-meson/photo-hadronic interactions and cosmic  $\gamma\gamma$  interactions.

## Programming Skills

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- Programming languages: C++, Python, Mathematica and Fortran
- Extensive experience in using `CRpropa`, an astrophysical simulation code for the propagation of ultra-high-energy particles.

## Mentoring

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### **PhD Students**

- 2023 -      **Karlijn Kruiswijk**, Université catholique de Louvain '22, "GeV neutrinos from GRBs", co-mentored with Dr. Walter Winter and Prof. Gwenhaël de Wasseige

### **Master and Undergraduate Students**

- 2023      **Federico Testagrossa**, University of Padova (MSc, '22), DESY Summer School
- 2023      **David Raudales**, National Autonomous University of Honduras (BSc, '20), DESY Summer School

## Teaching Experience

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2021 F	T.A., PHYS 561: Quantum Mechanics
2021 S	T.A., PHYS 400: Electrodynamics
2020 F	T.A., PHYS/MATH 479: Special and General Relativity
2018 S, 2020 S	Lab. T.A., PHYS 250: Introductory Physics
2018 F	T.A., PHYS 525: Methods of Theoretical Physics
2016 - 2017	Lab. T.A., PHYS 212: Electromagnetism

## Selected Service and Outreach

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<b>Referee</b>	<b>MNRAS, MNRAS Letters (2023 - )</b>
2023	DESY Astroparticle Division Retreat Co-organizer
2022 -	DESY Theoretical Astroparticle Seminar Organizer
2021	Abstract Sorting Committee of AAS 239th Annual Meeting
2021	Journal Club Organizer for the Center of Multimessenger Astrophysics
2017 - 2022	Guest Lecturer and A Tour of Universe Demonstrator at AstroFest (4-night outreach, 2500+ public visitors)
2018	Astropy Demonstrator at K-12 Educators - Bring Cutting-Edge STEM Research into your Classroom (2-day outreach, 100+ high-school teachers)

# Publications

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 Google Scholar |  ADS Library |  iNSPIRE

## 1st-author publications: 9

1. **Yuan, C.**, Winter, W., Lunardini, C., (2024), "AT2021lwx: Another Neutrino-Coincident Tidal Disruption Event with a Strong Dust Echo?", arXiv: 2401.09320, submitted to ApJL
2. **Yuan, C.**, and Winter, W. (2023), "Electromagnetic Cascade Emission from Neutrino-Coincident Tidal Disruption Events", *ApJ* 956 30
3. **Yuan, C.**, Murase, K., Guetta, D., Pe'er, A., Bartos, I., & Mészáros, P. (2021) "GeV Signature of Short Gamma-Ray Bursts in Active Galactic Nuclei", *ApJ* 932 80
4. **Yuan, C.**, Murase, K., Zhang, B. T., Kimura, S. S. & Mészáros, P. (2021) "Post-Merger Jets from Supermassive Black Hole Coalescences as Electromagnetic Counterparts of Gravitational Wave Emission", *ApJL*, 911 L15
5. **Yuan, C.**, Murase, K., Kimura, S. & Mészáros, P. (2020) "High-energy neutrino emission subsequent to gravitational wave radiation from supermassive black hole mergers", *Phys. Rev. D* 102, 083013
6. **Yuan, C.**, Murase, K. & Mészáros, P. (2020) "Complementarity of Stacking and Multiplet Constraints on the Blazar Contribution to the Cumulative High-Energy Neutrino Intensity", *ApJ*, 890:1
7. **Yuan, C.**, Murase, K. & Mészáros, P. (2019) "Secondary Radio and X-ray Emissions from Galaxy Mergers", *ApJ*, 878:76
8. **Yuan, C.**, Mészáros, P., Murase K. & Jeong, D. (2018) "Cumulative Neutrino and Gamma-Ray Backgrounds from Halo and Galaxy Mergers", *ApJ*, 857:50
9. **Yuan, C.** & Wang, F. (2015) "Cosmological Test Using Strong Gravitational Lensing Systems", *MNRAS*, 452:3

## 2nd-to-4th-author publications

10. Klinger, M., Rudolph, M., Rodrigues, X., **Yuan, C.**, Fichet de Clairfontaine, G., Fedynitch, A., Winter, W., Pohl, M., Gao, S. (2023), "AM3: An Open-Source Tool for Time-Dependent Lepto-Hadronic Modeling of Astrophysical Sources", arXiv: 2312.13371, submitted to ApJS
11. Zhang, T. B., Murase, K., **Yuan, C.**, Kimura, S. S. & Mészáros, P. (2020) "External Inverse-Compton Emission Associated with Extended and Plateau Emission of Short Gamma-Ray Bursts: Application to GRB 160821B", *ApJL* 908 L36

## 5th+-author publications

12. Zhang, B.T., Murase, K., Ioka, K., Song, D., **Yuan, C.**, Meszaros, P. (2023) "External Inverse-Compton and Proton Synchrotron Emission from the Reverse Shock as the Origin of VHE  $\gamma$ -Rays from Hyper-Bright GRB 221009A", *ApJL* 947 L14