

# Chengchao Yuan

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## RESEARCH INTERESTS

- Astroparticle physics (neutrinos, gamma rays and cosmic rays from extreme sources)
- High-energy astrophysics (particle acceleration, transport and radiation processes)
- Multimessenger astrophysics

## EDUCATION

- 2016-            Ph.D. candidate in Physics, Pennsylvania State University  
                  Supervised by Prof. Péter Mészáros and Prof. Kohta Murase  
                  Thesis: *The Origin of High-Energy Astrophysical Neutrinos and Photons in the Era of Multi-Messenger Astronomy*
- 2016            B.Sc. in Astronomy and Space Science, Nanjing University, China  
                  Supervised by Prof. Xiangyu Wang and Prof. Fayin Wang  
                  Undergraduate Thesis: *The origin of high-energy astrophysical neutrinos*

## HONORS & AWARDS

- 2020, 2019    David C. Duncan Graduate Fellowship, Penn State
- 2018            APS Graduate Student Travel Grant, American Physical Society
- 2017            Homer F. Braddock Scholarship, Penn State
- 2016            School of Astronomy and Space Science Dean's Scholarship, Nanjing U.
- 2016            Outstanding Thesis Award, Nanjing U.
- 2015            REU Intern Travel Grant (host institution: Penn State), Nanjing U.

## PUBLICATIONS

### First-author journal articles

- [5] **Yuan, C.**, Murase, K., Kimura, S. & Mészáros, P. “High-energy neutrino emission subsequent to gravitational wave radiation from supermassive black hole mergers”, [arXiv: 2008.05616](https://arxiv.org/abs/2008.05616), *submitted to Phys. Rev. D*
- [4] **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. doi: [10.3847/1538-4357/ab65ea](https://doi.org/10.3847/1538-4357/ab65ea)
- [3] **Yuan, C.**, Murase, K. & Mészáros, P. (2019) “Secondary Radio and X-ray Emissions from Galaxy Mergers”, *ApJ*, 878:76. doi: [10.3847/1538-4357/ab1f06](https://doi.org/10.3847/1538-4357/ab1f06)
- [2] **Yuan, C.**, Mészáros, P., Murase K. & Jeong, D. (2018) “Cumulative Neutrino and Gamma-Ray Backgrounds from Halo and Galaxy Mergers”, *ApJ*, 857:50. doi: [10.3847/1538-4357/ab1f06](https://doi.org/10.3847/1538-4357/ab1f06)

- [1] **Yuan, C.** & Wang, F. (2015) “Cosmological Test Using Strong Gravitational Lensing Systems”, *MNRAS*, 452:3. doi: [10.1093/mnras/stv1444](https://doi.org/10.1093/mnras/stv1444)

#### Articles in preparation

- [2] **Yuan, C.**, Murase, K., Kimura, S. & Mészáros, P. “Jet-induced high-energy electromagnetic counterpart of supermassive black hole mergers”, *preparing to submit to ApJL*
- [1] Zhang, T. B., Murase, K., **Yuan, C.**, Kimura, S. & Mészáros, P. “External Inverse Compton Emission Associated with Extended and Plateau Emission of Short Gamma-Ray Bursts: Application to GRB 160821B”, *preparing to submit to ApJ*
- Contributions:* portion of code development and discussion of results.

#### Conference proceedings and other articles

- [2] **Yuan, C.**, Mészáros, P., Murase K. & Jeong, D. (2018) “Cumulative Neutrino and Gamma-Ray Backgrounds from Halo and Galaxy Mergers”, in *APS April meeting: U17.004*. [Talk abstract](#)
- [1] **Yuan, C.**, Murase K. & Mészáros, P. (2019) “A Multi-Messenger Picture of Galaxy Mergers: Neutrinos and Electromagnetic Emissions”, (*ICRC2019*) 1041. [Proceedings of Science](#)

#### CONFERENCES AND SCIENTIFIC TALKS

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| Oct 2020 | <b>Talk:</b> Galaxy and SMBH mergers in the era of multi-messenger astrophysics. <i>Astronomical seminar</i> , Tohoku University, Japan  |
| Sep 2020 | <b>Lunch talk:</b> High-energy neutrino emission from SMBH mergers. Dept. of Astronomy & Astrophysics, Penn State  |
| Aug 2020 | <b>Talk:</b> High-energy neutrino emission subsequent to GW radiation from SMBH mergers. <i>Time-Domain High-Energy Messenger Astrophysics Workshop</i> , University of Kyoto, Japan |
| Jul 2019 | <b>Poster:</b> A Multi-Messenger Picture of Galaxy Merger. <i>36th International Cosmic Ray Conference (ICRC)</i> , Madison, WI  |
| Jun 2019 | <b>Talk:</b> A Multi-Messenger Picture of Galaxy Mergers: Neutrinos and Electromagnetic Emissions. <i>IGC@25: Multimessenger Universe Workshop</i> , State College, PA               |
| Apr 2018 | <b>Talk:</b> Cumulative Neutrino and Gamma-Ray Backgrounds from Halo and Galaxy Mergers. <i>APS April meeting</i> , Columbus, OH   |
| Aug 2015 | <b>Launch talk:</b> Monte Carlo simulations of electron-photon interactions with pair formation. Dept. of Astronomy & Astrophysics, Penn State                                       |
| May 2015 | <b>Talk:</b> Cosmological test using strong gravitational lensing systems. <i>Cosmology and Galaxy Workshop</i> , Yangzhou, China  |

## CODE DEVELOPMENT

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

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

- Developed the code for photo-meson/photo-hadronic interaction cross sections and cosmic  $\gamma\gamma$  interactions.

## PROGRAMMING SKILLS

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

## TEACHING EXPERIENCE

2018-2020      Lab. T.A. PHYS250: Introductory Physics  
2018              Office hour assistant PHYS525: Methods of Theoretical Physics  
2016-2017      Lab. T.A. PHYS212: Electromagnetism

## OUTREACH

Jul 2017,18,19      AstroFest - A Tour of Universe, Penn State  
May 2018              K-12 Educators: Bring Cutting-Edge STEM Research into your Classroom,  
                                 Penn State

## REFERENCES

### **Dr. Péter Mészáros** ([nnp@psu.edu](mailto:nnp@psu.edu))

Eberly Chair Professor, Astronomy & Astrophysics and Physics, Penn State

### **Dr. Kohta Murase** ([murase@psu.edu](mailto:murase@psu.edu))

Assistant Professor, Physics and Astronomy & Astrophysics, Penn State

### **Dr. Donghui Jeong** ([djeong@psu.edu](mailto:djeong@psu.edu))

Associate Professor, Astronomy & Astrophysics, Penn State

### **Dr. Xiangyu Wang** ([xywang@nju.edu.cn](mailto:xywang@nju.edu.cn))

Professor, Astronomy & Space Science, Nanjing University, China