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

Expected 2021 — Ph.D. 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 University
2016	Outstanding Thesis Award, Nanjing University
2015	REU Intern Travel Grant (host institution: Penn State), Nanjing University

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, *accepted for publication in 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

[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

[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/aab774

[1] **Yuan, C.** & Wang, F. (2015) "Cosmological Test Using Strong Gravitational Lensing Systems", *MNRAS*, 452:3. doi: 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

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

May 2015 **Talk:** Cosmological test using strong gravitational lensing systems. *Cosmology and Galaxy Workshop*, 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

2020 F	T.A. PHYS/MATH 479: Special and General Relativity
2018 S, 2019, 2020 S	Lab. T.A. PHYS 250: Introductory Physics
2018 F	Office hour assistant PHYS 525: Methods of Theoretical Physics
2016 F - 2017 F	Lab. T.A. PHYS 212: 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)
Eberly Chair Professor, Astronomy & Astrophysics and Physics, Penn State

Dr. Kohta Murase (murase@psu.edu)
Assistant Professor, Physics and Astronomy & Astrophysics, Penn State

Dr. Donghui Jeong (djeong@psu.edu)
Associate Professor, Astronomy & Astrophysics, Penn State

Dr. Xiangyu Wang (xywang@nju.edu.cn)
Professor, Astronomy & Space Science, Nanjing University, China