Chengchao Yuan

ORCiD: 0000-0003-0327-6136

ULB Postdoctoral Fellow
Université libre de Bruxelles
1500 Ixelles, Belgium

chengchao.yuan@ulb.be
+49 0151 50721540
yuan-cc.github.io

Appointments

2025 -	**ULB Postdoctoral Fellow**, University of Brussels, Belgium
2022 - 2025	**DESY Postdoctoral Fellow**, Deutsches Elektronen-Synchrotron DESY, Germany
2018 - 2022	**Research Assistant**, Dept. of Physics, Penn State, USA
2016 - 2022	**Teaching Assistant**, Dept. of Physics, Penn State, USA
Summer 2015	**REU Intern**, Dept. of Astronomy and Astrophysics, Penn State, USA

Education

08/2022	**Ph.D. in Physics, Pennsylvania State University, USA** Supervised by Prof. Péter Mészáros and Prof. Kohta Murase Thesis: *Neutrino and Electromagnetic Counterparts of Galaxy and Black Hole Mergers*
06/2016	**B.Sc. in Astronomy, Nanjing University, China**

Research Interests

- Astroparticle physics (CR acceleration, transport and radiation processes): theoretical & numerical
- Multimessenger astrophysics: gamma rays, neutrinos and cosmic rays from compact objects (e.g., GRBs, Kilonovae, and FRBs), TDEs, AGNs, and SMBH mergers

Fellowships & Awards

2025	**ULB Postdoctoral Fellowship**, University of Brussels, Belgium
2023, 2024	**DESY Postdoctoral Research Award** (x2), DESY
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	**Merit Student**, Education Department of Jiangsu Province, China
2015	**REU Intern Travel Grant** (host institution: Penn State), Nanjing University
2015	**Duxia Scholarship**, Nanjing University

Conferences and Scientific Talks

21 invited seminars and colloquia; 10 invited conference talks and lectures; 12 contributed conference talks and posters.

A full list is available at Talks and Events

Selected recent presentations

09/2025	Invited seminar, University of Brussels, Belgium
08/2025	Contributed talk, ICRC2025, Geneva, Switzerland
03/2025	Poster, 2nd LHAASO Spymosium, Hong Kong, China
03/2025	Invited seminar, Institute of High Energy Physics, Beijing, China
02/2025	Invited talk, Workshop on Numerical Multi-Messenger Modeling, Zeuthen, Germany
12/2024	Invited talk, DESY "Matter and the Universe" Days, Hamburg, Germany
11/2024	Invited seminar, University of Athens, Greece
09/2024	Invited talk, Roma International Conference on AstroParticle Physics (RICAP-24), Italy
09/2024	Invited colloquium, NCfA Astrophysics Forum, UNLV, USA
08/2024	Talk, TeVPA 2024, Chicago, USA
02/2024	Invited talk, Paris Numerical Lepto-Hadronic Modeling Workshop
09/2023	Talk, TeVPA 2023, Napoli, Italy
08/2023	Invited talk, Panelist of HE Transients, NEMMA Workshop, Penn State University, USA

Software

Astrophysical Multi-Messenger Modeling (AM^3)

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

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

Programming Skills

- Programming languages: C++, Python, Mathematica
- Extensive experience in using AM^3 and `CRpropa`

Mentoring

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

2024 -	**Andre Neubauer**, Humboldt-Universität zu Berlin (MSc, '23)
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

Oxford-Berlin Neutrino Physics Lecturer (Berlin, Germany, 2024)

Lecture Course on Neutrino Physics between Oxford University and Humboldt University Berlin

- Gave a lecture on time-dependent multi-messenger modeling using AM^3 software

DESY Summer School Lecturer (Zeuthen, Germany, 2023)

DESY Summer School on Astroparticle Physics for Undergraduate and Master Students

- Gave a lecture on the physics of GRBs and on the radiation processes in astroparticle physics
- Guided students to complete the analytical/numerical modeling of GRB afterglow emissions

Penn State Graduate Teaching Assistant (State College, PA, USA, 2016–2022)

Coordinating experiments/labs, grading assignments, offering office hours, and proctoring exams for graduate (G) and undergraduate (UG) courses in the Physics Department

- Laboratory coordinator and lecturer: Electromagnetism (UG), Introductory Physics (UG)
- Grader and office hour leader: Quantum Mechanics (G), Special and General Relativity (UG), Methods of Theoretical Physics (G)

Professional and Outreach Activities

Referee	**MNRAS, MNRAS Letters; ApJ, ApJL; PRD**
2024	Organizing Committee Member for the 3rd Numerical Lepto-Hadronic Modeling Workshop
2023	Organizing Committee Member for the DESY Astroparticle Division Retreat
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 co-organizer for the AstroFest (4-night outreach, 2500+ visitors)
2018	Astropy Demonstrator at K-12 Educators - Bring Cutting-Edge STEM Research into Classroom (2-day outreach, 100+ high-school teachers)

Publications

iNSPIRE

Journal articles: 20; 1st-author: 13; citations: > 360 (iNSPIRE); *highlighted

1. ***Yuan, C.,** Fiorillo, D. F. G., Petropoulou, M., Liu, Q. (2025) "Coupled Time-Dependent Proton Acceleration and Leptonic-Hadronic Radiation in Turbulent Supermassive Black Hole Coronae", arXiv: 2508.08233 (submitted to PRL)
2. Fiorillo, D F. G., Testagrossa, F., **Yuan, C.**, Petropoulou, M., Winter, W. (2025) "A generalized study of linear electromagnetic cascades in astrophysical sources", arXiv: 2509.00152 (submitted to JCAP)
3. **Yuan, C.,** Pfeiffer, L., Winter, W., Buson, S., *et al* (2025) "An Accretion Flare Interpretation for the UHE Neutrino Event KM3-230213A", arXiv: 2506.21111 (submitted to ApJL)
4. **Yuan, C.**, Winter, W., Zhang, B. T., Murase, K., Zhang, B., (2024), "Revisiting X-ray Afterglows of Jetted Tidal Disruption Events with the External Reverse Shock", arXiv: 2411.07925, ApJ 982 196
5. Li, R., **Yuan, C.**, He, H., et al. (2024), "A neutrino flare associated with X-ray emission from TDE ATLAS17jr", arXiv: 2411.06440, submitted to ApJL
   Contribution: theoretical model development, numerical calculation of neutrino and EM cascade emissions, paper writing
6. Plotko, P., Lunardini, C., Winter, W., **Yuan, C.** (2024), "Ultra-High-Energy Cosmic Rays from Neutrino-Emitting Tidal Disruption Events", arXiv: 2410.19047, submitted to ApJ
   Contribution: model building, TDE source parameter justification, results interpretation, and paper writing
7. ***Yuan, C.**, Zhang, B. T., Winter, W., Murase, K., (2024), "Structured Jet Model for Multiwavelength Observations of the Jetted Tidal Disruption Event AT 2022cmc", ApJ 974 162
8. Klinger, M., **Yuan, C.,** Taylor, A., Winter, W., (2024), "Lepto-Hadronic Scenarios for TeV Extensions of Gamma-Ray Burst Afterglow Spectra", arXiv:2403.13902, submitted to ApJ
   Contribution: model building and results interpretation; neutrino figure production
9. ***Yuan, C.**, Winter, W., Lunardini, C., (2024), "AT2021lwx: Another Neutrino-Coincident Tidal Disruption Event with a Strong Dust Echo?", ApJ 969 136
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, Astrophys. J. Suppl. 275 1
    Contribution: code development, tests, and documentation; TDE section writing
11. **Yuan, C.,** and Winter, W. (2023), "Electromagnetic Cascade Emission from Neutrino-Coincident Tidal Disruption Events", ApJ 956 30
12. 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

Contribution: model building and results interpretation; GRB code (AMES) developing

13. ***Yuan, C.**, Murase, K., Guetta, D., Pe'er, A., Bartos, I., & Mészáros, P. (2022) "GeV Signature of Short Gamma-Ray Bursts in Active Galactic Nuclei", *ApJ* 932 80
14. 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 γ-Rays from Hyper-Bright GRB 221009A", ApJL 947 L14
Contribution: model building and results interpretation
15. ***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
16. **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
17. **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
18. **Yuan, C.**, Murase, K. & Mészáros, P. (2019) "Secondary Radio and X-ray Emissions from Galaxy Mergers", *ApJ*, 878:76
19. **Yuan, C.**, Mészáros, P., Murase K. & Jeong, D. (2018) "Cumulative Neutrino and Gamma-Ray Backgrounds from Halo and Galaxy Mergers", *ApJ*, 857:50
20. **Yuan, C.** & Wang, F. (2015) "Cosmological Test Using Strong Gravitational Lensing Systems", *MNRAS*, 452:3