

Yangyao Chen (陈洋遥)

Postdoc, Department of Astronomy, University of Science and Technology of China
96 Jinzhai Rd., Hefei, Anhui, 230026, P. R. China

Homepage: <https://www.chenyangyao.com/>

✉ Email: yangyaochen.astro@foxmail.com

📖 ADS [library](#)  Orcid: [0000-0002-4597-5798](https://orcid.org/0000-0002-4597-5798)  [Github](#)



Research Interests

- **Galaxy formation models:** hydrodynamical simulations (cosmological and zoom-in); semi-analytical models; empirical (halo-based and field-based) models
- **Dark matter halos and fields:** density field reconstruction and its application; halo assembly/merger tree, structure and environment; cosmic web-halo-galaxy connection
- **Observational analysis and interpretation:** BCGs; dwarfs; globular clusters; SMBHs; galaxy statistics (mass/luminosity function, clustering); cosmic variance quantification and correction; forward mocking observations; high- z galaxies
- **Statistical and computational methods:** hierarchical/graph Bayesian inference; model ensembles; deep learning models; parallel computation; software development

Experience

- **08/2022 - present, postdoc fellow**, Department of Astronomy, University of Science and Technology of China
- **09/2017 - 06/2022, Ph.D. in astronomy**, Tsinghua University
Thesis: Modeling Galaxy Formation and Evolution Across Cosmic Time with Combined Empirical Approach and Hydrodynamic Simulations. Supervisor: Cheng Li
- **11/2019 - 10/2021, Visiting scholar**, Department of Astronomy, University of Massachusetts Amherst
- **09/2013 - 06/2017, B.S. in physics**, Wuhan University

Awards, Honors And Grants

- 2022, Mozi Fellowship, University of Science and Technology of China
- 2022, Special Funding from Chinese Postdoctoral Science Foundation, China Postdoctoral Science Foundation
- 2022, Outstanding Ph.D. Thesis, Tsinghua University
- 2020, National Scholarship for Ph.D. Students, Ministry of Education of China
- 2019, China Scholarship Council Scholarship Program, China Scholarship Council
- 2018, AMD Scholarship, Tsinghua Center for Astrophysics
- 2014, National Scholarship for Undergraduate Students, Ministry of Education of China

Publications

¹ = first author; * = corresponding; a complete list can be found in the ADS [library](#)

Papers that I have major contribution:

1. Z. Zhang¹, **Y. Chen¹**, Y. Rong¹, H. Wang*, H. Mo, X. Luo, H. Li. [arXiv eprint](#), 2025, 2504.03305. Nature in press.
Unexpected clustering pattern in dwarf galaxies challenges formation models
2. **Y. Chen^{1*}**, H. Mo, H. Wang. To be submitted
A two-phase model of galaxy formation: IV. Breeding seeds to grow supermassive black holes in dark matter halos

3. H. Li^{1*}, **Y. Chen***, H. Wang*, H. Mo. [arXiv eprint](#), 2024, 2409.06208. Submitted to MNRAS
Physical Processes Behind the Co-Evolution of Halos, Galaxies and Supermassive Black Holes in the IllustrisTNG Simulation
4. **Y. Chen**^{1*}, H. Mo, H. Wang. [arXiv preprint](#), 2024, 2405.18735. Submitted to MNRAS
A Two-Phase Model of Galaxy Formation: III. The Formation of Globular Clusters
5. **Y. Chen**^{1*}, H. Mo, and H. Wang. [MNRAS](#), 2024, 532, 4340
A two-phase model of galaxy formation: II. The size-mass relation of dynamically hot galaxies
6. H. Mo^{1*}, **Y. Chen**^{1*}, and H. Wang. [MNRAS](#), 2024, 532, 3808
A two-phase model of galaxy formation: I. The growth of galaxies and supermassive black holes
7. **Y. Chen**^{1*}, H. J. Mo, and K. Wang. [MNRAS](#), 2023, 526, 2542
Massive dark matter haloes at high redshift: Implications for observations in the JWST era
8. **Y. Chen**^{1*}, H. J. Mo, C. Li, K. Wang, H. Wang, and X. Yang. [MNRAS](#), 2023, 525, 1254
A conditional abundance matching method of extending simulated halo merger trees to resolve low-mass progenitors and sub-halos
9. **Y. Chen**^{1*}, H. J. Mo, C. Li, K. Wang, H. Wang, X. Yang, Y. Zhang, and N. Katz. [MNRAS](#), 2021, 507, 2510
MAHGIC: A Model Adapter for the Halo-Galaxy Inter-Connection
10. **Y. Chen**^{1*}, H. J. Mo, C. Li, and K. Wang. [MNRAS](#), 2021, 504, 4865
How to empirically model star formation in dark matter halos: I. Inferences about central galaxies from numerical simulations
11. **Y. Chen**^{1*}, H. J. Mo, C. Li, H. Wang, X. Yang, Y. Zhang, and K. Wang. [ApJ](#), 2020, 899, 81
Relating the Structure of Dark Matter Halos to Their Assembly and Environment
12. **Y. Chen**^{1*}, H. J. Mo, C. Li, H. Wang, X. Yang, S. Zhou, and Y. Zhang. [ApJ](#), 2019, 872, 180
ELUCID. VI. Cosmic Variance of the Galaxy Distribution in the Local Universe

Papers that I have co-authored:

13. H. Li¹, E. Wang*, C. Lyu*, **Y. Chen**, H. Wang, Z. Chen, H. Yu, C. Jia, C. Ma. [ApJ](#) in press.
Central Velocity Dispersion being the Primary Driver of Abundance Patterns in Quenched Galaxies
14. C. Jia^{1*}, E. Wang*, H. Wang, H. Li, Y. Yao, J. Song, H. Zhang, Y. Rong, **Y. Chen**, H. Yu, Z. Chen, H. Li, C. Ma, X. Kong. [ApJ](#), 2024, 977, 165
Size Growth on Short Timescales of Star-forming Galaxies: Insights from Size Variation with Rest-frame Wavelength with JADES
15. X. Luo*, H. Wang*, W. Cui, H. Mo, R. Li, Y. Jing, N. Katz, R. Dave, X. Yang, **Y. Chen** and H. Li, S. Huang. [ApJ](#), 2024, 966, 236
ELUCID. VIII. Simulating the Coma Galaxy Cluster to Calibrate Model and Understand Feedback
16. K. Wang*, H. J. Mo, **Y. Chen**, H. Wang, X. Yang, J. Wang, Y. Peng, and Z. Cai. [MNRAS](#), 2024, 528, 2046
Characterize the assembly of dark matter halos with protohalo size histories: I. Redshift evolution, relation to descendant halos, and halo assembly bias
17. J. Meng*, C. Li*, H. Mo, **Y. Chen**, K. Wang. [ApJ](#), 2024, 964, 161
Measuring Galaxy Abundance and Clustering at High Redshift from Incomplete Spectroscopic Data: Tests on Mock Catalogs
18. T. Wang*, H. Sun, L. Zhou, K. Xu, C. Cheng, Z. Li, **Y. Chen**, H. Mo, A. Dekel, X. Zheng, Z. Cai, T. Yang, Y. Dai, D. Elbaz, J. Huang. [arXiv preprint](#), 2024, 2403.02399. Submitted to Nature Communications.
The True Number Density of Massive Galaxies in the Early Universe Revealed by JWST/MIRI
19. K. Wang*, H. J. Mo, **Y. Chen**, J. Schaye. [MNRAS](#), 2024, 527, 10760
An efficient and robust method to estimate halo concentration
20. J. Meng*, C. Li*, H. J. Mo, **Y. Chen**, Z. Jiang, L. Xie. [ApJ](#), 2023, 944, 75
Galaxy Populations in Groups and Clusters: Evidence for a Characteristic Stellar Mass Scale at $M_{\text{sat}} 10^{9.5} M_{\odot}$
21. K. Wang*, **Y. Chen**, Q. Li, X. Yang. [MNRAS](#), 2023, 522, 3188
Late-formed halos prefer to host quiescent central galaxies. I. Observational results
22. K. Wang*, H. Mo, C. Li, **Y. Chen**. [MNRAS](#), 2023, 520, 1774-1788
Relating galaxies across different redshift to study galaxy evolution

23. K. Wang*, Y. Peng*, **Y. Chen**. [MNRAS](#), 2023, 523, 1268
Dissect two-halo galactic conformity effect for central galaxies: The dependence of star formation activities on the large-scale environment
24. K. Wang*, X. Wang*, **Y. Chen**. [ApJ](#), 2023, 951, 66
Environmental Dependence of the Mass-Metallicity Relation in Cosmological Hydrodynamical Simulations.
25. Z. Wang, **Y. Chen**, Y. Mao*, H. Mo, H. Wang, H. Guo, C. Li, J. Fu, Y. Jing, J. Wang, X. Yang, Z. Zheng. [ApJ](#), 2021, 907, 4.
The Breakdown Scale of HI Bias Linearity
26. K. Wang*, H. J. Mo, C. Li, **Y. Chen**. [MNRAS](#), 2021, 505, 3892
Finding proto-clusters to trace galaxy evolution: I. The finder and its performance
27. X. Yang*, H. Xu, M. He, Y. Gu, A. Katsianis, J. Meng, F. Shi, H. Zou, Y. Zhang, C. Liu, Z. Wang, F. Dong, Y. Lu, Q. Li, **Y. Chen**, H. Wang, H. Mo, J. Fu, H. Guo, A. Leauthaud, Y. Luo, J. Zhang, Y. Zu. [ApJ](#), 2021, 909, 143
An Extended Halo-based Group/Cluster finder: Application to the DESI legacy imaging surveys DR8
28. K. Wang*, H. J. Mo, C. Li, J. Meng, **Y. Chen**. [MNRAS](#), 2020, 499, 89
Identifying galaxy groups at high redshift from incomplete spectroscopic data - I. The group finder and application to zCOSMOS

Academic Activities

Mentoring:

- 2024-, Qinglin Ma, PhD candidate at Tsinghua University
Project: Transition of galaxy dynamics using zoom-in hydrodynamical simulations.
- 2024-, Ziwen Zhang, PhD candidate at USTC
Project: Assembly of brightest cluster galaxies
- 2023-, Hao Li, PhD candidate at USTC
Project 1: Physical processes behind the co-evolution of halos, galaxies and supermassive black holes in hydrodynamic simulations (submitted to MNRAS).
Project 2: Reconstruction of density fields From galaxy surveys.

Teaching:

- 2017, teaching assistant of “Observational Cosmology”, Tsinghua University

Service:

- 2024-, scientific consultant, Hefei No. 50 Middle School
- 2018-2019, co-organizer of the speaker lunch, Department of Astronomy, Tsinghua University

Selected talks:

- Invited talk at the Galaxies and Lensing Seminar, Universitäts-Sternwarte München (USM) 12/2024
Remote
Globular-Cluster Formation in Cosmological Context: A Multi-Scale Semi-analytical Approach
- Invited talk at the Galaxy and Globular Cluster Seminar, School of Physics and Astronomy, Sun Yat-Sen University (SYSU) 12/2024
Zhuhai
Globular Cluster Formation in Cosmological Context: Theory and semi-analytical forecasts
- Invited talk at Galaxy & Cosmology Seminar, Department of Astronomy, Tsinghua University (THU) 11/2024
Beijing
Breeding seeds to grow supermassive black holes in the cosmological context: theory and semi-analytical forecasts
- Contributed talk at the 2nd Conference of Active Galactic Nuclei Feedback 10/2024
Shanghai
Breeding seeds to grow supermassive black holes in dark matter halos: theory and semi-analytical forecasts
- Invited talk at Department of Astronomy, Tsinghua University (THU) 09/2024
Beijing
Reconstructing the cosmic history with galaxy surveys
- Invited talk at the Martes Talk Colloquium, School of Astronomy and Space Science, Nanjing University (NJU) 05/2024
Nanjing
A Multi-Phase and Multi-Scale Scenario of Galaxy Formation and its Semi-Analytic Forecasts

- Contributed talk at the Symposium on the coevolution of galactic ecosystems and their large-scale environment 04/2024
Hangzhou
Cooling and Compression: the Origin of Multi-Scale Stellar Size-Mass Relations in Turbulent CGM and ISM
- Contributed talk at the Anhui Astronomical Society Annual Meeting 01/2024
Maanshan
Semi-analytic modeling of galaxies and supermassive black holes in the JWST era
- Contributed talk at the Conference on Observations and Theories of Galaxies in the Era of Space Telescopes 11/2023
Beijing
The physical origin of the size-mass relation for dynamically hot galaxies throughout cosmic history
- Contributed talk at the Collaboration Workshop on Cosmology and Galaxy Formation 06/2023
Shanghai
MAHGIC: A Model Adapter for the Halo-Galaxy Inter-Connection
- Contributed talk at the 25th Guoshoujing Conference of Galaxy Formation 05/2023
Huangshan
Massive Dark Matter Halos at $z > 7$ and Implications for Observations in the JWST Era
- Invited talk at the 3rd JMLC MachineLearning Session 02/2023
Remote
MAHGIC: a Model Adapter for the Halo-Galaxy Inter-Connection
- Invited Lunch Talk at Kavli-IPMU, University of Tokyo 07/2021
Remote
How to Empirically Model Star Formation in Dark Matter Halos
- Contributed talk at the 11th PFS Collaboration Meeting 12/2019
Pasadena
Identifying galaxy protocluster at high redshift
- Contributed talk at the 21st Guoshoujing Conference of Galaxy Formation 05/2019
Xiamen
Cosmic variance of galaxy distribution in the local universe
- Contributed talk at the PFUNT Doctoral Academic Forum of the Five University Alliance 12/2018
Shanghai
Cosmic variance of galaxy distribution in the local universe
- Contributed talks at the 10th PFS Collaboration Meeting 12/2018
Shanghai
(i) Cosmic variance of galaxy distribution in the local universe
(ii) An empirical model of galaxy formation in dark matter halos

References

- [Houjun Mo](#), Professor, University of Massachusetts, Amherst. hjmo@umass.edu
- [Cheng Li](#), Professor, Tsinghua University, cli2015@tsinghua.edu.cn
- [Huiyuan Wang](#), Professor, University of Science and Technology of China, whywang@ustc.edu.cn