Zeyang Sun

800 Dongchuan Road, Minhang, Shanghai, 200240, China
Email: zeyangsun@sjtu.edu.cn Tel: (+86) 19916544417

EDUCATION

Shanghai Jiaotong Univeristy, Shanghai, China (2018-ongoing, expected June 2023)

- Astronomy | PhD | GPA: 3.59/4.00 | Supervisor: Prof. Pengjie Zhang
- *Awards*: 2021-2022 National Scholarship

Inner Mongolia University, Hohhot, Inner Mongolia, China (2014-2018)

- Applied Physics | Bachelor | Top 10% of School of Physics
- *Awards*: 2017-2018 The Second Prize Academic Scholarship

Peking University, Beijing, China (2016-2017)

- Applied Physics | Semester Exchange

RESEARCH EXPERIENCE

Project: Cross-correlation of CMB lensing with DESI galaxy groups (2021-2022)

- Significant detection of cross-correlation signal, signal-to-noise reaches 40
- DESI galaxy group catalog provides the estimation of group halo mass and therefore allows us to detect the dependence of bias on group mass with high significance
- Constrain the density bias of group for a conservative sample with richness ≥ 5
- Compare the measured bias with the theoretically predicted one using the estimated group mass
- Interesting finding: tSZ contaminates the galaxy group-CMB lensing cross-correlation at ~30% level, and must be deprojected first in CMB lensing reconstruction

Project: An unbiased method of measuring the ratio of two data sets (2022)

- In certain cases of astronomical data analysis, the meaningful physical quantity to extract is the ratio R between two data sets. However, simply taking the ratio of the two data sets is biased
- Derived an analytical expression of the posterior PDF P(R)
- Result enables fast and unbiased R measurement, with minimal statistical errors
- Relies on no underlying model other than the proportionality relation between the two data sets
- Take the lensing ratio as an example to demonstrate our method
- Resulting paper currently on arXiv

Project: Forecasts on CMB lensing observations with AliCPT-1 (2021-2022, collaborator)

- AliCPT-1: the first Chinese CMB experiment aiming for high precision measurement of CMB B-mode polarization; currently under deployment in Tibet; two frequency bands centered at 90 and 150 GHz
- Forecast the CMB lensing reconstruction, lensing-galaxy and lensing-CIB cross-correlation S/N for AliCPT-1
- In the final stage, the measurement significance will increase to 31σ
- Estimate the S/N of cross-correlations between AliCPT-1 CMB lensing and DESI galaxies/quasars for the 4 redshift bins at $0.05 < z < 2.1$. In the final stage, the lensing-galaxy cross-correlation can reach 52

RESEARCH INTERESTS

I am interested in cosmology: understanding structure formation, dark matter and dark energy. It is an exciting time to deal with observational data, and my research uses the beautiful weak lensing imaging from DECaLS surveys, galaxy data from DESI and cosmic microwave background information from Planck. My primary research focus weak gravitational lensing which probes the expansion history and growth of cosmic structures. In particular, I

focus on tackling the cross-correlation of galaxy and any tracer of large-scale structure, deriving an unbiased method of measuring the ratio of two data sets, and applying this method to lensing ratio.

SKILL AND HOBBIES

Language: English - Fluent, Mandarin Chinese - Native
Hobbies: Swimming, Playing Chinese Instrument Erhu

PUBLICATIONS

[1] **Sun, Z.**, Yao, J., Dong, F., Yang, X., Zhang, L., & Zhang, P. (2022). Cross-correlation of Planck cosmic microwave background lensing with DESI galaxy groups. Monthly Notices of the Royal Astronomical Society, 511(3), 3548-3560.
[2] **Sun, Z.,** Zhang, P., Yao, J., Dong, F., Shan, H., Jullo, E., Kneib, J., et al. (2022). An unbiased method of measuring the ratio of two data sets. arXiv preprint: 2210.13717
[3] Liu, J., **Sun, Z.,** Han, J., Carron, J., Delabrouille, J., Li, S., ... & Zhang, X. (2022). Forecasts on CMB lensing observations with AliCPT-1. SCIENCE CHINA Physics, Mechanics & Astronomy, 65(10), 109511.
[4] Dong, F., Zhang, P., **Sun, Z.**, & Park, C. (2022). The first direct measurement of gravitational potential decay rate at cosmological scales and improved dark energy constraint. The Astrophysical Journal, 938(1), 72.
[5] Dong, F., Zhang, P., Zhang, L., Yao, J., **Sun, Z.,** Park, C., & Yang, X. (2021). Detection of a Cross-correlation between Cosmic Microwave Background Lensing and Low-density Points. The Astrophysical Journal, 923(2), 153.
[6] Xu, H., Zhang, P., Peng, H., Yu, Y., Zhang, L., Yao, J., Qin, J., **Sun, Z.,** ... & Yang, X. (2022). Using angular two-point correlations to self-calibrate the photometric redshift distributions of DECaLS DR9. arXiv preprint: 2209.03967