Zhiwei Shao

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Research Interests

I am eager to learn about all aspects of astronomy and am particularly interested in researches related with cosmology:

- Cosmological simulations: AGN and stellar feedback, hydrodynamic solvers;
- Observational cosmology: halo boundary, galaxy-halo connection, intra-group medium, large scale structure.

Education

Nanjing University — Nanjing, China
B.S. in Astronomy, Overall GPA: 4.44/5.00, Major GPA: 4.50/5.00 — Sept 2016 – June 2020

- Thesis: "Galaxy Distribution around redMaPPer Clusters in SDSS"
- Advisor: Ying Zu, Shanghai Jiao Tong University

Research Positions

- Research Assistant, DoA, Shanghai Jiao Tong University, China — Aug 2020 – Now
- Research Intern, University of Victoria, Canada — July 2019 – Aug 2019
- Undergraduate Research Assistant, Nanjing University, China — Oct 2017 – Dec 2019

Publications

[1] **Z. Shao**, C. Yin, B. Zhang, and Z. Dai, "Anisotropic Ejecta Distribution of Kilonova AT 2017gfo", in submission.

[2] Y. Zu, H. Shan, J. Zhang, S. Singh, **Z. Shao**, X. Chen, J. Yao, J. B. Golden-Marx, W. Cui, E. Jullo, J.-P. Kneib, P. Zhang, and X. Yang, "Does Concentration Drive the Scatter in the Stellar-to-Halo Mass Relation of Galaxy Clusters?", arXiv:2012.08629, in submision.

Research Experience

Galaxy Distribution around redMaPPer Clusters in SDSS — Shanghai, China
Advisor: Ying Zu, Shanghai Jiao Tong University — Jan 2020 – Now

- Reproduced previous measurements of splashback radius and halo assembly bias using SDSS DR8 photometric catalog.
- Introduced isolation criteria to identify clusters suffering from projection effects and confirmed our criteria could reduce the discrepancy between splashback measurements using redMaPPer clusters and simulations.
- Currently working on building simplified redMaPPer cluster finding algorithm and using mock data to test our isolation criteria.

Unified Modelling of the Galaxies and Hot Diffuse Gas in Cosmic Environments — Victoria, Canada
Advisor: Arif Babul, University of Victoria — July 2019 – Now

- Used PyAtomDB to calculate the X-ray properties of intra-group medium in hydro simulations, including luminosities, temperatures, entropies, etc.
- Wrapped the codes into a python package XIGrM and wrote detailed documentations for public usage (project website: https://xigrm.readthedocs.io/).

- Analyzed a series of simulations with different stellar feedback models to see their influences on intra-group medium and their consistency with observations.
- Currently working on generating X-ray images and radial profiles of groups to further investigate the differences caused by wind algorithms and applying similar analysis to ROMULUS simulation.

Anisotropic Ejecta Distribution of Kilonova AT 2017gfo Nanjing, China

Advisor: Zi-Gao Dai and Bin-Bin Zhang, Nanjing University Oct 2017 – Now

- Processed the multi-band data collected by `Open Kilonova Catalog` to make the observables directly comparable with simulation results.
- Built an analytical model and used MCMC to determine the best fitting kilonova ejecta distribution in AT 2017gfo event.
- Took relativistic Doppler effects into consideration when calculating observables, which was later proved to play an important role in shaping the observed light curve.
- Currently working on using radiative transfer simulation to validate our simplified model according to reviewer's advice.

SHORT-TERM PROJECTS

Plasma Code Nanjing, China

Advisor: Li Ji, Purple Mountain Observatory Oct 2017 – Jan 2018

- Offered theoretical support to the use of PyAtomDB and checked the reliability of the database via comparing with other data.
- Used AtomDB and PyAtomDB to do line diagnostics of SNR N132D and successfully identified the presence of Fe, S and Si lines.

Satallites Distribution in C-EAGLE Beijing, China

Advisor: Liang Gao, National Astronomical Observatories of China Jan 2019

- Illustrated satellites number density profiles in C-EAGLE results with different stellar mass limits and demonstrated their connections with the mass distribution of the cluster.
- Compared number density profiles in C-EAGLE with observational data to examine its accordance with real universe.

HONORS AND AWARDS

- Outstanding Graduate of Nanjing University 2020
- Member of Elite Project 2016 – 2020
- Elite Project Scholarship 2017, 2019
- People's Scholarship 2017 – 2019
- Annual Scholarship of NAOC, CAS 2018
- Excellent Student 2017

COMPUTER SKILLS

- **Proficient with:** Python, Linux, LaTeX.
- **Working knowledge of:** C++, MATLAB, Mathematica, Shell scripts, MPI, SExtractor, PyRAF, Mangle, SQL, Git.
- **Often-used Packages:** Astropy, pynbody, emcee, dynesty, multiprocessing, PyAtomDB, Corrfunc.

OUTREACH

- **Translation** June 2018 – Now
  Translating the cosmology part of *An Introduction to Modern Astrophysics* by Bradley W. Carroll and Dale A. Ostlie into Chinese.
- **Teaching** at Qinhuai 2nd Experimental Primary School Spring 2017
  Teaching pupils elementary astronomy knowledge.