

Guochao (Jason) Sun

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Education History

- 09/2018 – present **California Institute of Technology, Pasadena, USA**
Ph.D. in Astrophysics; Advisor: James J. (Jamie) Bock
- 09/2016 – 06/2018 **California Institute of Technology, Pasadena, USA**
M.Sc. in Astrophysics
- 09/2011 – 06/2015 **University of California, Los Angeles, USA**
B.Sc. in Astrophysics, *summa cum laude*; Advisor: Steven R. Furlanetto

Research Interests

I am broadly interested many topics, from theoretical astrophysics to observational cosmology

- Theory: reionization, galaxy formation, large-scale structures, first stars, physics of ISM & IGM
- Observations/Instrumentation: intensity mapping, diffuse radiation, mm-wave instrumentation

Research Experience

- 07/2016 – present **Graduate Research Assistant, California Institute of Technology**
– Foreground cleaning strategy for the TIME experiment
– Physical/empirical models of the ISM for multi-tracer intensity mapping
– LIMFAST, a fast semi-numerical simulation for line intensity mapping
– Modeling of TIME scientific signals and forecasts
– TIME instrumentation, testing data analysis, and pipeline development
- 12/2013 – 06/2015 **Undergraduate Research Assistant, Senior-Year Project, UCLA**
– Constraining the star formation efficiency of galaxies during cosmic reionization with the abundance matching technique
- 06/2014 – 09/2014 **SURF, California Institute of Technology**
– Design and simulation of lithographed on-chip spectrometer arrays for future phases of TIME experiment

Conferences, Workshops & Talks

- 12/2021 (invited talk) LBL Institute for Nuclear and Particle Astrophysics Seminar, virtual
- 12/2021 (invited talk) University of Arizona EURECA Talk Series, virtual
- 12/2021 (invited talk) Cornell Galaxy Lunch, virtual
- 11/2021 (invited talk) UC Riverside Astronomy Seminar, virtual
- 10/2021 (talk) SAZERAC SIP (Models and Simulations of High- z Galaxies), virtual
- 10/2021 (invited talk) Study of the Universe By Line Intensity Mapping Experiments, virtual
- 07/2021 (talk) The KICP LIM Workshop, virtual
- 07/2020 (talk) The SAZERAC summer meeting, virtual
- 01/2020 The SMA Interferometry School, Hilo, HI
- 12/2019 (invited talk) Astrophysics Seminar, Shanghai Normal University, Shanghai, CHINA
- 11/2019 (invited talk) BCCP/Cosmology Seminar, Berkeley, CA
- 07/2019 (talk) *L2S2: Lines in the Large Scale Structure*, Marseille, FRANCE
- 05/2019 The 2019 CLOUDY workshop, Lexington, KY
- 02/2018 (poster) *Cosmological Signals from Cosmic Dawn to the Present*, Aspen, CO
- 09/2017 (talk) 3rd Swinburne-Caltech Workshop (*Galaxies and Their Halos*), Pasadena, CA
- 11/2015 (talk) Theoretical Astrophysics in Southern California (TASC), Fullerton, CA

Professional Activities

2021 – present Referee for the Astrophysical Journal

Skills

- Programming: Python, C++, MATLAB, Mathematica, R
- Softwares: IRAF, SOLIDWORKS, HFSS, L^AT_EX, MS Office suite

Teaching & Mentoring Experience

- 10/2017 – 04/2018 Graduate teaching assistantship, Caltech
– Ay121 (Radiative Processes), taught by Prof. S. Phinney
– Ay127 (Cosmology & Galaxy Formation), taught by Prof. S. Phinney & Prof. C. Steidel
- 06/2020 – 04/2021 Co-mentoring SURF student Michael Gonzalez (Caltech) to develop and apply LIMFAST source code to study multi-line intensity mapping
- 07/2021 – 09/2021 Co-mentoring SURP student Baria Khan (U of T) to study the cross-correlation between photo-*z* galaxies and CO intensity maps
- 06/2021 – present Co-mentoring SURF student Jasmine Parsons (McGill) to study the first stars' initial mass function with He II intensity mapping

Honors & Awards

- 06/2021 David and Barbara Groce Travel Fund, Caltech
- 06/2015 Charles Geoffrey Hilton Award for excellence in Astronomy, UCLA
- 06/2014 Summer Undergraduate Research Fellowship (SURF), Caltech
- 2011 – 2015 Dean's Honors List, every quarter, UCLA
- 2009 35th International Science School Scholarship, the University of Sydney

Services & Outreach

- 10/2020 – 10/2021 Treasurer of graduate students in astronomy, Caltech
- 10/2011 – 12/2013 Chief telescope operator, UCLA Undergraduate Astronomical Society
– Organized field trips, outreach events, led weekly public telescope show
- 11/2012 & 11/2013 Volunteer, *Explore Your Universe*
– Volunteered twice for the annually outreach activity held by Astronomy Live, UCLA

References

Prof. Jamie BOCK

Professor of Physics, California Institute of Technology; e-mail: jjb@astro.caltech.edu

Dr. Tzu-Ching CHANG

Research Scientist, Jet Propulsion Laboratory; e-mail: tzu-ching.chang@jpl.nasa.gov

Prof. Steven FURLANETTO

Professor of Astronomy, University of California, Los Angeles; e-mail: sfurlane@astro.ucla.edu

Prof. Abigail CRITES

Assistant Professor of Astronomy, Cornell University; e-mail: atc72@cornell.edu

Publication statistics

Total citations: >300

1st-author citations: >150

h-index: 6

Publications as a leading author

1. **Sun G.**, Mirocha J., Mebane R. H. & Furlanetto S. R., *Revealing the formation histories of the first stars with the cosmic near-infrared background*, 2021, MNRAS, 508, 1954; doi: 10.1093/mnras/stab2697
2. **Sun G.**, Chang T.-C., Uzgil B. D., et al., *Probing Cosmic Reionization and Molecular Gas Growth with TIME*, 2021, ApJ, 915, 33; doi: 10.3847/1538-4357/abfe62
3. **Sun G.**, Hensley B. S., Chang T.-C., et al., *A Self-consistent Framework for Multiline Modeling in Line Intensity Mapping Experiments*, 2019, ApJ, 887, 142; doi: 10.3847/1538-4357/ab55df
4. **Sun G.**, Moncelsi L., Viero M. P., et al., *A Foreground Masking Strategy for [C II] Intensity Mapping Experiments Using Galaxies Selected by Stellar Mass and Redshift*, 2018, ApJ, 856, 107; doi: 10.3847/1538-4357/aab3e3
5. **Sun G.** & Furlanetto S. R., *Constraints on the star formation efficiency of galaxies during the epoch of reionization*, 2016, MNRAS, 460, 417; doi: 10.1093/mnras/stw980

Publications as a contributing author

6. Parsons J., Mas-Ribas L., **Sun G.**, et al., *Probing Population III Initial Mass Functions with He II/H α Intensity Mapping*, submitted to ApJ
7. White N., Bauer F., Baumgartner, W., et al. (incl. **Sun G.**), *The Gamow Explorer: a Gamma-Ray Burst Observatory to study the high redshift universe and enable multi-messenger astrophysics*, 2021, Proc. SPIE, 11821; doi: 10.1117/12.2599293
8. Lidz A., Chang T.-C., Mas-Ribas, L. & **Sun G.**, *Future Constraints on the Reionization History and the Ionizing Sources from Gamma-ray Burst Afterglows*, 2021, ApJ, 917, 58; doi: 10.3847/1538-4357/ac0af0
9. Chang T.-C., Beane A., Doré O., et al. (incl. **Sun G.**), *Tomography of the Cosmic Dawn and Reionization Eras with Multiple Tracers*, 2019, BAAS, 51c, 282
10. Hunacek J., Bock J., Bradford, C. M., et al. (incl. **Sun G.**), *Hafnium films and magnetic shielding for TIME, a mm-wavelength spectrometer array*, 2018, Journal of Low Temperature Physics, 193, 893; doi: 10.1007/s10909-018-1906-3
11. Furlanetto S. R., Mirocha J., Mebane, R. H. & **Sun G.**, *A minimalist feedback-regulated model for galaxy formation during the epoch of reionization*, 2017, MNRAS, 472, 1576; doi: 10.1093/mnras/stx2132
12. Mirocha J., Furlanetto S. R. & **Sun G.**, *The global 21-cm signal in the context of the high-z galaxy luminosity function*, 2017, MNRAS, 464, 1365; doi: 10.1093/mnras/stw2412

Manuscripts in preparation

Sun G., Mas-Ribas L., Chang T.-C., et al., *LIMFAST. II. Understanding Galaxy Astrophysics During Cosmic Reionization with Multi-Tracer Line Intensity Mapping*, to be submitted to ApJ by December, 2021 (draft available)

Mas-Ribas L., **Sun G.**, Chang T.-C., et al., *LIMFAST. I. A Semi-Numerical Tool for Intensity Mapping*, to be submitted to ApJ by December, 2021 (draft available)