

## Research Interests

### Plasma Energization & Particle Acceleration

Magnetic reconnection (rate physics, turbulence generation, relativistic regimes, power-law formation, particle transport mechanisms). Collisionless shocks (shock-turbulence interaction, particle acceleration). Plasma turbulence (energy dissipation, stochastic acceleration). Transport theory and modeling.

### Solar & Space Physics Applications

Solar flares and eruptions (large-scale particle acceleration, nonthermal emissions, SEP origins). Reconnection-driven solar jets. Termination shocks in flares. Magnetotail dynamics. Coronal heating mechanisms.

### Computational & Theoretical Methods

Kinetic simulations (PIC, hybrid). MHD modeling. Transport equation solvers. Test-particle codes. Multi-scale coupling techniques. HPC algorithm development for GPU/CPU clusters.

## Education

The University of Alabama in Huntsville

HUNTSVILLE, AL, USA

Ph.D. in Space Science

2011 – 2016

Dissertation: "Numerical Simulation of Particle Acceleration during Solar Flares". Advisor: Gang Li

Peking University

BEIJING, CHINA

M.S. in Space Physics

2008 – 2011

Tongji University

SHANGHAI, CHINA

B.S. in Surveying and Mapping Engineering

2004 – 2008

## Research Experiences

Los Alamos National Laboratory, T-2 Division

Los ALAMOS, NM

Staff Scientist

Sep. 2024 – present

Study particle acceleration and transport in space, solar, and astrophysical plasmas using multi-scale kinetic and MHD simulations. Lead development of GPU-accelerated particle transport solvers and coordinate multi-institutional collaborations.

Postdoctoral Research Associate

Feb. 2017 – Feb. 2020

Investigated particle acceleration mechanisms in solar flare reconnection using PIC simulations. Developed and solved particle acceleration models coupled with MHD simulations, validated against multi-wavelength solar observations. Mentors: Fan Guo, Hui Li

Visiting Student

May 2014 – Aug. 2016, Jun. 2013 – Aug. 2013

Investigated roles of drift motions, flow shear/compression, and pressure anisotropy in reconnection energization using VPIC. Studied magnetic field amplification and particle acceleration in supernova remnant shocks via MHD + Parker transport. Mentors: Fan Guo, Hui Li

Dartmouth College

HANOVER, NH

Research Scientist

Feb. 2022 – Sep. 2024

Developed theories of particle acceleration in reconnection-driven solar eruptions. Combined MHD + transport and PIC simulations to model nonthermal emission signatures and compare with X-ray and microwave observations. Mentor: Yi-Hsin Liu

Research Associate B

Feb. 2020 – Jan. 2022

Performed large-scale PIC simulations to quantify reconnection rate reduction in high- $\beta$  plasmas and power-law formation in relativistic regimes. Applied MHD + transport framework to model particle acceleration and transport in solar flares. Mentor: Yi-Hsin Liu

The University of Alabama in Huntsville

HUNTSVILLE, AL

**Postdoctoral Research Assistant**

Studied plasma-tether interactions using kinetic PIC simulations. Mentor: Gary Zank

Sep. 2016 – Jan. 2017

**Graduate Research Assistant**

Dissertation: "Numerical Simulation of Particle Acceleration during Solar Flares." Developed test-particle code for chaotic magnetic fields and performed VPIC simulations to identify acceleration mechanisms in reconnection. Advisor: Gang Li

May 2012 – Aug. 2016

Peking University

BEIJING, CHINA

**Graduate Research Assistant**

Modeled electron transport using Monte Carlo (Geant4) simulations. Advisor: Hongfei Chen

Sep. 2009 – Jun. 2011

## Honors and Awards

Postdoctoral Distinguished Performance Award Honorable Mention, Los Alamos National Lab	2019
NASA Earth and Space Science Fellowship (NESSF), NASA	2013 – 2016
SPD Studentship Award, Solar Physics Division, AAS	2015
DPP Student Travel Grant Award, Division of Plasma Physics, APS	2014

## Teaching and Mentoring Experiences

**Teaching:**

<i>Graduate Teaching Assistant</i> , Department of Physics, The University of Alabama in Huntsville	Spring 2012
Grading for PH421 (Thermal & Statistical Physics)	
<i>Graduate Teaching Assistant</i> , Department of Physics, The University of Alabama in Huntsville	Fall 2011
Grading for PH113 (General Physics with Calculus III) and teaching PH114 (General Physics Labs)	

**Tutorial:**

<i>A tutorial on running reconnection simulations using VPIC</i>	2021
Material: <a href="https://github.com/xiaocanli/vpic_reconnection_tutorial">https://github.com/xiaocanli/vpic_reconnection_tutorial</a>	
<i>Reconnection Simulation using Athena++</i>	2022
Material: <a href="https://github.com/xiaocanli/athena_reconnection">https://github.com/xiaocanli/athena_reconnection</a>	
<i>A tutorial on using stochastic-parker</i>	2022
Material: <a href="https://stochastic-parker.readthedocs.io/en/latest/usage.html">https://stochastic-parker.readthedocs.io/en/latest/usage.html</a>	

**Mentoring/Technical Support:**

**At Dartmouth College**

<i>Shan-Chang Lin</i> , Graduate	2020 – present
Helping with simulations and assisting in studying reconnection rate and magnetotail reconnection	
<i>Sarah Peery</i> , Graduate	2020 – present
Helping with simulations and assisting in studying relativistic reconnection	

*Matthew Goodbred*, Undergraduate

Helping with simulations and assisting in studying magnetic reconnection

**At LANL**

<i>Shiva Thapa</i> ( <i>Graduate@Dartmouth College</i> ), Space Weather summer student	2023 – present
Collaborating in studying the role of resistivity gradient in magnetic reconnection	
<i>Daniel Humphrey</i> ( <i>Graduate@UWMadison</i> ), CPW summer student	2025 – present
Collaborating in understanding turbulence properties in 3D relativistic reconnection	
<i>Ima Hernandez</i> ( <i>Undergraduate@UCLA</i> ), CPW summer student	2025 – present
Collaborating in studying particle acceleration in 3D relativistic reconnection	
<i>Michael Farnell</i> ( <i>Undergraduate@Dartmouth College</i> ), DOE SULI Student	2024 – present
Assisting in studying shocks using kinetic simulations	
<i>Jake Halpern</i> ( <i>Graduate@Columbia University</i> ), DOE GFRP Student	2025
Collaborating in studying the role of Coulomb collision in particle acceleration by magnetic reconnection	
<i>Ethan Lee</i> ( <i>Undergraduate@Harvard</i> ), Summer Intern	2025 – present
Assisting in studying neutrino production in AGU accretion disks	

<i>Hassan Elshabasy (Undergraduate@UWaterloo)</i> , DOE SULI Student	2024
Assisting in studying magnetic reconnection using kinetic simulations	
<i>Giulia Murtas, now at University of Hawaii at Mānoa</i> , Postdoc	2022 – present
Assisting and collaborating in modeling particle acceleration and transport in large-scale reconnection	
<i>Jeongbhin Seo</i> , Postdoc	2023 – present
Collaborating in modeling particle acceleration and transport magnetic reconnection, solar flares, and outer heliosphere	
<i>Joshua Goodwill (Graduate@University of Delaware)</i> , Summer Intern	2023 – 2024
Assisting in studying Kelvin-Helmholtz instability using kinetic simulations	
<i>Grant Johnson (Graduate@Princeton University)</i> , Summer Intern	2021 – 2022
Assisting in studying particle acceleration in magnetic reconnection	
<i>Senbei Du (Graduate@The University of Alabama in Huntsville)</i> , Visiting Student	2016 – 2019
Helping with simulations and assisting in studying plasma energization in magnetic reconnection	
<i>Dylan Ma (Los Alamos High School)</i> , Intern	2018 – 2019
Helping with debugging, running simulations, and analyzing simulation results	
<b>At UAH</b>	
<i>David Fink (Undergraduate@Emory University)</i> , UAH & MSFC REU	2012
Helping with analyzing solar wind observations data	

## Grants & Computing Allocations

### Research Grants:

PI, <i>LANL LDRD Exploratory Research (ER)</i> , \$380k/year	2025 – 2028
“Integrated Beta Production and Transport Model for High Altitude Nuclear Explosions”	
Co-I, <i>NSF Solar Terrestrial program</i> , \$100k	2024 – 2027
“Collaborative Research: The role of supra-arcade downflows on energy transfer in solar flares” (PI: Xiaoyan Xie)	
Co-I, <i>NASA NASA Artificial Intelligence Applications in Heliophysics (AIAH)</i> , \$50k	2025 – 2026
“Numerical Tools of Ionization and Recombination Analysis in Plasma with Arbitrary Non-Maxwellian Electron Distribution” (PI: Chengcai Shen)	
Co-I, <i>NASA Heliophysics Theory, Modeling and Simulations (HTMS)</i> , \$150k	2023 – 2026
“Particle Acceleration and Transport in Coronal Solar Flare Regions” (PI: Fan Guo)	
Co-I, <i>NASA Heliophysics Supporting Research (HSR)</i> , \$150k	2023 – 2026
“Magnetic flux ropes and magnetic loops in Earth’s plasma sheet: their properties and role in particle energization” (PI: Weijie Sun)	
PI, <i>NASA Living With a Star Science (LWS)</i> , \$647k	2021 – 2025
“The Acceleration of Energetic Particles in Solar Flares and Their Transport in Solar Eruption Regions”	
Institutional PI, <i>NSF Astronomy &amp; Astrophysics Grants Program (AAG)</i> , \$178k	2021 – 2024
“Achieving a New Understanding of Solar Flare Termination Shocks” (PI: Fan Guo)	
Co-I, <i>NASA Heliophysics Supporting Research (HSR)</i> , \$167k	2021 – 2024
“Exploring Time-Dependent Ionization in Solar Eruption Models Combining with Energetic Particle Acceleration” (PI: Chengcai Shen)	
Institutional PI, <i>Purdue University–NASA prime</i> , \$23k	2021 – 2022
“Radiation and Polarization Signatures From 3D Relativistic Turbulent Magnetic Reconnection In Blazars” (PI: Dimitrios Giannios)	
Institutional PI, <i>LANL–NASA prime</i> , \$116k	2020 – 2023
“Exploring Energy Release and Conversion in Solar Eruptive Events Using Multi-wavelength Observations and Numerical Simulations” (PI: Bin Chen)	

### Computing Allocations:

PI, DOE ALCC, 750k GPU node-hours on Frontier@OLCF	2025 – 2026
PI, NERSC’s ERCAP, 4.2k CPU node-hours and 8k GPU node-hours/year	2025
PI, NERSC’s ERCAP, 7k CPU node-hours and 2.5k GPU node-hours/year	2024

PI, NERSC's ERCAP (Energy Research Computing Allocations Process), ~25k node-hours/year	2023
Co-I, TACC's Large-Scale Community Partnerships (LSCP) project, 890k node-hours/year	2021 – 2023
PI, Institutional Computing Project 2019, Los Alamos National Lab, 10M core-hours	2019 – 2020
PI, Institutional Computing Project 2018, Los Alamos National Lab, 8.8M core-hours/year	2018 – 2020
Co-I, NERSC's High-Impact Science at Scale program 2018, 60M core-hours	2018 – 2019

## Professional and Community Service

### Review Activities:

Guest Editor, <i>Frontiers in Astronomy And Space Sciences</i>	2021 – present
Referee, 66 papers for 21 journals	2016 – present
ApJ, ApJL, ApJS, PRL, PRX, MNRAS, JGR, GRL, PoP, Reviews of Modern Plasma Physics, Communications Physics, Frontier, Astrophysics and Space Sciences, Solar Physics, Plasma Science and Technology, Galaxies, Sensors, Atmosphere, Fluids, Entropy, Universe	
Panelist, 3 NASA grant panel, 3 NSF grant panel	2022–2025
Mail-in Reviewer, 1 grant proposal submitted to Swiss National Science Foundation (SNSF)	2023
Mail-in Reviewer, 1 application submitted for Secretary's Research Prizes of Smithsonian Institute	2023
Mail-in Reviewer, 2 grant proposals submitted to NASA funding programs	2019, 2020
Judge, Outstanding Student Paper Award of the AGU Fall Meeting	2017 – 2019, 2021 – 2024

### Meeting Activities:

Scientific Organizing Committee (SOC), <i>Solar Physics High Energy Research (SPHERE) 4 Workshop at Berkeley, CA</i>	2025
Session Organizer, <i>2025 SHINE Workshop at Charleston, SC</i>	2025
Topic: "Turbulence, reconnection, shock, and particle energization"	
Session Chair, <i>66th Annual Meeting of the APS DPP at Atlanta, GA</i>	2024
Topic: "Plasma Astrophysics"	
Session Chair, <i>AGU Fall Meeting at San Francisco, CA</i>	2023
Topic: "Magnetic Reconnection: Connecting Ideas from Observations, Experiments, Models, and Theory"	
Session Convener, <i>AGU Fall Meeting at Chicago, IL</i>	2022
Topic: "Magnetic Reconnection: Connecting Ideas from Observations, Experiments, Models, and Theory"	
Early Career Convener, <i>AGU Fall Meeting at Chicago, IL</i>	2022
Topic: "Energetic Particles from the Sun to the Heliosphere"	
Session Convener, <i>AGU Fall Meeting at San Francisco, CA (19), Online (20)</i>	2019-2020
Topic: "Plasma Energization, Particle Acceleration, and High-Energy Emission in Solar Flares"	
Organizer, <i>One-week workshop at Los Alamos, NM</i>	2019
Topic: "Magnetic Reconnection and Particle Acceleration in Solar Flares"	
Session Chair, <i>AGU Fall Meeting at Washington, D.C.</i>	2018
Topic: "Plasma Energization, Particle Acceleration, and High-Energy Emission in Solar Flares"	

## Computer Skills

HPC Platforms: Production-scale runs on NERSC, LANL, TACC, ALCF, and OLCF systems	2013 – present
Programming & Parallelism: Python, C/C++, Fortran, Julia; MPI, OpenMP, CUDA, Kokkos, Cabana; performance-portable kernels for GPU/CPU clusters	
Tooling & Build: Make/CMake workflows, profiling and debugging with GDB, Valgrind, Arm/Linaro DDT, and job-level diagnostics on large clusters	
Data & Visualization: HDF5, FFTW3, HeFFTe, ParaView, and Python analysis stacks for petascale simulation output	

AI-assisted workflows: ChatGPT, Claude Code, GitHub Copilot, and OpenAI Codex to prototype diagnostics, refactor kernels, and accelerate documentation for HPC codes

Numerical Codes: Athena/Athena++/AthenaK (global MHD), VPIC/VPIC-Kokkos/Hybrid-VPIC/HybridVPIC-K (kinetic simulations), custom test-particle code (<https://git.io/fxQYy>), stochastic transport solver (<https://git.io/fxQY1>)

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## Journal Articles

1800+ citations in total according to Google Scholar

### As First Author

14. **Xiaocan Li**, Chengcai Shen, Xiaoyan Xie, Fan Guo, Bin Chen, Ivan Oparin, Yuqian Wei, Sijie Yu, and Jeongbhin Seo. "Energy Conversion and Electron Acceleration and Transport in 3D Simulations of Solar Flares." *The Astrophysical Journal* 991, no. 2 (2025): 202.
13. **Xiaocan Li**, Joel Dahlin, Fan Guo, Bin Zhuang, Sophie Masson, and Spiro Antiochos. "Modeling Particle Acceleration and Release from Solar Eruptions." *The Astrophysical Journal* 985, no. 1 (2025): 118.
12. **Xiaocan Li**, Fan Guo, Yi-Hsin Liu, and Hui Li. "A Model for Nonthermal Particle Acceleration in Relativistic Magnetic Reconnection." *The Astrophysical Journal* 954 L37 (2023).
11. **Xiaocan Li**, Fan Guo, Bin Chen, Chengcai Shen, and Lindsay Glesener. "Modeling Electron Acceleration and Transport in the Early Impulsive Phase of the 2017 September 10 Solar Flare." *The Astrophysical Journal*, 932:92 (11pp), 2022 June 20
10. **Xiaocan Li**, Fan Guo, and Yi-Hsin Liu. "The acceleration of charged particles and formation of power-law energy spectra in nonrelativistic magnetic reconnection." *Physics of Plasmas* 28, no. 5 (2021): 052905 (**Featured Article**).
9. **Xiaocan Li**, and Yi-Hsin Liu. "The Effect of Thermal Pressure on Collisionless Magnetic Reconnection Rate." *The Astrophysical Journal* 912, no. 2 (2021): 152.
8. **Xiaocan Li**, Fan Guo, Hui Li, Adam Stanier, and Patrick Kilian. "Formation of Power-law Electron Energy Spectra in Three-dimensional Low- $\beta$  Magnetic Reconnection." *The Astrophysical Journal* 884, no. 2 (2019): 118.
7. **Xiaocan Li**, Fan Guo, Hui Li. "Particle acceleration in kinetic simulations of non-relativistic magnetic reconnection with different ion-electron mass ratio" *The Astrophysical Journal*, 879:5 (12pp), 2019 July 1.
6. **Xiaocan Li**, Fan Guo, Hui Li, Shengtai Li. "Large-scale Compression Acceleration during Magnetic Reconnection in a Low- $\beta$  Plasma." *The Astrophysical Journal* 866, no. 1 (2018): 4.
5. **Xiaocan Li**, Fan Guo, Hui Li, Joachim Birn. "The roles of fluid compression and shear in electron energization during magnetic reconnection." *The Astrophysical Journal*, 855:80 (2018)
4. **Xiaocan Li**, Fan Guo, Hui Li, and Gang Li. "Particle Acceleration during Magnetic Reconnection in a Low-beta Plasma." *The Astrophysical Journal* 843.1 (2017): 21.
3. **Xiaocan Li**, Fan Guo, Hui Li, and Gang Li. "Nonthermally Dominated Electron Acceleration during Magnetic Reconnection in a Low-beta Plasma." *The Astrophysical Journal Letters*, 811:L24 (5pp), 2015 October 1
2. **Xiaocan Li**, Brahmananda Dasgupta, and Gang Li. "Energization of charged particle in a time-dependent chaotic magnetic field with an implication of the production of seed particles in solar energetic particle events." *Advances in Space Research* 53, no. 8 (2014): 1153-1161.
1. **Xiaocan Li**, Hongfei Chen, Yongqiang Hao, Hong Zou, and Weihong Shi. "Investigation of electrons inside the satellite by the Geant4 simulation." *Science China Technological Sciences* 54, no. 9 (2011): 2271-2275.

### As Second Author

12. Chengcai Shen, **Xiaocan Li**, Yuan-Kuen Ko, John C. Raymond, Fan Guo, Vanessa Polito, and Viviane Pierrard. "Modeling of Ionization and Recombination Processes in Plasma with Arbitrary Non-Maxwellian Electron Distributions." *arXiv preprint arXiv:2506.14668* (2025).
11. Giulia Murtas, **Xiaocan Li**, and Fan Guo. "Compression Acceleration of Protons and Heavier Ions at the Heliospheric Current Sheet." *The Astrophysical Journal* 974, no. 1 (2024): 28.

10. Fan Guo, **Xiaocan Li**, Omar French, Qile Zhang, William Daughton, Yi-Hsin Liu, William Matthaeus, Patrick Kilian, Grant Johnson, and Hui Li. "Comment on ‘Nonideal Fields Solve the Injection Problem in Relativistic Reconnection’." *Physical Review Letters* 130, no. 18 (2023): 189501.
9. Kevin J. Genestreti, **Xiaocan Li**, Yi-Hsin Liu, James L. Burch, Roy B. Torbert, Stephen A. Fuselier, Takuma Nakamura et al. "On the origin of ‘patchy’ energy conversion in electron diffusion regions." *Physics of Plasmas* 29, 082107 (2022)
8. Haocheng Zhang, **Xiaocan Li**, Dimitrios Giannios, Fan Guo, Hannes Thiersen, Markus Böttcher, Tiffany Lewis, and Tonia Venters. "Radiation and Polarization Signatures from Magnetic Reconnection in Relativistic Jets. II. Connection with  $\gamma$ -Rays." *The Astrophysical Journal* 924, no. 2 (2022): 90.
7. Fan Guo, **Xiaocan Li**, William Daughton, Hui Li, Patrick Kilian, Yi-Hsin Liu, Qile Zhang, and Haocheng Zhang. "Magnetic Energy Release, Plasma Dynamics and Particle Acceleration during Relativistic Turbulent Magnetic Reconnection." *The Astrophysical Journal* 919, no. 2 (2021): 111.
6. Haocheng Zhang, **Xiaocan Li**, Dimitrios Giannios, Fan Guo. "First-principles Prediction of X-Ray Polarization from Magnetic Reconnection in High-frequency BL Lacertae Objects." *The Astrophysical Journal* 912, no. 2 (2021): 129.
5. Haocheng Zhang, **Xiaocan Li**, Dimitrios Giannios, Fan Guo, Yi-Hsin Liu, and Lingyi Dong. "Radiation and Polarization Signatures from Magnetic Reconnection in Relativistic Jets. I. A Systematic Study." *The Astrophysical Journal* 901, no. 2 (2020): 149.
4. Patrick Kilian, **Xiaocan Li**, Fan Guo, and Hui Li. "Exploring the acceleration mechanisms for particle injection and power-law formation during trans-relativistic magnetic reconnection." *The Astrophysical Journal* 899, no. 2 (2020): 151.
3. Fan Guo, **Xiaocan Li**, William Daughton, Hui Li, Yi-Hsin Liu, Wangcheng Yan, Dylan Ma, and Patrick Kilian. "Determining the Dominant Acceleration Mechanism during Relativistic Magnetic Reconnection in Large-scale Systems." *The Astrophysical Journal Letters* 879, no. 2 (2019): L23.
2. Haocheng Zhang, **Xiaocan Li**, Fan Guo, and Dimitrios Giannios. "Large-Amplitude Blazar Polarization Angle Swing as a Signature of Magnetic Reconnection." *The Astrophysical Journal Letters* 862, no. 2 (2018): L25.
1. Fan Guo, **Xiaocan Li**, Hui Li, William Daughton, Bing Zhang, Nicole Lloyd-Ronning, Yi-Hsin Liu, Haocheng Zhang, and Wei Deng. "Efficient production of high-energy nonthermal particles during magnetic reconnection in a magnetically dominated ion–electron plasma." *The Astrophysical Journal Letters* 818, no. 1 (2016): L9.

### As Supporting Author

33. Fan Guo, Omar French, Qile Zhang, **Xiaocan Li**, and Jeongbin Seo. "Particle Injection Problem in Magnetic Reconnection and Turbulence." *arXiv preprint arXiv:2506.19938* (2025).
32. Goodwill, J., Adhikari, S., Li, X., Pucci, F., Yang, Y., Guo, F. and Matthaeus, W.H., 2025. Nonlinear evolution and energy dissipation in shear-driven collisionless plasma turbulence. *Physics of Plasmas*, 32(5).
31. Xiaoyan Xie, Chengcai Shen, Katharine K. Reeves, Bin Chen, **Xiaocan Li**, Fan Guo, Sijie Yu, Yuqian Wei, and Chuanfei Dong. "Anisotropic Turbulent Flows Observed in Above-the-loop-top Regions during Solar Flares." *The Astrophysical Journal Letters* 984, no. 1 (2025): L27.
30. Yi-Hsin Liu, Prayash Pyakurel, **Xiaocan Li**, Michael Hesse, Naoki Bessho, Kevin Genestreti, and Shiva B. Thapa. "An analytical model of ‘Electron-Only’ magnetic reconnection rates." *Communications Physics* 8, no. 1 (2025): 128.
29. Shan-Chang Lin, Yi-Hsin Liu, and **Xiaocan Li**. "The spreading of magnetic reconnection X-line in particle-in-cell simulations-mechanism and the effect of drift-kink instability." *Journal of Geophysical Research: Space Physics* 130, no. 2 (2025): e2024JA033494.
28. Divyot Singh, Omar French, Fan Guo, and **Xiaocan Li**. "Low-energy Injection and Nonthermal Particle Acceleration in Relativistic Magnetic Turbulence." *The Astrophysical Journal* 979, no. 1 (2025): 39.
27. Weijie Sun, Mitsuo Oka, Marit Øieroset, Drew L. Turner, Tai Phan, Ian J. Cohen, **Xiaocan Li** et al. "Relativistic Electron Acceleration and the ‘Ankle’ Spectral Feature in Earth’s Magnetotail Reconnection." *The Astrophysical Journal Letters* 978, no. 2 (2025): L28.
26. Ji, H., L. Gao, G. Pomraning, K. Sakai, F. Guo, **X. Li**, A. Stanier et al. "Study of magnetic reconnection at low- $\beta$  using laser-powered capacitor coils." *Physics of Plasmas* 31, no. 10 (2024).

25. Bin Chen, Xiangliang Kong, Sijie Yu, Chengcai Shen, **Xiaocan Li**, Fan Guo, Yixian Zhang, Lindsay Glesener, and Säm Krucker. "Energetic Electrons Accelerated and Trapped in a Magnetic Bottle above a Solar Flare Arcade." *The Astrophysical Journal* 971, no. 1 (2024): 85.

24. Seo, Jeongbin, Fan Guo, **Xiaocan Li**, and Hui Li. "Proton acceleration in low- $\beta$  magnetic reconnection with energetic particle feedback." *The Astrophysical Journal* 977, no. 2 (2024): 146.

23. Qile Zhang, Fan Guo, William Daughton, **Xiaocan Li**, and Hui Li. "Plasma Dynamics and Nonthermal Particle Acceleration in 3D Nonrelativistic Magnetic Reconnection." *The Astrophysical Journal* 974, no. 1 (2024): 47.

22. Sarah Peery, Yi-Hsin Liu, and **Xiaocan Li**. "Conditions for Relativistic Magnetic Reconnection under the Presence of Shear Flow and Guide Field." *The Astrophysical Journal* 964, no. 2 (2024): 144.

21. Haocheng Zhang, Alan Marscher, Fan Guo, Dimitrios Giannios, **Xiaocan Li**, and Michela Negro. "First-Principle-Integrated Study of Blazar Synchrotron Radiation and Polarization Signatures from Magnetic Turbulence." Accepted to *The Astrophysical Journal* (2023).

20. Xiangliang Kong, Bin Chen, Fan Guo, Chengcai Shen, **Xiaocan Li**, Jing Ye, Lulu Zhao et al. "Numerical Modeling of Energetic Electron Acceleration, Transport, and Emission in Solar Flares: Connecting Loop-top and Footpoint Hard X-Ray Sources." *The Astrophysical Journal Letters* 941, no. 2 (2022): L22.

19. Grant Johnson, Patrick Kilian, Fan Guo, and **Xiaocan Li**. "Particle Acceleration in Magnetic Reconnection with Ad hoc Pitch-angle Scattering." *The Astrophysical Journal*, 933:73 (9pp), 2022 July 1

18. Oka, M., T. D. Phan, M. Øieroset, D. L. Turner, J. F. Drake, X. Li, S. A. Fuselier et al. "Electron energization and thermal to non-thermal energy partition during earth's magnetotail reconnection." *Physics of Plasmas* 29, no. 5 (2022): 052904.

17. Yi-Hsin Liu, Paul Cassak, **Xiaocan Li**, Michael Hesse, Shan-Chang Lin, and Kevin Genestreti. "First-principles theory of the rate of magnetic reconnection in magnetospheric and solar plasmas." *Communications Physics* 5, no. 1 (2022): 1-9.

16. Xiangliang Kong, Jing Ye, Bin Chen, Fan Guo, Chengcai Shen, **Xiaocan Li**, Sijie Yu, Yao Chen, and Joe Giacalone. "A model of double coronal hard X-ray sources in solar flares." *The Astrophysical Journal*, 933:93 (8pp), 2022 July 1

15. Fan Guo, Lulu Zhao, Christina MS Cohen, Joe Giacalone, Richard A. Leske, Mark E. Wiedenbeck, Stephen W. Kahler, **Xiaocan Li**, Qile Zhang, George Ho, and Mihir Desai. "Variable Ion Compositions of Solar Energetic Particle Events in the Inner Heliosphere: A Field Line Braiding Model with Compound Injections." *The Astrophysical Journal* 924, no. 1 (2022): 22.

14. Qile Zhang, Fan Guo, William Daughton, **Xiaocan Li**, and Hui Li. "Efficient Nonthermal Ion and Electron Acceleration Enabled by the Flux-Rope Kink Instability in 3D Nonrelativistic Magnetic Reconnection." *Physical Review Letters* 127, no. 18 (2021): 185101.

13. Matthew Goodbred, Yi-Hsin Liu, Bin Chen, and **Xiaocan Li**. "The relation between the energy conversion rate and reconnection rate in Petschek-type reconnection—Implications for solar flares." *Physics of Plasmas* 28, no. 8 (2021): 082103.

12. Shan-Chang Lin, Yi-Hsin Liu, and **Xiaocan Li**. "Fast magnetic reconnection induced by resistivity gradients in 2D magnetohydrodynamics." *Physics of Plasmas* 28, no. 7 (2021): 072109.

11. Liping Yang, Hui Li, Fan Guo, **Xiaocan Li**, Shengtai Li, Jiansen He, Lei Zhang, and Xueshang Feng. "Fast Magnetic Reconnection with Turbulence in High Lundquist Number Limit." *The Astrophysical Journal Letters* 901, no. 2 (2020): L22.

10. Fan Guo, Yi-Hsin Liu, **Xiaocan Li**, Hui Li, William Daughton, and Patrick Kilian. "Recent progress on particle acceleration and reconnection physics during magnetic reconnection in the magnetically-dominated relativistic regime." *Physics of Plasmas* 27, no. 8 (2020): 080501.

9. Senbei Du, Gary P. Zank, **Xiaocan Li**, and Fan Guo. "Energy dissipation and entropy in collisionless plasma." *Physical Review E* 101, no. 3 (2020): 033208.

8. Yi-Hsin Liu, Shan-Chang Lin, Michael Hesse, Fan Guo, **Xiaocan Li**, Haocheng Zhang, and Sarah Peery. "The Critical Role of Collisionless Plasma Energization on the Structure of Relativistic Magnetic Reconnection." *The Astrophysical Journal Letters*, 892 L13

7. Fu, Xiangrong, Fan Guo, Hui Li, and **Xiaocan Li**. "Heating of Heavy Ions in Low-beta Compressible Turbulence." *The Astrophysical Journal*, 890(2), 161, 2020.

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6. Chen, G., H. S. Fu, Y. Zhang, **Xiaocan Li**, Y. S. Ge, A. M. Du, C. M. Liu, and Y. Xu. "Energetic Electron Acceleration in Unconfined Reconnection Jets." *The Astrophysical Journal Letters* 881, no. 1 (2019): L8.
5. Adam Stanier, William Daughton, Ari Le, **Xiaocan Li**, and Robert Bird. "Influence of 3D plasmoid dynamics on the transition from collisional to kinetic reconnection." *Physics of Plasmas* 26, 072121 (2019)
4. Senbei Du, Fan Guo, Gary P. Zank, **Xiaocan Li**, and Adam Stanier. "Plasma Energization in Colliding Magnetic Flux Ropes." *The Astrophysical Journal* 867, no. 1 (2018): 16.
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## Conference Proceedings

4. Bin Dong, Patrick Kilian, **Xiaocan Li**, Fan Guo, Suren Byna, and Kesheng Wu. 2019. "Terabyte-scale Particle Data Analysis: An ArrayUDF Case Study". In *Proceedings of the 31st International Conference on Scientific and Statistical Database Management (SSDBM '19)*. ACM, New York, NY, USA, 202-205.
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2. Kirit Makwana, Hui Li, Fan Guo, and **Xiaocan Li**. "Dissipation and particle energization in moderate to low beta turbulent plasma via PIC simulations." In *Journal of Physics: Conference Series*, vol. 837, no. 1, p. 012004. IOP Publishing, 2017.
1. Brahmananda Dasgupta, Gang Li, **Xiaocan Li**, Abhay Ram, Qiang Hu, Gang Li, Gary P. Zank, Xianzhi Ao, Olga Verkhoglyadova, and James H. Adams. "Particle transport and acceleration in a chaotic magnetic field: Implications for seed population to solar flare and CME." In *AIP Conference Proceedings-American Institute of Physics*, vol. 1500, no. 1, p. 56. 2012.

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## White Papers

5. Oka, M., ..., Li, X. et al., 2023. "Particle acceleration in solar flares with imaging-spectroscopy in soft X-rays." *Whitepaper #302 in the Decadal Survey for Solar and Space Physics (Heliophysics) 2024-2033*. Bulletin of the AAS, 55(3). <https://doi.org/10.3847/25c2cfeb.c1b1eb07>
4. Chen, B., ..., Li, X. et al., 2023. "Quantifying Energy Release in Solar Flares and Solar Eruptive Events: New Frontiers with a Next-Generation Solar Radio Facility." *Whitepaper #060 in the Decadal Survey for Solar and Space Physics (Heliophysics) 2024-2033*. Bulletin of the AAS, 55(3). <https://doi.org/10.3847/25c2cfeb.aa2ad1do>
3. Gary, D., ..., Li, X. et al., 2023. "Frequency Agile Solar Radiotelescope." *Whitepaper #123 in the Decadal Survey for Solar and Space Physics (Heliophysics) 2024-2033*. Bulletin of the AAS, 55(3). <https://doi.org/10.3847/25c2cfeb.7ecdoda5>
2. Guo, F., ..., Li, X. et al., 2023. "Advancing Theory and Modeling Efforts in Heliophysics." *Whitepaper #144 in the Decadal Survey for Solar and Space Physics (Heliophysics) 2024-2033*. Bulletin of the AAS, 55(3). <https://doi.org/10.3847/25c2cfeb.d8579f9b>
1. Ji, H., ..., Li, X. et al., 2023. "Major Scientific Challenges and Opportunities in Understanding Magnetic Reconnection and Related Explosive Phenomena in Heliophysics and Beyond." *Whitepaper #192 in the Decadal Survey for Solar and Space Physics (Heliophysics) 2024-2033*. Bulletin of the AAS, 55(3). <https://doi.org/10.3847/25c2cfeb.e22a8d1f>

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## Invited Talks

17. Modeling Electron Acceleration and Transport in 3D Solar Flare Regions, *2025 US-Japan Workshop on Magnetic Reconnection*, Mar. 12th, 2025, PPPL, Princeton, NJ.
16. Understanding Particle Acceleration during Solar Flares through Integrated Modeling and Observations, *2023 AGU Fall Meeting*, Dec. 11th, 2023, San Francisco, CA.
15. Modeling Particle Acceleration and Transport in Solar Flares and Solar Eruption Regions, *EOVSA Data and GX Simulator Modeling Camp & FASR Workshop 2023*, Jan. 11th, 2023, Newark, NJ.
14. Modeling Electron Acceleration and Transport in Magnetic Reconnection *AOGS 19th Annual Meeting*, Aug. 1st, 2022, Online
13. Thermal and Nonthermal Partition in Nonrelativistic Magnetic Reconnection *Magnetic Reconnection Workshop 2022*, May. 19th, 2022, Monterey, CA.
12. The acceleration of charged particles in nonrelativistic magnetic reconnection *2021 AGU Fall Meeting*, Dec. 16th, 2021, Online
11. Formation of Power-law Electron Energy Spectra in 3D Low- $\beta$  Magnetic Reconnection, *62nd Annual Meeting of APS DPP*, Nov. 9, 2020, Online
10. Power-Law Generation of Accelerated Particles in 3D Reconnection, *4th Asia-Pacific Conference on Plasma Physics*, Oct. 28, 2020, Zoom online
9. Large-scale particle acceleration during magnetic reconnection in solar flares. *Solar Physics Webinar of Global Reach—SOFER Colloquium*, Aug. 21, 2020, Webex online
8. The formation of power-law energy spectrum in low- $\beta$  magnetic reconnection. *Magnetic Reconnection and Particle Acceleration in Solar Flares*, Mar. 18-20, 2019, Los Alamos, NM
7. The formation of power-law energy spectrum in 3D low- $\beta$  magnetic reconnection. *The 18th Annual International Astrophysics Conference*, Feb. 18-22, 2019, Pasadena, CA
6. The Roles of Fluid Compression and Shear in Particle Energization during Magnetic Reconnection. *Particle Transport and Energization in Turbulent Plasmas*, April 24-27, 2018, Zhuhai, Guangdong, China.
5. The Roles of Fluid Compression and Shear in Particle Energization during Magnetic Reconnection. *The 17th Annual International Astrophysics Conference*, March 5-9, 2018, Santa Fe, NM.
4. The Role of Fluid Compression in Particle Energization during Magnetic Reconnection. *2017 AGU Fall Meeting*, New Orleans, LA.
3. The Role of Fluid Compression in Particle Energization during Magnetic Reconnection. *The 16th Annual International Astrophysics Conference*, March 6-10, 2017, Santa Fe, NM
2. Nonthermally Dominated Electron Acceleration during Magnetic Reconnection in a Low-beta Plasma. *Plasma Energization: Exchanges between Fluid and Kinetic Scales*, May 4-6, 2015, Los Alamos, NM.
1. Particle acceleration in reconnection: a view from electric current, *Meso-scale Plasma Dynamics and Energetic Particles: Applications to Laboratory, Space, and Astrophysical Plasmas*, June 30 – July 1, 2014, Los Alamos, NM.

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## Other Talks

33. Particle Acceleration and Transport in Solar Eruption Regions, *NASA GSFC Seminar*, Aug. 22nd, 2025, Online
32. Energy Conversion and Particle Acceleration and Transport in 3D Simulations of Solar Flares, *SPHERE-4 Workshop 2025*, Aug. 13th, 2025, Space Sciences Laboratory (SSL), Berkeley, CA
31. Modeling Electron Acceleration and Transport in 3D Solar Flare Regions, *HSR Team+ Workshop 2025*, Apr. 28th, 2025, NJIT, Newark, NJ
30. Turbulence properties and associated particle transport in 3D low-beta magnetic reconnection, *66th Annual Meeting of APS DPP*, Oct. 10th, 2024, Atlanta, GA
29. Plasma heating and particle acceleration in 3D turbulent magnetic reconnection, *MMS 10th Community Workshop*, Sep. 17th, 2024, Los Angeles, CA
28. Modeling Electron Acceleration and Transport in 3D Solar Flare Regions, *TESS 2024 Meeting*, Apr. 10th, 2024
27. Exploring Particle Acceleration and Transport during Solar Flares through Integrated Modeling and Observations, *seminar at Space Science Laboratory, UC Berkeley*, Apr. 9th, 2024, Online

26. Turbulence and Associated Particle Acceleration and Transport in 3D Magnetic Reconnection, *65th Annual Meeting of APS DPP*, Nov. 2nd, 2023, Virtual
25. Modeling particle acceleration and transport in 3D solar flare regions, *SDU Qingdao Forum on Energy Particles and Radio Radiation*, Oct. 26th, 2023, Virtual
24. Turbulence Properties in 3D Magnetic Reconnection: Implications for Particle Acceleration and Transport, *Friends-of-Magnetosphere (FoM) seminar at LASP*, Oct. 17th, 2023, Online
23. Modeling Particle Acceleration and Transport during Solar Flares, *Seminar at Space Science Center @ University of New Hampshire*, Sept. 27th, 2023
22. Modeling Electron Acceleration and Transport in 3D Solar Flare Regions, *HSR workshop at NJIT*, Aug. 29th, 2023
21. Modeling Particle Acceleration and Transport in Solar Flares, *Seminar at National Space Science Center*, May 5th, 2023, Online
20. Modeling Particle Acceleration and Transport in Solar Flare Magnetic Reconnection Region, *2022 AGU Fall Meeting*, Dec. 16th, 2022, Chicago, IL
19. A Model for Nonthermal Particle Acceleration in Relativistic Magnetic Reconnection, *64th Annual Meeting of APS DPP*, Oct. 18th, 2022, Online
18. Modeling Large-scale Electron Acceleration and Transport in Solar Flare Magnetic Reconnection Region, *2021 AGU Fall Meeting*, Dec. 14th, 2021, Online
17. Modeling Large-scale Electron Acceleration in Solar Flare Magnetic Reconnection Region, *IPMU Workshop on "Particle Acceleration in Solar Flares and the Plasma Universe – Deciphering its features under magnetic reconnection"*, Nov. 18th, 2021, Online
16. A model for nonthermal particle acceleration in magnetic reconnection, *63rd Annual Meeting of APS DPP*, Nov. 9th, 2021, Online
15. Turbulence properties relevant to particle acceleration and transport in 3D reconnection, *MMS Community Workshop*, Oct. 20th, 2021, Waterville Valley, NH
14. Modeling Large-scale Electron Acceleration Associated with Magnetic Reconnection, *SolFER Spring 2021 Meeting*, May 25th, 2021, Online
13. Power-law Index of Energy Spectrum in Magnetically Dominated Systems, *62nd Annual Meeting of APS DPP*, Nov. 11, 2020, Online
12. Power-law formation of nonthermal electrons in low- $\beta$  reconnection. *MMS telecom*, July 28, 2020, online Webex meeting
11. Power-law formation in 3D low- $\beta$  magnetic reconnection. *DRIVE Science Center Collaboration on Solar Flare Energy Release (SolFER), Group 3*, July 9, 2020, online Zoom meeting
10. Large-scale particle acceleration during solar flare reconnection. *18th RHESSI Workshop*, May 28-June 1, 2019, Minneapolis, MN
9. Particle acceleration in compressible reconnection layer. *60th Annual Meeting of the APS Division of Plasma Physics*, November 5-9, 2018; Portland, Oregon
8. Particle Acceleration during Magnetic Reconnection in Solar Flares. *Dartmouth College*, Oct. 23, 2018, Hanover, NH.
7. Particle acceleration mechanisms during magnetic reconnection. *National Space Science Center*, May 31, 2018, Beijing, China.
6. Particle acceleration mechanisms during magnetic reconnection. *Beihang University*, May 30, 2018, Beijing, China.
5. Particle acceleration mechanisms during magnetic reconnection. *Shandong University Weihai Campus*, May 23, 2018, Weihai, Shandong, China.
4. Particle acceleration mechanisms during magnetic reconnection. *Purple Mountain Observatory*, May 16, 2018, Nanjing, Jiangsu, China.
3. Nonthermal particle acceleration in 2D and 3D nonrelativistic magnetic reconnection. *59th Annual Meeting of the APS Division of Plasma Physics*, October 23-27, 2017, Milwaukee, WI

2. The role of fluid compression in particle energization at the reconnection site during solar flares. *RHESSI 16th Workshop*, June 19-24, 2017, Boulder, CO
1. Nonthermally Dominated Particle Acceleration during Magnetic Reconnection in a Low-beta Plasma. *14th RHESSI Workshop*, July 12 – 15, 2015, Newark, NJ