Subash Adhikari

Postdoctoral Researcher – Department of Physics and Astronomy
University of Delaware (UD), Newark, DE, 19711

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Key Skills

1. Computer simulations: Magnetohydrodynamics (MHD), Hybrid and fully kinetic particle-in-cell (PIC)
2. Languages: Python, Fortran, Matlab, IDL, C/C++
3. Libraries: NumPy, Matplotlib, pandas, SciPy
4. Developer tools: Github

Education

Ph.D. (Physics) *Department of Physics and Astronomy, University of Delaware (UD)*
Dissertation: Interplay Between Magnetic Reconnection and Turbulence *2017-2022*
M.S. (Physics) *Central Department of Physics, Tribhuvan University , Nepal*
Thesis: A Study of Geodesics in Schwarzschild De-Sitter Spacetime *2011-2014*
B.S. (Physics, Maths, Computer Science) *St. Xavier's College, Tribhuvan University , Nepal*
First Rank with Distinction among all B.S. and B. Tech. graduates *2007-2010*

Professional Research Experience

Postdoctoral Researcher, University of Delaware *07/02/2024 - Present*
Perform simulations of space plasma processes using Particle-In-Cell (PIC) Code P3D
Use of High performance computing (HPC) using supercomputers located at NERSC, NCAR/UCAR, and UD
Analysis of observational data via satellite missions such as Parker Solar Probe (PSP).
Mentor graduate students with their projects.

Team Member, International Space Science Insitute (ISSI) Bern *2023-2025*
Project Title: Unveiling Energy Conversion and Dissipation in Non-Equilibrium Space Plasmas
Perform kinetic PIC simulations of plasma phenomenon such as magnetic reconnection and turbulence.

Postdoctoral Researcher, West Virginia University *08/29/2022 - 07/01/2024*
Perform simulations of space plasma processes using Particle-In-Cell (PIC) codes (VPIC, P3D)
Use of High performance computing (HPC) using supercomputers located at NERSC, NCAR/UCAR, and UD
Perform exploratory data analysis (EDA), data visualization and data management for long term storage.
Present remarkable results in scientific conferences and publish them in scientific journals.
Mentor grad students, assist with their projects, collaborate with scientific researchers, and assist with grants/surveys.

Graduate Research Assistant, UD *06/01/2019 - 08/28/2022*
Perform kinetic PIC simulations of magnetic reconnection (2D), MHD simulations of turbulence (2D, 3D)
Data analysis, and data visualization from the simulations and compile results for publications/presentations
Assist with the grant application and surveys

Profession Teaching Experience

Guest Lecturer for Graduate Level Courses, UD
PHYSICS 638, TURBULENT FLOWS, Spring 2025
PHYSICS 601, ELECTRODYNAMICS, Fall 2024
PHYSICS 660, COMPUTATIONAL METHODS OF PHYSICS, Spring 2022

Guest Lecturer for Undergraduate Level Courses, UD
PHYSICS 202, INTRODUCTORY PHYSICS II, Spring 2019

Graduate Teaching Assistant, UD *08/29/2017 - 05/31/2019*

Teach Introductory physics for undergraduate students majoring life sciences, physical sciences, and engineering

Assist Professor with teaching and grading homework, assignments and exams.

Received an Instructor rating of $\mathbf{4.768}$ *out of* $\mathbf{5.0}$ (*Source: Course Evaluation*)

Nominated for the Outstanding Teaching Assistant Award

High School Teacher (Physics and Mathematics) *03/15/2013-05/15/2017*

Lecture Physics/Mathematics at Budhanilkantha School (GCSE A-levels), Ed-Mark College, and Jyoti Academy

Grade assignments, homework, and one-to-one student mentoring.

Publications

(*8 first authored* (*Highlighted titles*), *18 in total*)

2025

18. "3D Dynamics of Reconnection Spreading of Non-Parallel Heliospheric Flux Ropes in Simulations of the PHASMA Experiment", R. John, P. A. Cassak, S. Adhikari, G. Bartolo, S. Yadav, E. E. Scime, *In Preparation* (2025).
17. "**Characterization of the Turbulence Properties of the Solar Wind as Observed by Parker Solar Probe in Encounters 8-19**", S. Adhikari , R. Bandyopadhyay, W. H. Matthaeus, D. Ruffalo, P. Thepthong, P. Pongkitiwanichakul, S. Roy, F. Pecora R. Chhiber, A. Usmanov, M. Stevens, S. Badman, O. Romeo, J. Wang, J. Goodwill, and Melvyn Goldstein, *In Preparation* (2025).
16. "**Structure and Scaling of Electron Pressure-strain Interaction as a Function of Guide Field in Ion Coupled Reconnection**", S. Adhikari, P. A. Cassak, M. H. Barbhuiya, M. A. Shay, A. Chasapis, Y. Yang, and W. H. Matthaeus, *In preparation for submission to Physics of Plasmas* (2025).
15. "Energy Transfer and Conversion in Magnetic Reconnection: Observation and Simulation", S. Roy, R. Bandyopadhyay, S. Adhikari, Y. Yang, and W. H. Matthaeus, *Submitted to Physics of Plasmas* (2025).
14. "Does turbulence at the correlation scale regulate the statistics of magnetic reconnection?", M. B. Khan, M. A. Shay, S. Oughton, W. H. Matthaeus, C. C. Haggerty, S. Adhikari, P. A. Cassak, S. Fordin, D. O'Donnell, Y. Yang, R. Bandyopadhyay, S. Roy, *Submitted to the Physical Review Letters* (2025).
13. "**Revisiting Compressible and Incompressible Pressure-Strain Interaction in Kinetic Plasma Turbulence**", S. Adhikari, Y. Yang, and W. H. Matthaeus, *Under review in Physics of Plasmas* (2025).
12. "Nonlinear Evolution and Energy Dissipation in Shear Driven Turbulence of Collisionless Plasma", J. Goodwill, S. Adhikari, X. Li, F. Pucci, Y. Yang, F. Guo, and W. H. Matthaeus, Physics of Plasmas 32, 052301 (2025).
11. "Simulation Models for Exploring Magnetic Reconnection", M. A. Shay, S. Adhikari, N. Beesho, J. Birn, J. Büchner, P. A. Cassak, L. J Chen, Y. Chen, G. Cozzani, J. Drake, F. Guo, M. Hesse, N. Jain, Y. Pfau-Kempf, Y. Lin, Y. H. Liu, M. Oka, Y. A. Omelchenko, M. Palmroth, O. Pezzi, P. H. Reiff, M. Swisdak, F. Toffoletto, G. Toth, R. A. Wolf, *Under Review in Space Science Reviews* (2025).

2024

10. "Electron Dissipation and Electromagnetic Work", Y. Yang, S. Adhikari, W. H. Matthaeus, Journal of Geophysical Research: Space Physics, 129, e2024JA033105 (2024).
9. "**Scale Filtering Analysis of Collisionless Reconnection and its Associated Turbulence**", S. Adhikari, Y. Yang, W. H. Matthaeus, P. A. Cassak, T. N. Parashar, and M. A. Shay, Physics of Plasmas, **31**, 020701 (2024).
8. "Higher-order nonequilibrium term: Effective power density quantifying evolution towards or away from local thermodynamic equilibrium", M. H. Barbhuiya, P. A. Cassak, S. Adhikari, T. N. Parashar, H. Liang, M. R. Argall, Physical Review E 109, 015205 (2024)

2023

7. "Using direct laboratory measurements of electron temperature anisotropy to identify the heating mechanism in electron-only magnetic reconnection", P. Shi, E. E. Scime, M. H. Barbhuiya, P. A. Cassak, S. Adhikari, M. Swisdak, and J. E. Stawarz, Phys. Rev. Lett. 131, 155101 (2023).
6. "**Statistics of Pressure Fluctuations in Turbulent Kinetic Plasmas**", S. Adhikari, M. A. Shay, T. N. Parashar, W. H. Matthaeus, and P. A. Cassak, Monthly Notices of the Royal Astronomical Society, Volume 526, Issue 3, December (2023).
5. "**Effect of a guide field on the turbulence like properties of magnetic reconnection**", S. Adhikari, M. A. Shay, T. N. Parashar, W. H. Matthaeus, P. S. Pyakurel, J. E. Stawarz, and J. P. Eastwood, Physics of Plasmas, **30** 082904 (2023).

2022

4. "Turbulent Energy Transfer and Proton-Electron Heating in Collisionless Plasmas", S. Roy, R. Bandyopadhyay, Y. Yang, T. N. Parashar, W. H. Matthaeus, S. Adhikari, A. Chasapis, Hui Li, D. J. Gershman, B. L. Giles, and J. L. Burch, The Astrophysical Journal, **941** 137 (2022).
3. "Strategies for determining the cascade rate in MHD turbulence: isotropy, anisotropy, and spacecraft sampling",

Y. Wang, R. Chhiber, S. Adhikari, Y. Yang, R. Bandyopadhyay, M. A. Shay, S. Oughton, W. H. Matthaeus, and M. E. Cuesta, The Astrophysical Journal, **937** 76 (2022).

2021 . . . . . .

2. "**Energy Transfer in Reconnection and Turbulence**", S. Adhikari, T. N. Parashar, M. A. Shay, W. H. Matthaeus, P. Sharma Pyakurel, S. Fordin, J. E. Stawarz, J. P. Eastwood, Physical Review E, **104**, 065206 (2021).

2020 . . . . . .

1. "**Reconnection from a turbulence perspective**", S. Adhikari, M. A. Shay, T. N. Parashar, P. Sharma Pyakurel, W. H. Matthaeus, D. Godzieba, J. E. Stawarz, J. P. Eastwood, J. T. Dahlin, Physics of Plasmas, **27**, 042305 (2020).

Conference Presentations

16 Posters and 19 Oral (*Invited talks in bold*)

1. Oral: "Is Pi-D incompressible? Revisiting pressure-strain interaction, **S. Adhikari**, Y. Yang, W. H. Matthaeus, MMS TagUp Weekly Meeting, (Virtual), March 11, 2025.
2. Poster: "Electron Dissipation and Electromagnetic Work", **S. Adhikari**, et al., AGU Fall Meeting, 2024, Washington DC.
3. Poster: "Effect of a guide field on the electron pressure-strain interaction in ion coupled reconnection", **S. Adhikari**, et al., AGU Fall Meeting, 2024, Washington DC.
4. Oral: "Revisiting Pressure-Strain Interaction in Incompressible Plasma Turbulence", **S. Adhikari**, ARCETRI Workshop on Plasma Astrophysics 14^{th} Edition, Florence, Italy, October 28-31, 2024.
5. Oral: "**Scaling Electron Pressure-strain Interaction in Large Guide Field Reconnection**", West Virginia University KINETIC Center Plasma Seminar, **S. Adhikari**, October 17, 2024.
6. Oral: "Structure and scaling of electron pressure-strain interaction as a function of guide field in ion coupled reconnection", **S. Adhikari**, Bartol Centennial Meeting, University of Delaware, Newark DE, September 18-20, 2024.
7. Oral: "Scaling of electron pressure-strain interaction in guide field reconnection", Magnetospheri Multiscale Mission (MMS) Science Working Team (SWT) Tag-Up (Virtual), September 10, 2024.
8. Poster: "Structure and scaling of electron pressure-strain interaction as a function of guide field in ion-coupled reconnection, Solar Heliospheric and INterplanetary Environment (SHINE), Juneau, Alaska, August 2024.
9. Oral: "Energy transfer in reconnection: A scale filtering approach", **S. Adhikari**, Magnetospheri Multiscale Mission (MMS) Science Working Team (SWT) Tag-Up (Virtual), March 12, 2024
10. Poster:"Scale Filtering Analysis of Collisionless Reconnection and its Associated Turbulence", **S. Adhikari**, Y. Yang, W. H Matthaeus, P. Cassak, T. N. Parashar, and M. A. Shay, AGU Fall Meeting, San Fransisco, December 2023.
11. Oral:"**Energy Transfer Channels in Reconnection: A Scale Filtering Approach**", **S. Adhikari**, Y. Yang, W. H Matthaeus, P. Cassak, T. N. Parashar, and M. A. Shay, MMS SWT Meeting, University of Maryland, College Park, Maryland, October 2023.
12. Poster: "Electron to Ion Scale Transition of Energy and Entropy Conversion In Kinetic Turbulence", **S. Adhikari**, P. A. Cassak, M. H. Barbhuiya, T. N. Parashar, and M. A. Shay, Solar Heliospheric and INterplanetary Environment (SHINE), Stowe, Vermont, August 2023.
13. Poster: "Mechanical and Total Pressure Statistics in Vlasov-Maxwell Plasmas", **S. Adhikari**, P. A. Cassak, T. N. Parashar, W. H. Matthaeus, and M. A. Shay, European Geosciences Union (EGU) General Assembly, Vienna, Austria, April 23-28, 2023.
14. Poster: "Statistics of Total Pressure in Kinetic Plasma Turbulence", **S. Adhikari**, M. A. Shay, T. N. Parashar, W. H. Matthaeus, and P. A. Cassak, AGU Fall Meeting, Chicago, December 12-16, 2022.
15. Poster:" Guide field dependence of energy spectrum and energy transfer in reconnection", **S. Adhikari** et al., Solar Heliospheric and INterplanetary Environment (SHINE), Honolulu, Hawaii, June 2022.
16. Oral: "**Analyzing Reconnection From a Turbulence Standpoint**", **S. Adhikari**, M. A. Shay, T. N. Parashar, W. H. Matthaeus, P. S. Pyakurel, J. E. Stawarz, and J. P. Eastwood, 44^{th} Scientific Assembly of the Committee on Space Research (COSPAR), July 16-24, 2022.
17. Poster:" Guide field dependence of energy spectrum and energy transfer in reconnection", **S. Adhikari** et al., Solar Heliospheric and INterplanetary Environment (SHINE), Honolulu, Hawaii, June 2022.
18. Poster:" Effect of a guide field on the turbulence-like properties of magnetic reconnection", **S. Adhikari** et al., Geospace Environment Modeling (GEM), Honolulu, Hawaii, June 2022.
19. Oral:"**A Fundamental Connection Between Reconnection and Turbulence**", Magnetospheric Online Seminar Series, May 23, 2022.
20. Oral: "Reconnection and Turbulence: A Qualitative Approach to their Relationship", **S. Adhikari**, et. al., European Geosciences Union (EGU) General Assemby, Vienna, Austia, May 23-27, 2022.
21. Oral: **"Reconnection as a Cascade"**, **S. Adhikari**, et. al., US-Japan Workshop on Magnetic Reconnection 2022 (MR2022), Monetery, CA, May 16-20, 2022.
22. Oral: "Von Kaŕmań Analysis of Standard Reconnection using Particle-In-Cell (PIC) Simulation", **S. Adhikari**, et.

al., Magnetospheri Multiscale Mission (MMS) Science Working Team (SWT) Tag-Up (Virtual), January 11, 2022.
23. Poster: "Beta Dependence of Kinetic Plasma Turbulence and Reconnection Across Scales", **S. Adhikari**, et. al., AGU Fall Meeting, New Orleans, December 13-17, 2021.
24. Poster: "Shear in Hall-MHD Turbulence: A Third-Order Analysis", **S. Adhikari**, et. al., Virtual Geospace Environment Modelling, July 25-30, 2021.
25. Oral: "Reconnection as a Turbulence Process", **S. Adhikari**, M. A. Shay et. al., MMS Spring 2021 SWT Meeting, April 25-9, 2021.
26. Oral: "Reconnection as an Energy Cascade", **S. Adhikari**, M. A. Shay, W. H. Matthaeus, T.N. Parashar, AGU Fall Meeting (Online Everywhere), December 1-17, 2020.
27. Oral: **"Energy Cascade in Reconnection: 3rd Order Dynamics"**, **S. Adhikari**, et al., virtual MMS Fall 2020 Science Working Team Meeting, October 6-8, 2020.
28. Oral: "Is Reconnection a Cascade Process?", **S. Adhikari**, et al., virtual Geospace Environment Modelling (vGEM), July 20-23, 2020.
29. Poster: "Is Reconnection an Energy Cascade?", **S. Adhikari**, et al., virtual Geospace Environment Modelling (vGEM), July 20-23,2020.
30. Oral: **"Interplay Between Magnetic Reconnection and Turbulence"**, **S. Adhikari**, et al., Laboratory of Atmospheric and Space Physics (LASP) Turbulence Bi-weekly Meeting (Online), July 20, 2020.
31. Poster: "Reconnection from a turbulence perspective", **S. Adhikari**, et al., Delaware Data Science DARWIN Computing Symposium, University of Delaware (Newark, Delaware, USA), February 12, 2020.
32. Poster: "Magnetic Reconnection from a Turbulence Perspective", **S. Adhikari**, M.A. Shay, T. Parashar, P. Sharma, W.H. Matthaeus, D. Godzeiba. J. Dahlin, AGU Fall Meeting, San Francisco, USA, December 2019.
33. Oral: **"Reconnection from a Turbulence Perspective"**, **S. Adhikari**, et al. NASA Monday Science Telecon, August 26, 2019.
34. Oral: "Reconnection from a Turbulence Perspective", **S. Adhikari**, M.A. Shay, T. Parashar, P. Sharma, W.H. Matthaeus, D. Godzeiba. J. Dahlin, Geospace Environment Modeling (GEM), Santa Fe, USA, June 2019.
35. Poster: "Is laminar reconnection a turbulent process?", **S. Adhikari**, M.A. Shay, T. Parashar, P. Sharma, W.H. Matthaeus, D. Godzeiba. J. Dahlin, Geospace Environment Modeling (GEM), Santa Fe, USA, June 2019.

Awards and Achievements

1. ***Qaisar and Monika Shafi Outstanding Award***, Department of Physics and Astronomy, University of Delaware, May 2023.
2. ***Graduate Student Travel Award***, Graduate College, University of Delaware, October 2021.
3. ***Best Global System Modelling Poster***, Geospace Environment Modeling (GEM), Santa Fe, USA, June 2019.
4. ***Professional Development Award***, Office of Graduate and Professional Studies, University of Delaware, May 2019.
5. ***M.S. Thesis Grant***, Ministry of Science and Technology, Government of Nepal, 2013.
6. ***M.S. Fellowship***, Central Department of Physics, Tribhuvan University, Kathmandu, Nepal, 2011-2013.
7. ***Nepal Bidyabhusan Padak, "GA"*** awarded by the **President of Nepal** Dr. Ram Baran Yadav, 2011.
8. ***Excellence Award for Highest Score in B.Sc.***, St. Xavier's College, Kathmandu, Nepal, 2010.

Synergistic Activities

Mentorship

1. Joshua Goodwill (*Expected PhD on 2026*, University of Delaware)

Volunteer Experience

1. Member, Space Physics and Aeronomy (SPA) Section Advocacy Committee (2025-2027)

Reviewer

1. Physics of Plasmas
2. The Astrophysical Journal
3. Frontiers in Astronomy and Space Sciences
4. NASA Proposal Review Panelist (2024)

Professional Membership

1. Member, American Physical Society (APS)
2. Member, American Geophysical Union (AGU)
3. Member, European Geosciences (EGU)
4. Member, Committee on Space Research (COSPAR)

Last updated on May 20, 2025.