

# Mani K Chettri

PhD Scholar in Physics

Department of Physics, School of Physical Sciences  
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## Research Interests

Kinetic Alfvén wave (KAW) turbulence in the heliosphere and magnetosphere; nonlinear wave coupling (KAW–ion acoustic and KAW–magnetosonic interactions); pseudospectral and split-step Fourier simulations of nonlinear plasma models (modified Zakharov and NLSE frameworks); multi-mission spacecraft data analysis using NASA MMS, Wind, Parker Solar Probe, and ISRO Aditya-L1; energy dissipation at sub-ion kinetic scales; plasma instabilities.

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## Education

### PhD in Physics, Sikkim University, Gangtok, India

2022 – present

*Thesis title:* Numerical Study of Nonlinear Plasma Phenomena in the Heliosphere

*Supervisors:* Dr. Hemam Dinesh Singh (NSUT, New Delhi) and Dr. Rupak Mukherjee (Sikkim University, IUCAA Visiting Associate)

*Description:* The PhD project investigates KAW turbulence in the solar wind and magnetosphere through pseudospectral simulations (modified Zakharov and NLSE frameworks) and multi-mission spacecraft data analysis (MMS, Wind, Parker Solar Probe, Aditya-L1).

### MSc in Physics, Sikkim Manipal Institute of Technology, Majitar

2020 – 2022

*Dissertation:* The Cosmic Microwave Background Radiation and the Big Bang

### BSc Physics (Honours), Nar Bahadur Bhandari Degree College, Tadong

2016 – 2019

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## Publications

### Peer-Reviewed Journal Articles

1. **Chettri, M. K.**, Shrivastav, V., Singh, B., Mukherjee, R., and Singh, H. D. (2026). Inertial-range suppression and ponderomotive density cavitation in broadband sub-Alfvénic turbulence under plasma sheet boundary layer conditions. *Journal of Subatomic Particles and Cosmology*, 100383.  
doi:10.1016/j.jspc.2026.100383 arXiv:2603.14436
2. Mukherjee, R., **Chettri, M. K.**, Shrivastav, V., Singh, B., and Singh, H. D. (2026). How big is the Sun? A measurement from India's Aditya-L1 spacecraft. *PANE Journal of Physics Education*, 1(1), 60–74.  
journals.paneindia.org

3. **Chettri, M. K.**, Shrivastav, V., Mukherjee, R., Gaur, N., Sharma, R., and Singh, H. D. (2024). Nonlinear coupling of kinetic Alfvén waves and ion acoustic waves in the inner heliosphere. *Research in Astronomy and Astrophysics*, **24**(10), 105009. doi:10.1088/1674-4527/ad76ee

### Preprints and Submitted Manuscripts

1. **Chettri, M. K.**, Mukherjee, R., and Singh, H. D. (2026). Electromagnetic signatures of kinetic Alfvén wave turbulence at ion inertial scales in Earth's high- $\beta$  magnetosheath. *Submitted to Advances in Space Research*. arXiv:2605.25199
2. **Chettri, M. K.**, Singh, H. D., and Mukherjee, R. (2026). MMS observations of kinetic Alfvén wave turbulence and steep kinetic-range spectra in the outer plasma sheet boundary layer. *Submitted to Journal of Atmospheric and Solar-Terrestrial Physics*. arXiv:2603.07969 SSRN 6447726
3. **Chettri, M. K.**, Singh, H. D., Shrivastav, V., Singh, B., and Mukherjee, R. (2025). Damped kinetic Alfvén waves in Earth's magnetosheath: numerical simulations and MMS observations. arXiv:2512.09828
4. **Chettri, M. K.**, Shrivastav, V., Singh, B., Mukherjee, R., and Singh, H. D. (2026). A validated analysis workflow for near-Earth spacecraft plasma observations: methodology, quality controls, and systematic error assessment. SSRN 6394663
5. Shrivastav, V., **Chettri, M. K.**, Singh, B., Singh, H. D., and Mukherjee, R. (2026). Linear-wave bound on electromagnetic energy equipartition at sub-electron scales in non-relativistic plasmas. arXiv:2604.18472
6. Shrivastav, V., **Chettri, M. K.**, Singh, H. D., Singh, B., and Mukherjee, R. (2026). Ion channel dynamics in temperature-dependent Weibel instability saturation. arXiv:2604.21875
7. Shrivastav, V., **Chettri, M. K.**, Singh, H. D., Singh, B., and Mukherjee, R. (2026). Weibel instability in collisionless plasmas across astrophysical and laboratory shocks. arXiv:2603.12747
8. Shrivastav, V., **Chettri, M. K.**, Singh, H. D., Singh, B., and Mukherjee, R. (2026). Suppression of two-stream and Weibel instabilities in ultra-relativistic electron-positron plasma. SSRN 6502757
9. Shrivastav, V., **Chettri, M. K.**, Singh, H. D., and Mukherjee, R. (2025). Suppression of two-stream instability in relativistic electron-ion plasmas. arXiv:2508.14362

### Software

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#### PLASMAform, open-source web formulary for space plasma physics

2025 – present

mkchettri.in/plasmaform, GitHub, MIT License

46 formulas across 9 categories covering KAW parameters, instability thresholds, reconnection parameters, and spacecraft environment presets (MMS, Wind, PSP, Aditya-L1). Runs as a single HTML file.

## Conference Presentations

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- European Physical Society Conference on Plasma Physics (EPS-2026)** 2026 (*upcoming*)  
Edinburgh, UK. Abstract accepted.
- Trends in Science and Space Technology (TIST-2026), oral** 2026  
Salesian College, Siliguri, India  
*Damped kinetic Alfvén waves in Earth's magnetosheath: numerical simulations and MMS observations.*
- 5th Conference on Plasma Simulation (CPS-2026), poster** Jan 2026  
IPS Academy and IIT Indore, India  
*KAW turbulence simulations in the plasma sheet boundary layer with MMS comparison.*
- XV PANE Conference 2025, oral** Dec 2025  
Nagaland University, Lumami, India  
*Turbulent signatures of kinetic Alfvén waves in Earth's plasma sheet boundary layer.*

## Professional Certifications

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- Research Ethics, Elsevier Researcher Academy** May 2026  
Certificate of Excellence. Completed all modules (5 hours 30 minutes).
- Artificial Intelligence and Machine Learning in Space Exploration** Feb 2026  
India Space Academy (ISA), Viksit Bharat Abhiyan, online. Certificate No. ISA-1003033.

## Workshops and Training

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- JPP Frontiers of Plasma Physics Colloquium, online** May 2026  
Journal of Plasma Physics (Cambridge University Press).  
*Attended: A parallel-kinetic-perpendicular moment model for magnetised plasmas.*
- Aditya-L1 Support Cell Workshop** Dec 2025  
IIT Jammu, organized by ISRO.  
Data analysis using Aditya-L1 instruments (ASPEX, PAPA, MAG) via ISSDC/PRADAN.

## Teaching Experience

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- Science and Mathematics Instructor, Ascend Coaching Institute, Gangtok** 2022 – present
- Science Teacher, St. Mary's Convent School, West Sikkim** 2019 – 2020
- Mathematics Tutor, Grace Academy, Gangtok** 2017 – 2019

## Technical Skills

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<b>Programming</b>	Python, Fortran, MATLAB, HTML/JS, $\LaTeX$
<b>Scientific Libraries</b>	NumPy, SciPy, Matplotlib, PySPEDAS, mpi4py, mpi4py-fft
<b>Simulation Techniques</b>	Pseudospectral with 2/3-dealiasing, split-step Fourier, 4th-order Runge–Kutta, MPI-parallelized solvers
<b>Spacecraft Data</b>	MMS (FGM, FPI, EDP), Wind (MFI, SWE), Parker Solar Probe, Aditya-L1 (ASPEX, PAPA, MAG); via PySPEDAS and ISSDC/PRADAN
<b>HPC</b>	MPI parallelization, IUCAA HPC cluster (Pune)
<b>Version Control</b>	Git, GitHub

## Languages

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<b>Nepali</b>	Read, speak, write
<b>Hindi</b>	Read, speak, write
<b>English</b>	Read, speak, write

## Leadership and Service

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<b>President, Convention on Climate Change, Namchi Degree College</b>	2019
<b>President, Physicist Meet, Manan Kendra, Gangtok</b>	2018

## References

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### **Dr. Hemam Dinesh Singh**

Associate Professor  
Dept. of Applied Physics  
Netaji Subhas University of Technology  
New Delhi, India  
*PhD Supervisor*

### **Dr. Rupak Mukherjee**

Associate Professor  
Dept. of Physics  
Sikkim University  
Gangtok, India  
*PhD Co-Supervisor*

Full contact details and additional references available on request.