

Alankar Dutta

(he/him)

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👤 Dutta, A.

Nationality: India

About me

- 📖 I am currently a postdoctoral research fellow in Computational astrophysics at the Max Planck Institute for Astrophysics, Garching near Munich in Germany.
- 📖 I was an integrated Ph.D. (M.Sc. + Ph.D.) candidate at the Indian Institute of Science, Bangalore as a Prime Minister's Research Fellow supported by the Ministry of Education, Government of India.
- 📖 I am a Computational astrophysicist interested in modeling and simulation of the multiphase gaseous environments around galaxies called the circumgalactic medium (CGM).
- 📖 My research spans over different aspects related to idealized simulations and modeling of the CGM, synthetic observations, cosmological simulations, and multiphase astrophysical plasma.

Work profile

2024 – present 📖 **MPA postdoctoral research fellow, Max-Planck-Institut für Astrophysik,**
Garching b. München, Deutschland
in *Computational Astrophysics*

Education

2017 – 2024 📖 **Integrated M.Sc. + Ph.D., Indian Institute of Science,**
Bangalore, India
in *Computational astrophysics*
Thesis: *Simulations and modeling of multiphase gas in the circumgalactic medium*

2014 – 2017 📖 **B.Sc. Physics, Presidency University,**
Kolkata, India
Undergraduate with a major in Physics.

Publications

- 1 M. S. Bisht, P. Sharma, **A. Dutta**, and B. B. Nath, “Misty, patchy, and turbulent: constraining the cool circumgalactic medium with mCC,” *Monthly Notices of the Royal Astronomical Society*, vol. 542, no. 2, pp. 1573–1595, Sep. 2025. 🔗 DOI: 10.1093/mnras/staf1319. arXiv: 2411.17173 [astro-ph.GA].
- 2 **A. Dutta**, P. Sharma, and M. Gronke, “Fading in the Flow: Suppression of cold gas growth in expanding galactic outflows,” *Monthly Notices of the Royal Astronomical Society*, Oct. 2025. 🔗 DOI: 10.1093/mnras/staf1845. arXiv: 2506.08545 [astro-ph.GA].
- 3 R. Ghosh, M. Gronke, P. Sharma, and **A. Dutta**, “Woven by the Whirls: The growth and entrainment of cold clouds in turbulent hot winds,” *arXiv e-prints*, arXiv:2510.03552, arXiv:2510.03552, Oct. 2025. 🔗 DOI: 10.48550/arXiv.2510.03552. arXiv: 2510.03552 [astro-ph.GA].
- 4 R. Mohapatra, **A. Dutta**, and P. Sharma, “Tracing Multiphase Structure in the Circumgalactic Medium: Insights from Magnetohydrodynamic Turbulence Simulations,” *arXiv e-prints*, arXiv:2511.00229, arXiv:2511.00229, Oct. 2025. 🔗 DOI: 10.48550/arXiv.2511.00229. arXiv: 2511.00229 [astro-ph.GA].
- 5 **A. Dutta**, M. S. Bisht, P. Sharma, R. Ghosh, M. Roy, and B. B. Nath, “Beyond radial profiles: Using log-normal distributions to model the multiphase circumgalactic medium,” *Monthly Notices of the Royal Astronomical Society*, stae977, Apr. 2024, ISSN: 0035-8711. 🔗 DOI: 10.1093/mnras/stae977. arXiv: 2310.03717.

- 6 R. Ghosh, **A. Dutta**, and P. Sharma, “Ram pressure stripping in clusters: Gravity can bind the ISM but not the CGM,” *Monthly Notices of the Royal Astronomical Society*, stae1345, May 2024, ISSN: 0035-8711. [DOI](#): 10.1093/mnras/stae1345. arXiv: 2404.02035.
- 7 **A. Dutta**, P. Sharma, and D. Nelson, “Cooling flows around cold clouds in the circumgalactic medium: steady-state models and comparison with TNG50,” *Monthly Notices of the Royal Astronomical Society*, vol. 510, no. 3, pp. 3561–3574, Mar. 2022. [DOI](#): 10.1093/mnras/stab3653. arXiv: 2107.02722 [astro-ph.GA].
- 8 V. Kanjilal, **A. Dutta**, and P. Sharma, “Growth and structure of multiphase gas in the cloud-crushing problem with cooling,” *Monthly Notices of the Royal Astronomical Society*, vol. 501, no. 1, pp. 1143–1159, Feb. 2021. [DOI](#): 10.1093/mnras/staa3610. arXiv: 2009.00525 [astro-ph.GA].
- 9 **A. Dutta** and P. Sharma, “On Modeling CC85 Wind in an Expanding Local Box [non-peer reviewed],” *Research Notes of the American Astronomical Society*, vol. 3, no. 10, 148, p. 148, Oct. 2019. [DOI](#): 10.3847/2515-5172/ab4bd8. arXiv: 1910.06339 [astro-ph.GA].
- 10 P. Chakraborty, S. Chatterjee, **A. Dutta**, and A. D. Myers, “Mean Occupation Function of High-redshift Quasars from the Planck Cluster Catalog,” *Publications of the Astronomical Society of the Pacific*, vol. 130, no. 988, p. 064 001, Jun. 2018. [DOI](#): 10.1088/1538-3873/aaab3e. arXiv: 1801.06522 [astro-ph.GA].
- 11 **A. Dutta**, “X-ray environments of supermassive black holes [non-peer reviewed; undergraduate thesis],” May 2017. [DOI](#): 10.13140/RG.2.2.26190.97606.

Skills

Languages	■ Proficient in Bengali (native), English and Hindi. Also knows German (A2).
Coding	■ C/C++ , Python, L ^A T _E X. Specialized in computational hydrodynamics. Leading code developer of AstroPlasma, an astrophysical plasma modeling interpolation package. Developed yt visualization frontend and Catalyst In-situ visualization for PLUTO and IDEFIX. Developed parallel hdf5 io on IDEFIX.
Misc.	■ Academic research, teaching, high-performance computing, GPU programming, data analysis, analysis of cosmological simulation data like Illustris TNG, and 3D data visualization. Tools/Codes used: PLUTO, Arepo, Cloudy, ParaView, ...

Conferences, workshops & research visits

Selected talks

November 2025	■ <i>Modelling of Multiphase Astrophysical Media</i> , organized by Max Planck Institute for Astrophysics at Schloss Ringberg, Tegernsee, Bavaria, Germany (<i>contributed</i>)
October 2025	■ <i>Multi-phase, Multi-temperature and Complex</i> , organized by European Southern Observatory at Olbia, Italy (<i>contributed</i>)
September 2025	■ <i>Kapteyn Astronomical Institute, University of Groningen</i> , Groningen, Netherlands (seminar)
Dec 2024	■ <i>Baryons Beyond Galactic Boundaries - 2024</i> , organized by Inter-University Centre for Astronomy and Astrophysics (IUCAA) at Pune, India (<i>contributed</i>)
Oct 2024	■ <i>2024 Ringberg Workshop on ‘Computational Galaxy Formation’</i> , organized by Max Planck Institute for Astrophysics at Tegernsee, Bavaria, Germany (<i>invited</i>)
Sept 2024	■ PLUTO symposium, University of Turin , Torino, Italy (<i>online</i> ; talk on In-situ visualization module for PLUTO)
May 2024	■ <i>Observe Local Think Global: What Solar Observations can teach us about Multiphase Plasmas across Astrophysical Scales</i> , organized by International Space Science Institute at Bern, Switzerland (<i>online</i>)
Mar 2024	■ Research School of Astronomy & Astrophysics, Australian National University , Canberra, Australia (<i>seminar; online</i>)

Conferences, workshops & research visits (continued)

- Feb 2024  Astronomical Society of India Meeting, **ASI 2024, IISc Bangalore**, India (*contributed*)
- Jun 2023  **European Southern Observatory**, Garching, Germany; CGM meeting (*seminar*)
-  *Modelling of Multiphase Astrophysical Media*, organized by **Max Planck Institute for Astrophysics** at Schloss Aspenstein, Kochel am See, Bavaria, Germany (*contributed*)
- Mar 2023  *Observe Local Think Global: What Solar Observations can teach us about Multiphase Plasmas across Astrophysical Scales*, organized by **International Space Science Institute** at Bern, Switzerland (*contributed*)
- Feb 2023  **University of Turin**, Torino, Italy (*seminar*)
-  **Nicolaus Copernicus Astronomical Center**, Warsaw, Poland (*seminar*)
- Jan 2023  **Leibniz Institute for Astrophysics**, Potsdam, Germany (*seminar; online*)
-  **Max Planck Institute for Astrophysics**, Garching, Germany; *Cosmology Seminar*
- Sept 2022  *What matter(s) around galaxies 2022: Connecting the dots between the CGM and the larger-scale environment*, organized by **Università Milano-Bicocca** at Champoluc, Aosta Valley, Italy (*contributed*)
- Aug 2022  *6th ICM Theory and Computation Workshop*, **Niels Bohr Institute**, Copenhagen, Denmark (*contributed*)
- Feb 2021  Alumni Seminar Series, **Presidency University**, Kolkata, India (*invited*)

Poster presentations

- July 2025  *18th Potsdam Thinkshop*, **Leibniz Institute for Astrophysics (AIP)** at Potsdam, Germany (*contributed*)
- Mar 2024  Annual PMRF symposium 2024, **IIT Indore**, India (*invited*)
- Mar 2022  Astronomical Society of India Meeting, **ASI 2022, IIT Roorkee**, India (*contributed*)
- Feb 2020  Astronomical Society of India Meeting, **ASI 2020, IISER Tiupati**, India (*contributed*)

Research visits

- Jan – Feb 2023  **Max Planck Institute for Astrophysics**, Garching, Germany *as a visiting student*.
- May – Aug 2019  **Max Planck Institute for Astrophysics**, Garching, Germany *as a visiting student*.
- Jun 2016  **Inter-University Centre for Astronomy and Astrophysics (IUCAA)**, Pune, India *as a visiting undergraduate student*.

Workshops attended

- Aug – Sept 2024  *Toward a Holistic Understanding of the Multi-scale, Multiphase Circumgalactic Medium*, organized by **Aspen Center for Physics** at Aspen, Colorado, USA (participation in research working groups & discussions on research areas related to multiphase gas physics in the CGM)
- Jan 2021  *KITP Program: Fundamentals of Gaseous Halos*, **Kavli Institute for Theoretical Physics**, Santa Barbara, California, USA (online)
- Jan 2019  *Cosmology: The Next Decade*, **International Centre for Theoretical Sciences (ICTS)**, Bangalore, India

Professional services & teaching

- Jul 2023  Organized *hands-on sessions* in the Workshop on Computational MHD with the PLUTO code, **IISc Bangalore**, India on basics of PLUTO code, makefiles and software development using Git to about 60 beginning Ph.D. and advanced masters students.

Feb/Mar

Professional services & teaching (continued)

- 2019,20,23,24  Actively volunteered in the organization of *Open Day* at **IISc Bangalore**, India, a public science outreach program which hosts around 50,000 people throughout the day. Led demonstrations like reversible fluid flow experiments at low Reynolds number, and presented talks on multi-messenger astronomy.
- Nov 2019  Demonstration of science experiments to about 600 primary and high school students at **Kendriya Vidyalaya**, IISc, Bangalore, India as a part of International Astronomical Union (IAU) global project 'Astronomy day in school'.

Teaching

- Aug - Sept 2024  Teaching an ISSS course on [Computational physics with Python](#)
- Jan - Apr 2024  Teaching Assistance for NPTEL course on [Problem Solving Through Programming In C](#)
- Jan - May 2023  Teaching Assistance for Computational Physics course as a part of the two-year masters in the School of Astrophysics, Presidency University, Kolkata (online)
- Jul - Sep 2022  Teaching Assistance for NPTEL course on [Python for Data Science](#)
- Jan - May 2022  Teaching Assistance for a course on Computer applications, Kendriya Vidyalaya, IISc
- Jan - May 2021  Teaching Assistance for Computational Physics course, Department of Physics, IISc
- Jan - May 2020  Teaching Assistance for Intermediate Electromagnetism and the Quantum Physics of Radiation, Department of Physics, IISc

Fellowships & awards

- Aug 2024 - present  Max Planck Institute for Astrophysics postdoctoral fellowship
- Aug 2020 - July 2024  Prime Minister's Research Fellowship awarded by the Ministry of Education, Government of India (Acceptance rate: 3.5% out of 3000 within institute)
- Aug 2017 - Jul 2020  Indian Institute of Science Fellowship for the Integrated Ph.D. program at the Department of Physical Sciences, IISc (0.3% out of 10000 to be selected in IISc Integrated Ph.D. program through JAM)
- Jan - Mar 2017  Qualified in JAM (rank 107), JEST (rank 36), TIFR-GS (declined offer from NCRA, Pune)

Students mentored

- Ioannis Panagiotou  Simulations of non-isobaric clouds in cloud-crushing simulations. Co-mentored with Prof. Filippo Fraternali, University of Groningen, the Netherlands.
- Yash Mehul Mehta  Investigating the properties and statistical distribution of cold cloud population in the CGM of simulated galaxies from the Illustris TNG50 cosmological simulation. Co-mentored with Prof. Prateek Sharma, IISc, India.
- Vishnu Prasath T.  Simulations of clouds with different geometries in cloud-crushing simulations & investigation of the role of geometry on shear-driven turbulent radiatively cooling boundary layers. Co-mentored with Prof. Prateek Sharma, IISc, India.

References

-  **Prateek Sharma**, Professor, Indian Institute of Science, Bangalore, India
 prateek@iisc.ac.in

References (continued)

- **Max Gronke**, Research Group Leader at ZAH, Astronomisches Rechen-Intitut (ARI), Heidelberg University, Heidelberg, Germany
✉ max.gronke@uni-heidelberg.de
- **Volker Springel**, Director, Computational Astrophysics, Max Planck Institute for Astrophysics, Garching b. München, Germany
✉ vspringel@mpa-garching.mpg.de
- **Dylan Nelson**, Emmy Noether Research Group Leader, Institute for Theoretical Astrophysics, Heidelberg University, Germany
✉ dnelson@uni-heidelberg.de
- **Biman B. Nath**, Professor, Raman Research Institute, Bangalore, India
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