

UMCP PHaSER Overview

Natalia Buzulukova

University of Maryland, Astronomy Department / NASA GSFC Code 673

PHaSER Open House

September 18, 2024

NASA Goddard Space Flight Center

University of Maryland, College Park

UMCP is the leading university nationally and globally with rising ranking

2023 UMCP ranking in critical for NASA areas:

- Artificial intelligence: No. 15 overall, No. 9 among publics
- Data analytics/science (new): No. 13 overall; No. 7 among publics
- Aerospace/aeronautical/astronautical: No. 11 nationwide, No. 7 among publics
- Computer engineering: No. 18 nationwide, No. 11 among publics
- Mechanical engineering: No. 14 nationwide, No. 9 among publics
- Electrical/electronic/communications engineering: No. 20 nationwide, No. 12 among publics



(Source: <https://today.umd.edu/umd-rises-in-u-s-news-rankings-of-national-universities>)

Astronomy Department (College of Computer, Mathematical and Natural Sciences, CMNS) is a home for PHaSER UMCP

- Diverse and dynamic team, currently 16 PHaSER- and PHaSER-affiliated appointments ranging from Post Doctoral Associates to Principal Research Engineers and Scientists;
- Administrative and HR support for PHaSER appointments, connection with NASA GSFC sponsors, attractive UMD system of benefits;
- PHaSER employees are members of UMD Professional Track (PTK) faculty;
- Opportunities for leadership experience at CMNS level and PHaSER level;
- Currently open positions:

CMNS Diversity & Inclusion Advisory Council (due day for applications is September 19th); PHaSER UMD liaison position (open until fulfilled)

PHaSER UMCP Contact Information I

PI Natalia Buzulukova nyb@umd.edu nbuzulukova@gmail.com

ORA Website

<https://ora.umd.edu/>

Astronomy Website

<https://www.astro.umd.edu/>

Equity, Diversity & Inclusion Resources

<https://www.astro.umd.edu/EDI/EDIResourcePage.html>

Benefits

<https://uhr.umd.edu/benefits-and-wellness>

Proposal Routing Form

<https://www.astro.umd.edu/resources/internal/deptsupport/routingform.pdf>

Contact

Contact Email

Dent, Olivia

odent@umd.edu

[Director of Academic Admin & Faculty Relations](#)

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barbarah@umd.edu

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[Astronomy IT](#)

Rowe, Natalie

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[Business Manager](#)

TBN

[Business Coordinator](#)

PHaSER UMCP Contact Information II

UMD - College Park

Primary Contact

Copy to:

Travel & Travel Reimbursements

Susan Lehr

Purchases

Natalie Rowe for approval

TBN - for processing

New Hire Salary/Visas

Olivia Dent/Susan Lehr

Natalie Rowe

Proposals/Post Award

Natalie Rowe

General Payroll Questions & Benefits

Susan Lehr

Dorinda Kimbrell

Payroll fund changes,
new appointments, terminations

Natalie Rowe

Computer Related Issues

Kevin Rauch

On-Campus office space

Olivia Dent

Parking on-campus

Barbara Hansborough

Overview of the Benefits:

- Accident Leave: University System of Maryland USM Policy II-2.32(C)
- Sick Leave: USM Policy II-2.30; UM Policy II-2.30(A); UM Policy II-2.30(B)
- Adoption Leave: UM Policy II-2.30(D)
- Faculty Parental Leave and Other Family Supports: USM II-2.25; UM II-2.25(A)
- Family and Medical Leave: USM Policy II-2.31
- Leave Without Pay: USM Policy II-2.20; UM Policy II-2.20(A)
- Tuition Remission for Self: USM Policy VII-4.10; UM Policy VII 4.10(A)
- Tuition Remission for Spouses & Dependents (after two years of continuous employment): USM Policy VII-4.20; UM Policy VII 4.20(A)
- Annual and Personal Leave (twelve-month employees): USM Policy II-2.40
- Employer-subsidized Health Benefits
- Retirement Benefits

Highlights:

The ample amounts of annual/sick/holiday/personal leave; paid parental leave guarantee, tuition remission, **5 different heavily subsidized health plans**; variability of pension/retirement plans with a help from HR consultant to review.

Please also see University Human Resources web-site for additional info
<https://uhr.umd.edu/benefits-and-wellness>

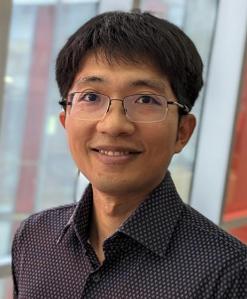
Overview of Promotion Process

- Promotion process is made to be compliant with University and Astronomy Department policies and procedures;
- Details of promotion process are different between different institutions in PHaSER;
- UMD Astronomy policies and procedures are available at: <https://www.astro.umd.edu/resources/policies/>;
- At PHaSER UMCP, there are on general three ranks for promotion for engineers and scientists with ~ 5 years or more service between promotions;
- Promotions start from preparing a dossier and working with PHaSER UMCP PI with the aim to have a strong and defensible case with high probability of success;
- There are opportunities for salary increase between promotions through COLA adjustments and Merit Reviews.

Our Scientists and Engineers



Matthew Finley(UMD/673)
Post-Doc. Associate



Haoming Liang(UMD/673)
Visiting Assistant Res. Sci.



Levon Avanov (UMD/673)
Principal Res. Engineer



Jonathan Ng (UMD/673)
Assistant Res. Scientist



Harsha Gurram (UMD/673)
Post-Doc. Associate



Joel Dahlin(UMD/674)
Assistant Res. Scientist



Dennis Chornay(UMD/673)
Principal Res. Engineer



Rachel Rice(UMD/673)
Post-Doc. Associate

Jaewoong Jung(UMD/673)
Post-Doc. Associate
(leaving September 2024)

Spiro K. Antiochos
Principal Res. Scientist

De'Ondre Kittrel (UMD/671)
Visiting Faculty Specialist
(leaving October 2024)



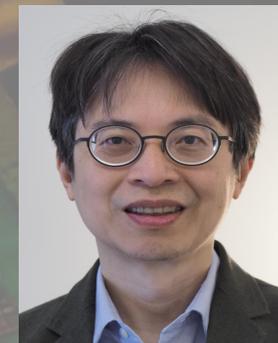
Natalia Buzulukova
(UMD/673)
Associate Res. Scientist



Ian Richardson
(UMD/672)
Principal Res. Scientist



Naoki Bessho
(UMD/673)
Principal Res. Scientist



Yi-Min Huang (UMD/674)
Visiting Associate Res. Sci

Noteworthy events for years 2023-2024:

Awards

1. 2023 NASA Heliophysics Peer Award (Richardson)
2. 2024 NASA Heliophysics Peer Award (Rice, Jung)
3. 2024 NASA Group Achievement Award to Parker Solar Probe Team (Liang)
4. 2023 Distinguished Research Scientist Prize, Department of Astronomy, UMD (Richardson)
5. 2024 Distinguished Research Scientist Prize, Department of Astronomy, UMD (Chornay)
6. MMS Early Career award (Ng, Gurram)

Invited Talks, Lectures, Seminars:

1. E.U. SERPENTINE Project workshop, Toulouse, France, 2023 (Richardson),
2. Van Allen Probes seminar 2023 (Richardson);
3. Operational Space Weather Fundamentals School, L' Aquila, Italy, 2024 (Richardson);
4. European Cosmic Ray Symposium, Croatia, 2024 (Richardson);
5. NOAA Space Weather Prediction Center Seminar, 2024 (Richardson);
6. 65th APS DPP Meeting, October 31, 2023, Denver, Colorado (Huang);
7. 2023 Frequency Agile Solar Radiotelescope (FASR) Workshop, Newark, NJ, 2023 (Dahlin);
8. 2023 US-Japan Workshop on Magnetic Reconnection, Ise Shima, Japan, 2023 (Dahlin, Bessho)
9. Lectures to undergraduate students in TREND REU program at UMD (Liang);
10. 2024 UN-Germany Space Weather Workshop, Neustrelitz, Germany (Buzulukova)

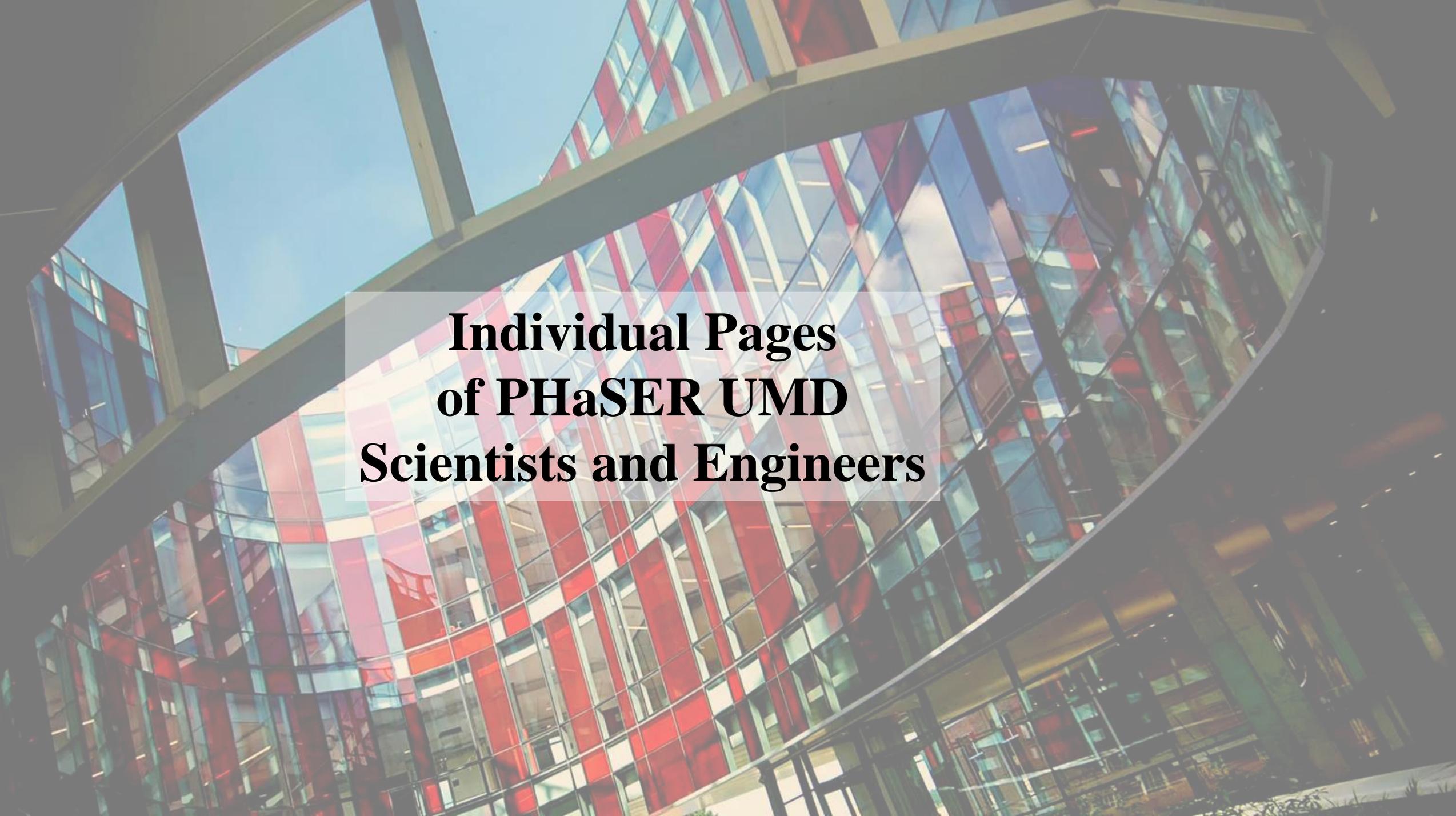
Noteworthy events for years 2023-2024 II:

Meetings/Sessions Organizing:

1. Solar Heliospheric and Interplanetary Environment 2024 (SHINE) Session “Beyond the Standard Flare Model” (Dahlin)
2. Organizing committee of MMS Science Working Team Meeting held at UMD (2023) (Ng, Rice)
3. Organizing committee of NSF Workshop on Geomagnetically Induced Currents to be held October 21-24, 2024 at UMD (Buzulukova)

Other events and projects:

1. Eclipse 2024 activities at UMD (Richardson)
2. Completely finished development, testing and calibration CAPE-e and CAPE-I instruments for GDC (Avanov)
3. Completely finished development, testing and calibration EEA instrument for HERMESS mission (Avanov)
4. On ongoing effort completed to process and validate the solar energetic particle data obtained by the Wind/EPACT/LEMT instrument and archive them to the NASA/Space Physics Data Facility (Tan)
5. NASA TRACERS mission support (Co-I, Magnetometer Suite Interference Mitigation, Finley)
6. MAGSTAR ML-Based Magnetometer Interference Mitigation Software Suite (PI, Finley)
7. Endurance mission Nature paper published in August 2024, featuring first measurements of the Earth’s ambipolar electric field made by Retarding Potential Analyzer (a very sensitive electron spectrometer) developed by Dr. Chornay.



**Individual Pages
of PHaSER UMD
Scientists and Engineers**

Dennis Chornay (PHaSER UMD/673)

Areas of expertise:

1. Research Engineer
2. Design, build, test and calibrate space physics instruments, including
 - electron and ion mass spectrometers,
 - neutral particle detectors
 - X-Ray imaging detectors.
3. Design and build laboratory facilities for to develop, test and calibrate the above instruments.



Noteworthy events, leadership, awards, invited talks, outreach for years 2023-2024:

1. 2024 Distinguished Research Faculty Prize for Excellence UMD Astronomy

Publications (2023-2024):

1. Collinson, G.A., Glocer, A., Pfaff, R., Barjatya, A., Conway, R., Chornay, D., *et al.* Earth's ambipolar electrostatic field and its role in ion escape to space. *Nature* **632**, 1021–1025 (2024). <https://doi.org/10.1038/s41586-024-07480-3>.
2. Daniel J Gershman, Levon Avanov, Glyn Collinson, Dennis Chornay et al A gated-time-of-flight top-hat electrostatic analyzer for low energy ion measurements. *Review of Scientific Instruments* 94, 083304 (2023)
3. Paw, C., Walsh, B., Busk, S., Connoir, C., Chornay, D., et al The Lunar Environment heliospheric X-ray Imager (LEXI): preparing for X-ray imaging of the magnetopause from the lunar surface,. AGU Fall Meeting 2023

Rachel Rice (PHaSER UMD/673)



Areas of Expertise

MMS and other spacecraft data analysis
Magnetopause boundary layer development
Kelvin-Helmholtz instability observations

Noteworthy Activities/Awards

NASA Heliophysics Peer Award
Organizer: MMS Community Workshop 2024; MMS Science Working Team Meeting 2023
Invited talk: MMS Community Workshop 2023

Recent Publications

Rice, R. C., Blasl, K. A., Nykyri, K., Kavosi, S., Sorathia, K. and Liou, Y.-L. (accepted) Mini-Review: Multi-scale Processes of the Kelvin-Helmholtz Instability *Frontiers in Astronomy and Space Science*, doi:10.3389/fspas.2024.1464010
Rice, R.C., Chen, L.-J., Gershman, D., ..., and Burch, J. (2024). Dynamics of the Storm Time Magnetopause and Magnetosheath Boundary Layers: An MMS-THEMIS Conjunction. *Geophysical Research Letters*, doi:10.1029/2023GL106600

Joel Dahlin (PHaSER UMD/674)

Areas of expertise:

1. Solar eruptive events (solar flares, coronal mass ejections)
2. Magnetic reconnection
3. Particle acceleration

Noteworthy events, leadership, awards, invited talks, outreach for years 2023-2024:

1. Organizer, 2024 ARMS Users Meeting
2. Invited Talk, 2023 Frequency Agile Solar Radiotelescope (FASR) Workshop, Newark, NJ, 2023.
3. Invited Talk, 2023 US-Japan Workshop on Magnetic Reconnection, Ise Shima, Japan, 2023.
4. Organizer of Solar Heliospheric and Interplanetary Environment (SHINE) Session "Beyond the Standard Flare Model"



Publications (2023-2024):

1. J. Ng, N. Bessho, J. T. Dahlin, and L.-J. Chen, Reconnection along a Separator in Shock Turbulence, *Astrophys. Journal* 962 181 (2024).
2. C. Zhu, C. R. DeVore, J. T. Dahlin, J. Qiu, M. D. Kazachenko, V. M. Uritsky, and J. S. Vandervelde, Large-scale Coronal Dimming Foreshadowing a Solar Eruption on 2011 October 1, *Astrophys. Journal* 961, 218 (2024).
3. J. Qiu, M. Alaoui, S. K. Antiochos, J. T. Dahlin, M. Swisdak, J. F. Drake, A. Robison, C. R. DeVore, V. M. Uritsky, The Role of Magnetic Shear in Reconnection-Driven Flare Energy Release, *Astrophys. Journal* 955, 34 (2023).

Ian G. Richardson (PHaSER UMD/672)

Areas of expertise:

1. Solar Energetic Particles (SEPs) including multi-spacecraft data interpretation;
2. Solar wind structures including cataloging of interplanetary coronal mass ejections and long-term variations in solar wind structure;
3. Cosmic rays, including intensity modulations associated with solar wind structures;
4. Space Weather, including geomagnetic storms and the prediction of SEP events.

Noteworthy events, leadership, awards, invited talks, outreach for years 2023-2024:

1. 2023 Distinguished Research Scientist Prize, Department of Astronomy, University of Maryland;
2. 2023 Peer Award, GSFC Heliophysics Science Division;
3. "Solar Energetic Particle Transport in the Corona and Heliosphere", E.U. SERPENTINE Project workshop, Toulouse, France, 2023;
4. "A Heliospheric View of Solar Energetic Particle Events", Van Allen Probes seminar 2023;
5. "The Solar Wind" and "Prediction of SEP Events", Operational Space Weather Fundamentals School, L' Acquila, Italy, 2024;
6. "A Widespread View of Widespread Solar Particle Events", European Cosmic Ray Symposium, Croatia, 2024;
7. "Classification of Solar Wind Structures Since 1963", NOAA Space Weather Prediction Center Seminar, 2024;

Publications 2023-24:

- Whitman, K., R. Egeland, I. G. Richardson et al., "Review of Solar Energetic Particle Prediction Models", *Advances in Space Research*, 72, 5161, Doi:10.1016/j.asr.2022.08.006, 2023.
- Belov, A. N. et al., "Study of the radial-dependence of Forbush Decreases at 0.28–1 AU using data from the Helios 1 and 2 spacecraft", *MNRAS*, 521, 4652, doi:10.1093/mnras/stad732, 2023.
- Salice, J.A. et al., "Exploring the predictability of the high-energy tail of MEE precipitation based on solar wind properties", *J. Geophys. Res: Space Physics*, 128, e2022JA031194. doi:10.1029/2022JA031194, 2023.
- Lario, D., I. G. Richardson, A. Aran, and N. Wijsen, "High-Energy (> 40 MeV) Proton Intensity Enhancements Associated with the Passage of Interplanetary Shocks at 1 au", *Astrophys. J.*, 950:89, doi:10.3847/1538-4357/acc9c5, 2023.
- Wijsen, N., et al., "The effect of the ambient solar wind medium on a CME-driven shock and the associated gradual solar energetic particle event", *Astrophys. J.*, 950 172, doi: 10.3847/1538-4357/acd1ed, 2023.
- Strauss, R.D., N. Dresing, I.G. Richardson, J.P. van den Berg, P.J. Steyn, "On the onset delays of solar energetic electrons and protons: Evidence for a common accelerator", *Astrophys. J.*, 951, 2, doi: 10.3847/1538-4357/acd3ef, 2023.
- Farrugia, C. J., et al., "How magnetic reconnection may affect the coherence of interplanetary CMEs", *Astrophys. J.*, 953:15, doi: 10.3847/1538-4357/acdcf7, 2023.
- Bruno, A., G. A. de Nolfo, J. M. Ryan, I. G. Richardson, and S. Dalla, "Statistical Relationship Between Long-Duration High-Energy Gamma-Ray Emission and Solar Energetic Particles", *Astrophys. J.*, 953:187, doi:10.3847/1538-4357/ace24c, 2023.
- Temmer, M., C. Scolini, I. G. Richardson, et al., "CME Propagation Through the Ambient Solar Wind: Observations and Model Development", *Adv. Space Res.*, online, doi.org/10.1016/j.asr.2023.07.003, 2023.
- Richardson, I.G., O. C. St. Cyr, J. T. Burckpile, H. Xie, B. J. Thompson, "Solar Energetic Particle-Associated Coronal Mass Ejections Observed by the Mauna Loa Solar Observatory Mk3 and Mk4 Coronameters", *Solar Phys.*, 298:105, doi:10.1007/s11207-023-02192-9, 2023.
- Babu, E.M., et al., "An Updated Geomagnetic Index-based Model for Determining the Latitudinal Extent of Energetic Electron Precipitation", E.M. Babu et al., *J. Geophys. Res.*, 128, e2023JA031371, doi:10.1029/2023JA031371, 2023
- Clover, E.W., S.M. White, I.G. Richardson, "A floor in the Sun's photospheric magnetic field: Implications for an independent small-scale dynamo", *Astrophys. J. Lett.*, 961:L46, doi:10.3847/2041-8213/ad192e, 2024.
- Palmerio, E., et al., "Improving the onset of SEP events in heliospheric modelling with the WSA–Enlil–SEPMOD chain", *J. Space Weather Space Clim.*, 14,3, doi:10.1051/swsc/2024001, 2024.
- Posner, A., I. G. Richardson, R. D.-T. Strauss, "The "SEP clock": A discussion of first proton arrival times in wide-spread solar energetic particle events", *Solar Physics*, in press, 2024.
- Lario, D. et al., "A rapid sequence of SEP events associated with a series of EUV jets: Solar Orbiter, STEREO-A and near-Earth spacecraft observations", *Astrophys. J.*, in press.
- Farwa, G. U., et al., "Electron and proton peak intensities as observed by a five-spacecraft fleet in solar cycle 25", *Astron. Astrophys.*, submitted, 2024.



Matthew G. Finley (PHaSER UMD/673)



Research Interests

- Magnetometer Instrumentation
- Magnetometer Interference Mitigation
- Nonparametric Event Detection for Onboard Science Autonomy
- Explainable AI/ML Tools & Techniques

Projects & Science Team Memberships

- TRACERS (Co-I, Magnetometer Suite Interference Mitigation)
- HERMES NEMISIS (Research Scientist)
- MAGSTAR ML-Based Magnetometer Interference Mitigation Software Suite (PI, 2023-Pres.)
- CHIMERA Hybrid Fluxgate/Search Coil Mag. (Instrument Lead, Launched on ACES-II Sounding Rockets Nov. 2022)

Recent Publications

- **Finley, M. G.**, Martinez-Ledesma, M., Paterson, W. R., Argall, M. R., Miles, D. M., Dorelli, J. C., & Zesta, E. (2024). “Generalized time-series analysis for in-situ spacecraft observations: anomaly detection and data prioritization using principal components analysis and unsupervised clustering.” *Earth and Space Science*. (Accepted, In Production).
- **Finley, M. G.**, et al. (2024). “Enabling in situ validation of mitigation algorithms for magnetic interference via a laboratory-generated dataset.” *Geoscientific Instrumentation, Methods and Data Systems*, 13, 2, 263-275. <https://doi.org/10.5194/gi-13-263-2024>
- **Finley, M. G.**, Bowen, T. A., Pulupa, M., Koval, A., & Miles, D. M. (2023). “Statistical decomposition and machine learning to clean in situ spaceflight magnetic field measurements.” *Geophysical Research Letters*, 50, e2023GL103626. <https://doi.org/10.1029/2023GL103626>
- **Finley, M. G.**, Broadfoot, R. M., Shekhar, S., & Miles, D. M. (2023). “Identification and removal of reaction wheel interference from in-situ magnetic field data using multichannel singular spectrum analysis.” *Journal of Geophysical Research: Space Physics*, 128, e2022JA031020. <https://doi.org/10.1029/2022JA031020>

EDUCATION

PhD in Elec/Comp Engineering
University of Iowa, Iowa City
2021

MS in Elec/Comp Engineering
University of Iowa, Iowa City
2019

BSC in Elec/Comp Engineering
University of Iowa, Iowa City
2018

BACKGROUND

Postdoctoral Research Associate
Geospace Physics Laboratory
NASA Goddard Flight Center
2023 – Present

Postdoctoral Research Scholar
Physics and Astronomy
University of Iowa
2022 – 2023

Areas of Expertise

- Magnetic reconnection
- Collisionless shocks
- Kinetic theory and simulations of collisionless plasmas
- Global hybrid simulations

Noteworthy Events

- Organizing committee of MMS SWT held at UMD (2023)

Publications

- Earth's Alfvén wings driven by the April 2023 Coronal Mass Ejection, LJ Chen, D Gershman, B Burkholder, Y Chen, M Sarantos, L Jian, J Drake, et al. GRL e2024GL108894 (2024)
- Reconnection along a Separator in Shock Turbulence, J Ng, N Bessho, JT Dahlin, LJ Chen, The Astrophysical Journal 962 (2), 181
- Laboratory Study of Collisionless Magnetic Reconnection, H Ji, J Yoo, W Fox, M Yamada, M Argall, J Egedal, YH Liu, R Wilder et al. Space Science Reviews 219 (8), 76
- Electron Acceleration and Heating during Magnetic Reconnection in the Earth's Quasi-parallel Bow Shock, N Bessho, LJ Chen, M Hesse, J Ng, LB Wilson, JE Stawarz, The Astrophysical Journal 954 (1), 25
- Soft X-Ray Imaging of Earth's Dayside Magnetosheath and Cusps Using Hybrid Simulations, J Ng, BM Walsh, LJ Chen, Y Omelchenko, Geophysical Research Letters 50 (10), e2023GL103347
- 3D simulation of lower-hybrid drift waves in strong guide field asymmetric reconnection in laboratory experiments, J Ng, J Yoo, LJ Chen, N Bessho, H Ji, Physics of Plasmas 30 (4)
- Multiscale hybrid modeling of the impact response of the Earth's magnetotail to ionospheric O⁺ outflow, YA Omelchenko, C Mouikis, J Ng, V Roytershteyn, LJ Chen, Frontiers in Astronomy and Space Sciences 10, 1056497

Jonathan Ng (PHaSER UMD/673)



Naoki Bessho (PHaSER UMD/673)

Areas of expertise

1. Particle-in-cell simulations for magnetic reconnection and shock waves
2. Kinetic physics (particle distribution functions, particle acceleration and heating, etc.) in plasma
3. Relativistic effects on magnetic reconnection and shock waves

Noteworthy events, leadership, awards, invited talks, outreach for years 2023-2024

1. PIs of three NASA projects (shock-driven reconnection, waves in reconnection, and ion heating)
2. Invited talk: N. Bessho, L.-J. Chen, M. Hesse, J. Ng, , L. B. Wilson III, and J. E. Stawarz, Electron acceleration by magnetic reconnection in the Earth's bow shock, Magnetic Reconnection Workshop 2023 (MR2023), Shima, Japan, June 2023



Publications for years 2023-2024

1. N. Bessho, L.-J. Chen, M. Hesse, J. Ng, L. B. Wilson III, J. E. Stawarz, and H. Madanian, Electron acceleration in magnetic islands in quasi-parallel shocks, accepted by the Astrophysical Journal (2024).
2. H. Hasegawa, M. R. Argall, N. Aunai, R. Bandyopadhyay, N. Bessho, et al., Advanced methods for analyzing in-situ observations of magnetic reconnection, Space Science Reviews, 220, 68 (2024).
3. J. A. Agudelo Rueda, Y.-H. Liu, K. Germaschewski, M. Hesse, and N. Bessho, On the effect of driving turbulent-like fluctuations on a Harris current sheet configuration and the formation of plasmoids, The Astrophysical Journal, 971, 109 (2024).
4. L.-J. Chen, D. Gershman, B. Burkholder, Y. Chen, et al., Earth's Alfvén wings driven by the April 2023 coronal mass ejection, Geophysical Research Letters, 51, e2024GL108894 (2024).
5. J. Ng, N. Bessho, J. T. Dahlin, and L.-J. Chen, Reconnection along a separator in shock turbulence, The Astrophysical Journal, 962, 181 (2024).
6. N. Bessho, L.-J. Chen, M. Hesse, J. Ng, L. B. Wilson III, and J. E. Stawarz, Electron acceleration and heating during magnetic reconnection in the Earth's quasi-parallel bow shock, The Astrophysical Journal, 954, 25 (2023).
7. J. Ng, J. Yoo, L.-J. Chen, N. Bessho, and H. Ji, 3D simulation of lower-hybrid drift waves in strong guide field asymmetric reconnection in laboratory experiments, Physics of Plasmas, 30, 042101 (2023).
8. J. R. Shuster, D. J. Gershman, B. L. Giles, N. Bessho, et al. Temporal, spatial, and velocity-space variations of electron phase space density measurements at the magnetopause, Journal of Geophysical Research, Space Physics, 128, e2022JA030949 (2023).

Levon Avanov (PHaSER UMD/673)

Areas of expertise:

1. Space Plasma Physics
2. Low and high latitudes reconnection
3. Investigation of extreme events with MMS spacecraft, comparison of the data with the results of the global kinetic modeling
4. Design, development and calibration of new plasma instruments for NASA missions
5. Data analyses and development software to process experimental data



Noteworthy events, leadership, awards, invited talks, outreach for years 2023-2024:

1. Invited as a panelist for NASA MAG3 proposal review
2. Leading laboratory experiments
3. Completely finished development, testing and calibration CAPE-e and CAPE-I instruments for GDC
4. Completely finished development, testing and calibration EEA instrument for HERMESS mission

Publications (2023-2024):

Lipatov, A. S., Avanov, L. A., Giles, B. L., & Gershman, D. J. (2024). Hybrid kinetic modeling of the magnetosheath impulsive plasma cloud penetration through the magnetopause and comparison with MMS and other spacecraft observations. *J. Geophys. Res., Space Physics*, 129, e2024JA032909. <https://doi.org/10.1029/2024JA032909>.

Chih-Ping Wang, Jay Johnson, Xiaoyan Xing, Levon Avanov, (2024) Ion diffusive transport across the separatrix between the low-latitude mantle and the plasma sheet by kinetic Alfvén waves: MMS observation, *J. Geophys. Res., Space Physics*, submitted

Gershman, D.J., L.A. Avanov, G. Collinson, C.J Tucker, A. Barrie, D.J. Chornay, N.P. Paschalidis, D. Rowland, T. E.

Moore, (2023), A gated-time-of-flight top-hat electrostatic analyzer for low energy ion measurements, *Rev. Sci. Instrum.* 94, 083304

Lun-Chang Tan (PHaSER UMD/672)

Areas of expertise:

1. Acceleration and transport of solar energetic particles during shock waves driven by coronal mass ejections
2. Turbulent origin of solar particle intensity variations in the inner heliosphere

Noteworthy events, leadership, awards, invited talks, outreach for years 2023-2024:

Complete an ongoing effort to process and validate the solar energetic particle data obtained by the Wind/EPACT/LEMT instrument and archive them to the NASA/Space Physics Data Facility

Publications (2023-2024):

Tan, L. C. 2023, Turbulent Origins of Particle Intensity Dropout in Gradual Solar Energetic Particle Events During Solar Cycle 23, ApJ, 964, 26

Natalia Buzulukova (PHaSER UMD/673)



Areas of expertise:

1. Solar wind-magnetosphere-ionosphere interactions, geomagnetic storms, ring current dynamics, inner magnetosphere dynamics
2. Energetic Neutral Atom (ENA) emissions data analysis and modeling
3. Global magnetospheric 3D modeling, code development
4. Space weather, extreme space weather events, spacecraft charging anomalies

Noteworthy events, leadership, awards, invited talks, outreach for years 2023-2024:

1. International Space Science Institute (ISSI) team lead on global magnetosphere
2. Invited talk for United Nations/Germany workshop on International Space Weather Initiative (ISWI)
3. Organizer of NSF-sponsored workshop on Geomagnetically Induced Currents at UMD (to be held at UMD October 21-24, 2024)

Publications (2023-2024):

1. B. T. Kress, J. Rodrigues, N. Buzulukova et al., "Relationship Between GOES-R Series Spacecraft Operational Anomalies and In Situ 30 eV–3-MeV Electron Measurements," in *IEEE Transactions on Plasma Science*, vol. 52, no. 5, pp. 1610-1618, May 2024, doi: 10.1109/TPS.2024.3390658.
2. Samsonov, A., Milan, S., Buzulukova, N. et al. (2024). "Time sequence of magnetospheric responses to a southward IMF turning. *Journal of Geophysical Research: Space Physics*, 129, e2023JA032378. <https://doi.org/10.1029/2023JA032378>
3. N. Buzulukova et al. "Extreme Space Weather Events", proceedings of ISWI-2024, 2024, submitted

Haoming Liang (PHaSER UMD/673)

Areas of expertise:

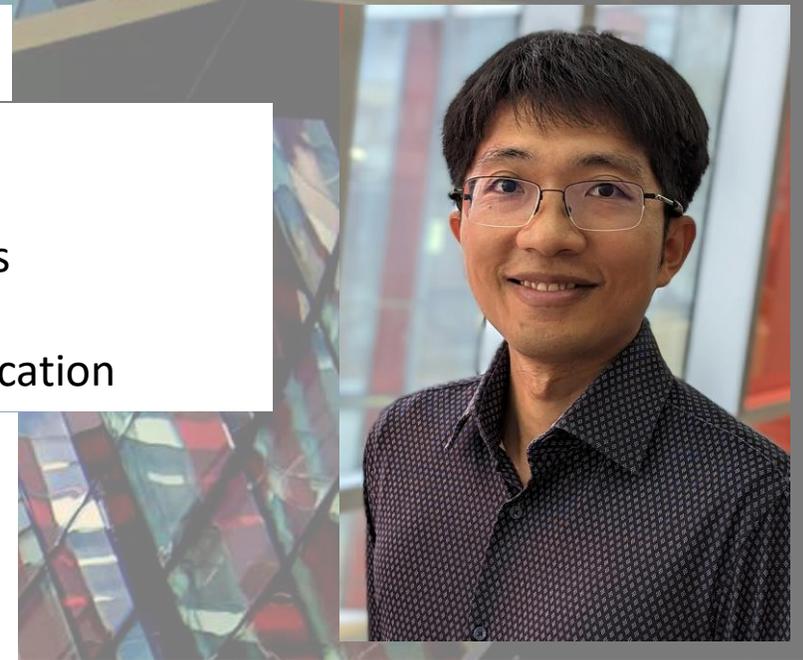
1. Energy transfer and dissipation in weakly collisional/collisionless plasmas
 - Magnetic Reconnection; plasma acceleration and heating; heavy ion dynamics
 - Alfvénic fluctuations in solar wind; solar wind-magnetosphere interaction
2. Particle-in-cell simulations; kinetic entropy diagnostic code development and application

Noteworthy events, leadership, awards, invited talks, outreach for years 2023-2024:

1. NASA Group Achievement Award to Parker Solar Probe Team
2. Guest lecturer to undergraduate students in TREND REU program at UMD
3. Internship supervisor of two high-school students in space physics research

Publications (2023-2024):

1. **Liang, H.**, Chen, L.-J., Bessho, N., Ng, J., Impact of the Out-of-Plane Flow Shear on Magnetic Reconnection at the Flanks of Earth's Magnetopause, *Journal of Geophysical Research: Space Physics*, under review.
2. **Liang, H.**, Chen, L.-J., Fuselier, S. A., Gomez, R. G., Burkholder, B., Bessho, N., Gurram, H., Rice, et al., Observation of O⁺ Characteristics During the Terrestrial Alfvén Wing State Induced by the April 2023 Coronal Mass Ejection, *Geophysical Research Letters*, submitted.
3. Chen, L.-J., Gershman, D., Burkholder, B., Chen, Y., Sarantos, M., Jian, L., Drake, J., Dong, C., Gurram, H., Shuster, J., Graham, D. B., Le Contel, O., Schwartz, S. J., Fuselier, S., Madanian, H., Pollock, C., **Liang, H.**, et al., Earth's Alfvén wings driven by the April 2023 Coronal Mass Ejection. *Geophysical Research Letters*, 51, e2024GL108894. (2024)
4. Barbhuiya, M. H., Cassak, P. A., Adhikari, S., Parashar, T. N., **Liang, H.**, and Argall, M. R. Higher-order nonequilibrium term: Effective power density quantifying evolution towards or away from local thermodynamic equilibrium. *Physical Review E*, 109(1), 015205. (2024)
5. Arencibia, M., Cassak, P. A., Shay, M. A., Qiu, J., Petrinec, S. M., and **Liang, H.**, Three-Dimensional Magnetic Reconnection Spreading in Current Sheets of Non-Uniform Thickness. *Journal of Geophysical Research: Space Physics*, 128(3), e2022JA030999. (2023)
6. Cassak, P. A., Barbhuiya, M. H., **Liang, H.**, and Argall, M. R., Quantifying Energy Conversion into Higher Order Phase Space Density Moments in Plasmas, *Physical Review Letters*, 130(8), 085201. (2023).



Yi-Min Huang (PHaSER UMD/674)

Areas of expertise:

1. Theoretical and computational plasma physics
2. Magnetic reconnection
3. Plasma turbulence
4. Plasma confinement and controlled thermonuclear fusion
5. Magnetohydrodynamic and shear flow instabilities
6. Numerical methods and high-performance computation

Noteworthy events, leadership, awards, invited talks, outreach for years 2023-2024:

“Self-generated Turbulent Reconnection in Three-dimensional Hall Magnetohydrodynamics,” solicited oral presentation in the 65th APS DPP Meeting, October 31, 2023, Denver, Colorado.

Publications (2023-2024):

1. E. Balkovic, J. Loizu, J. P. Graves, Y.-M. Huang, and C. Simet, “Direct prediction of saturated neoclassical tearing modes in slab using an equilibrium approach” *Plasma Physics and Controlled Fusion*, submitted (Invited Paper of the 2024 Varenna–Lausanne International Workshop).
2. Yi-Min Huang and Amitava Bhattacharjee, “Three-dimensional plasmoid-mediated reconnection and turbulence in Hall magnetohydrodynamics,” *Physics of Plasmas*, 31, 082119 (2024) (Featured Article). [DOI: 10.1063/5.0216561]
3. Yi-Min Huang, Yao Zhou, Joaquim Loizu, Stuart Hudson, and Amitava Bhattacharjee, “Structure of Pressure-Gradient-Driven Current Singularity in Ideal Magnetohydrodynamic Equilibrium,” *Plasma Physics and Controlled Fusion*, 65, 034004 (2023) (Invited Paper of the 2022 Varenna–Lausanne International Workshop). [DOI: 10.1088/1361-6587/acb382]
4. Yi-Min Huang, “Plasmoid instability, magnetic field line chaos, and reconnection,” *Radiation Effects and Defects in Solids* 178, 1362 (2023). [DOI: 10.1080/10420150.2023.2291773]

