Ramiz A. Qudsi

Curriculum Vitæ

Postdoctoral Associate
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Employment

Center for Space Physics, Boston University

Research Scientist (March, 2023 – Present)

Postdoctoral Associate (August, 2021 – February, 2023)

National Remote Sensing Center, ISRO

Scientist 'C' (September, 2008 – July, 2012)

Education

University of Delaware, Newark, DE (August, 2015 – July, 2021)

Doctor of Philosophy in Physics (July, 2021)

Supervisor: Bennett A. Maruca

Dissertation: *On The Interplay Between Microkinetics and Turbulence in Space Plasmas*

Indian Institute of Space Science and Technology, Trivandrum, India (August, 2008 – May, 2012)

Bachelors of Technology in Physical Sciences (May, 2012)

Chinmaya Vidyalaya, Bokaro Steel City, India (August, 2005 – May, 2007)

All India Senior Secondary School Certificate Exam (May, 2007)

Indian Public School, Madhubani, India (March, 2001 – March, 2005)

All India Senior Secondary School Exam (May, 2005)

Research Activities and Collaborations

Large-Scale Average Trends in Plasma Parameters Across the Heliosphere (2022 –)

The project compiles and synthesize historical datasets from in-situ spacecraft into a validated, machine learning (ML)-ready dataset consisting of solar wind parameters spanning the heliosphere. I am a Co-I of the study and the primary person responsible for data analysis and standardisation as well as producing and managing the final dataset.

The project is funded by NASA under Living With a Star Tools and Methods program.

Refining Predictions of Reconnection X-lines at Earth's Magnetopause (2021 –)

The project's goal is to have a better understanding of what controls the location of the magnetic reconnection X-line at Earth's dayside magnetopause. I am currently testing reconnection X-line hypotheses by comparing their predictions with observed X-line locations from in-situ data using MMS. Additionally, I am evaluating the process of turning a reconnection hypothesis into a working location model to determine whether mispredictions are due to errors in the hypotheses or in the approximations used to test them. All the codes developed in this project so far and the results are shared publicly on GitHub[1].
The project is funded by NASA.

Lunar Environment heliospheric X-ray Image (LEXI) (2021 –)

LEXI is a soft X-ray imager developed to provide wide field-of-view images of the interaction between the solar wind and Earth's magnetosphere set to be launched in early 2024. I am primarily responsible for developing the python code for real-time data visualization from LEXI as well as data processing, management and hosting.All the codes developed in this project so far and the results are shared publicly on GitHub[2].
LEXI is funded by and is part of NASA's Lunar Science and Technology Program.

PlasmaPy (2020 –)

PlasmaPy is an open source scientific Python ecosystem for plasma physics. I have worked on developing various two fluid dispersion solver packages for the ecosystem. I am presently involved in an advisory position with the team.
The project is funded by NSF/DOE.

The Simultaneous Interplanetary Magnetic Probe Explorer (SIMPEX) (2020 –)

SIMPEX is a mission design concept where we proposed launching of multiple small spacecraft to record the solar magnetic field and reconstruct a full 3-D image of it, using Machine Learning Algorithm, which will help greatly in understanding the nature and type of turbulence in space plasmas. I am working on it as the lead data scientist and the contact point for algorithm development.
More details about the mission can be found here.

[1] https://github.com/qudsiramiz/rcn [2] https://github.com/Lexi-BU

Complete List of Peer-Reviewed Publications

[1] Riddhi Bandyopadhyay, M. L. Goldstein, B. A. Maruca, W. H. Matthaeus, T. N. Parashar, D. Ruffolo, R. Chhiber, A. Usmanov, A. Chasapis, R. Qudsi, Stuart D. Bale, J. W. Bonnell, Thierry Dudok de Wit, Keith Goetz, Peter R. Harvey, Robert J. MacDowall, David M. Malaspina, Marc Pulupa, J. C. Kasper, K. E. Korreck, A. W. Case, M. Stevens, P. Whittlesey, D. Larson, R. Livi, K. G. Klein, M. Velli, and N. Raouafi. Enhanced Energy Transfer Rate in Solar Wind Turbulence Observed near the Sun from Parker Solar Probe. *The Astrophysical Journal Supplement Series*, 246(2):48, February 2020. arXiv:1912.02959, doi:10.3847/1538-4365/ab5dae.

[2] Riddhi Bandyopadhyay, W. H. Matthaeus, T. N. Parashar, R. Chhiber, D. Ruffolo, M. L. Goldstein, B. A. Maruca, A. Chasapis, R. Qudsi, D. J. McComas, E. R. Christian, J. R. Szalay, C. J. Joyce, J. Giacalone, N. A. Schwadron, D. G. Mitchell, M. E. Hill, M. E. Wiedenbeck, Jr. McNutt, R. L., M. I. Desai, Stuart D. Bale, J. W. Bonnell, Thierry Dudok de Wit, Keith Goetz, Peter R. Harvey, Robert J. MacDowall, David M. Malaspina, Marc Pulupa, M. Velli, J. C. Kasper, K. E. Korreck, M. Stevens, A. W. Case, and N. Raouafi. Observations of Energetic-particle Population Enhancements along Intermittent Structures near the Sun from the Parker Solar Probe. *The Astrophysical Journal Supplement Series*, 246(2):61, February 2020. arXiv:1912.03424, doi:10.3847/1538-4365/ab6220.

[3] Riddhi Bandyopadhyay, Ramiz A. Qudsi, S. Peter Gary, William H. Matthaeus, Tulasi N. Parashar, Bennett A. Maruca, Vadim Roytershteyn, Alexandros Chasapis, Barbara L. Giles, Daniel J. Gershman, Craig J. Pollock, Christopher T. Russell, Robert J. Strangeway, Roy B. Torbert, Thomas E. Moore, and James L. Burch. Interplay of turbulence and proton-microinstability growth in space plasmas. *Physics of Plasmas*, 29(10):102107, October 2022. doi:10.1063/5.0098625.

[4] Rohit Chhiber, M. L. Goldstein, B. A. Maruca, A. Chasapis, W. H. Matthaeus, D. Ruffolo, R. Bandyopadhyay, T. N. Parashar, R. Qudsi, T. Dudok de Wit, S. D. Bale, J. W. Bonnell, K. Goetz, P. R. Harvey, R. J. MacDowall, D. Malaspina, M. Pulupa, J. C. Kasper, K. E. Korreck, A. W. Case, M. Stevens, P. Whittlesey, D. Larson, R. Livi, M. Velli, and N. Raouafi. Clustering of Intermittent Magnetic and Flow Structures near Parker Solar Probe's First Perihelion—A Partial-variance-of-increments Analysis. *The Astrophysical Journal Supplement Series*, 246(2):31, February 2020. arXiv:1912.03608, doi:10.3847/1538-4365/ab53d2.

[5] Haley DeWeese, Bennett A. Maruca, Ramiz A. Qudsi, Alexandros Chasapis, Mark Pultrone, Elliot Johnson, Sarah K. Vines, Michael A. Shay, William H. Matthaeus, Roman G. Gomez, Stephen A. Fuselier, Barbara L. Giles, Daniel J. Gershman, Christopher T. Russell, Robert J. Strangeway, James L. Burch, and Roy B. Torbert. Alpha Particle Temperature Anisotropy in Earth's Magnetosheath. *The Astrophysical Journal*, 941(1):12, December 2022. doi:10.3847/1538-4357/ac9791.

[6] S. Peter Gary, Riddhi Bandyopadhyay, Ramiz A. Qudsi, William H. Matthaeus, Bennett A. Maruca, Tulasi N. Parashar, and Vadim Roytershteyn. Particle-in-cell Simulations of Decaying Plasma Turbulence: Linear Instabilities versus Nonlinear Processes

in 3D and 2.5D Approximations. *The Astrophysical Journal*, 901(2):160, October 2020. doi:10.3847/1538-4357/abb2ac.

[7] Jia Huang, J. C. Kasper, D. Vech, K. G. Klein, M. Stevens, Mihailo M. Martinović, B. L. Alterman, Tereza Ďurovcová, Kristoff Paulson, Bennett A. Maruca, Ramiz A. Qudsi, A. W. Case, K. E. Korreck, Lan K. Jian, Marco Velli, B. Lavraud, A. Hegedus, C. M. Bert, J. Holmes, Stuart D. Bale, Davin E. Larson, Roberto Livi, P. Whittlesey, Marc Pulupa, Robert J. MacDowall, David M. Malaspina, John W. Bonnell, Peter Harvey, Keith Goetz, and Thierry Dudok de Wit. Proton Temperature Anisotropy Variations in Inner Heliosphere Estimated with the First Parker Solar Probe Observations. *The Astrophysical Journal Supplement Series*, 246(2):70, February 2020. arXiv:1912.03871, doi:10.3847/1538-4365/ab74e0.

[8] C. L. Lentz, A. Chasapis, R. A. Qudsi, J. Halekas, B. A. Maruca, L. Andersson, and D. N. Baker. On the Solar Wind Proton Temperature Anisotropy at Mars' Orbital Location. *Journal of Geophysical Research (Space Physics)*, 126(10):e29438, October 2021. doi:10.1029/2021JA029438.

[9] Bennett A. Maruca, Jeffersson A. Agudelo Rueda, Riddhi Bandyopadhyay, Federica B. Bianco, Alexandros Chasapis, Rohit Chhiber, Haley DeWeese, William H. Matthaeus, David M. Miles, Ramiz A. Qudsi, Michael J. Richardson, Sergio Servidio, Michael A. Shay, David Sundkvist, Daniel Verscharen, Sarah K. Vines, Joseph H. Westlake, and Robert T. Wicks. MagneToRE: Mapping the 3-D Magnetic Structure of the Solar Wind Using a Large Constellation of Nanosatellites. *Frontiers in Astronomy and Space Sciences*, 8:108, July 2021. doi:10.3389/fspas.2021.665885.

[10] T. N. Parashar, M. L. Goldstein, B. A. Maruca, W. H. Matthaeus, D. Ruffolo, R. Bandyopadhyay, R. Chhiber, A. Chasapis, R. Qudsi, D. Vech, D. A. Roberts, S. D. Bale, J. W. Bonnell, T. Dudok de Wit, K. Goetz, P. R. Harvey, R. J. MacDowall, D. Malaspina, M. Pulupa, J. C. Kasper, K. E. Korreck, A. W. Case, M. Stevens, P. Whittlesey, D. Larson, R. Livi, M. Velli, and N. Raouafi. Measures of Scale-dependent Alfvénicity in the First PSP Solar Encounter. *The Astrophysical Journal Supplement Series*, 246(2):58, February 2020. doi:10.3847/1538-4365/ab64e6.

[11] R. A. Qudsi, B. A. Maruca, W. H. Matthaeus, T. N. Parashar, Riddhi Bandyopadhyay, R. Chhiber, A. Chasapis, Melvyn L. Goldstein, S. D. Bale, J. W. Bonnell, T. Dudok de Wit, K. Goetz, P. R. Harvey, R. J. MacDowall, D. Malaspina, M. Pulupa, J. C. Kasper, K. E. Korreck, A. W. Case, M. Stevens, P. Whittlesey, D. Larson, R. Livi, M. Velli, and N. Raouafi. Observations of Heating along Intermittent Structures in the Inner Heliosphere from PSP Data. *The Astrophysical Journal Supplement Series*, 246(2):46, February 2020. arXiv:1912.05483, doi:10.3847/1538-4365/ab5c19.

[12] Ramiz A. Qudsi, Riddhi Bandyopadhyay, Bennett A. Maruca, Tulasi N. Parashar, William H. Matthaeus, Alexandros Chasapis, S. Peter Gary, Barbara L. Giles, Daniel J. Gershman, Craig J. Pollock, Robert J. Strangeway, Roy B. Torbert, Thomas E. Moore, and James L. Burch. Intermittency and Ion Temperature-Anisotropy Instabilities: Simulation and Magnetosheath Observation. *The Astrophysical Journal*, 895(2):83, June 2020. arXiv:2004.06164, doi:10.3847/1538-4357/ab89ad.

[13] Nikos Sioulas, Zesen Huang, Marco Velli, Rohit Chhiber, Manuel E. Cuesta, Chen Shi, William H. Matthaeus, Riddhi Bandyopadhyay, Loukas Vlahos, Trevor A. Bowen, Ramiz A. Qudsi, Stuart D. Bale, Christopher J. Owen, P. Louarn, A. Fedorov, Milan Maksimović, Michael L. Stevens, Anthony Case, Justin Kasper, Davin Larson, Marc Pulupa, and Roberto Livi. Magnetic Field Intermittency in the Solar Wind: Parker Solar Probe and SolO Observations Ranging from the Alfvén Region up to 1 AU. *The Astrophysical Journal*, 934(2):143, August 2022. arXiv:2206.00871, doi:10.3847/1538-4357/ac7aa2.

[14] Nikos Sioulas, Marco Velli, Rohit Chhiber, Loukas Vlahos, William H. Matthaeus, Riddhi Bandyopadhyay, Manuel E. Cuesta, Chen Shi, Trevor A. Bowen, Ramiz A. Qudsi, Michael L. Stevens, and Stuart D. Bale. Statistical Analysis of Intermittency and its Association with Proton Heating in the Near-Sun Environment. *The Astrophysical Journal*, 927(2):140, March 2022. arXiv:2201.10067, doi:10.3847/1538-4357/ac4fc1.

Full list of peer-reviewed publications.