

Eric J. Zirnstein
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Curriculum Vitae

EDUCATION

Ph.D., Physics, University of Alabama in Huntsville, 2014
M.S., Physics, University of Alabama in Huntsville, 2012
B.S., Physics, University of Alabama in Huntsville, 2010

PROFESSIONAL CHRONOLOGY

Principal Research Scientist II, S2, May 2026 – Present
Research Scholar, Princeton University, July 2021 – May 2026
Associate Research Scholar, Princeton University, Oct. 2016 – June 2021
Research Scientist, Southwest Research Institute, May 2016 – Sept. 2016
Postdoctoral Researcher, Southwest Research Institute, Sept. 2014 – May 2016
Research Assistant, University of Alabama in Huntsville, Aug. 2011 – Aug. 2014
Teaching Assistant, University of Alabama in Huntsville, Aug. 2010 – Aug. 2011

SUMMARY

Dr. Zirnstein is a research scientist specializing in the simulation and analysis of hydrogen energetic neutral atom (ENA) emission from the solar wind-local interstellar medium interaction as well as the transport of interstellar pickup ions through the heliosphere and beyond the heliopause. He received his B.S., M.S., and Ph.D. in Physics at the University of Alabama in Huntsville, specializing in Space Science. He developed a numerical code that computes hydrogen ENA fluxes at 1 au for NASA's Interstellar Boundary Explorer (IBEX) mission by post-processing 3D MHD-plasma/kinetic-neutral simulation results of the heliosphere, including the development of time-independent and -dependent algorithms, employing MPI and distributed/shared memory algorithms in C that run on multi-node computer clusters, and simulation/data analysis and visualization/analysis in IDL, MATLAB, and Mathematica. His current research continues the simulation and analysis of observations made by the IBEX mission, as well as supporting the analysis of New Horizon's Solar Wind Around Pluto (SWAP) instrument measurements at the Pluto plasma environment and in the solar wind. He helps analyze data from the Solar Wind And Pickup Ion (SWAPI) instrument and simulates the measurements and serves on the science teams for the IMAP-Lo, IMAP-Hi, and IMAP-Ultra ENA imagers, all onboard the Interstellar Mapping and Acceleration Probe (IMAP) that was launched in September 2025.

Dr. Zirnstein is actively involved with presenting talks/posters at conferences and meetings, and refereeing journal articles and NASA proposals. He served on NASA's Heliophysics Advisory Committee (HPAC) for the Heliophysics Division from 2023 through 2024. He was co-editor of the *Heliophysics Newsletter* from 2016-2026. As of May 2026, he has authored/co-authored 114 refereed publications (38 first author), 4 Decadal Survey white papers (1 first author), with over 4600 citations and an h-index of 37 (Google Scholar).

MANUSCRIPTS UNDER REVIEW/IN PRESS (1 total, 0 first author)

- No, S. J., Reisenfeld, D. B., **Zirnstein, E. J.**, Funsten, H. O., Janzen, P. H., Kim, T. K., Walia, N. K., Guo, F., Osthus, D., Beesley, L. J., Sokol, J. M., Fujiki, K., *Global Characteristics of the IBEX Ribbon and Its Temporal Variation: Implications for Relationships with Solar Cycle Variability and the Interstellar Magnetic Field*, ApJ, under review.

PUBLICATIONS

2026 (6 total, 1 first author)

- Elliott, H. A., Kim, T. K., Richardson, J. D., Sokol, J. M., Shrestha, B. L., **Zirnstein, E. J.**, McComas, D. J., Swaczyna, P., Opher, M., Dayeh, M. A., Hill, M. E., Poppe, A., Stern, S. A., Brandt, P. C., Singer, K., Parker, J., Verbiscer, A. J., New Horizons Heliophysics Team, *The Gradual Slowing of the Solar Wind in the Outer Heliosphere*, ApJ, 1001, 55, doi:10.3847/1538-4357/ae39c6, 2026.
- Szalay, J. R., Provornikova, E., Ayari, E., Bzowski, M., Christian, E. R., Funsten, H. O., Galli, A., Gkioulidou, M., Horanyi, M., Livi, S., McComas, D. J., Moebius, E., Ogasawara, K., Rahmanifard, F., Rankin, J. S., Reisenfeld, D. B., Schwadron, N. A., Sternovsky, Z., Swaczyna, P., Turner, D., Zank, G. P., **Zirnstein, E. J.**, *Direct Samples of Interstellar and Interplanetary Material with IMAP*, SSRv, 222, 36, doi:10.1007/s11214-026-01291-w, 2026.
- Huang, Y., Guo, F., Sun, X., Noh, S., **Zirnstein, E. J.**, Reisenfeld, D. B., Li, H., Florinski, V., Heerikhuisen, J., *Evolution of a Pickup Ion Ring-beam Population in Large-scale Turbulence and Small-scale Self-generated Waves: Implications for the IBEX Ribbon*, ApJ, 1000, 203, doi: 10.3847/1538-4357/ae4c40, 2026.
- **Zirnstein, E. J.**, Fraternali, F., Pogorelov, N. V., Bera, R. K., *Kelvin-Helmholtz Instabilities and Energetic Neutral Atoms in the Heliosphere*, ApJL, 997, L11, doi:10.3847/2041-8213/ae3239, 2026.
- Reisenfeld, D. B., Allegrini, F., Christian, E. R., et al., **Zirnstein, E. J.**, *Exploring the Outer Heliosphere Through ENA Observations from IMAP*, SSRv, 222, 7, doi:10.1007/s11214-025-01258-3, 2026.
- Cohen, C. M. S., Alterman, B. L., Baker, D. N., et al., **Zirnstein, E. J.**, *IMAP's role in understanding particle injection and energization throughout the heliosphere*, SSRv, 222, 6, doi: 10.1007/s11214-025-01257-4, 2026.

2025 (15 total, 6 first author)

- **Zirnstein, E. J.**, Dayeh, M. A., *Distance to the IBEX Ribbon beyond the Heliopause*, ApJ, 995, 208, doi:10.3847/1538-4357/ae2269, 2025.
- Lee, C. O., Christian, E. R., Sandoval, L., et al., **Zirnstein, E. J.**, *Space Weather Science to Enhance Forecasting with the NASA IMAP Active Link for Real-Time (I-ALiRT) System*, SSRv, 221, 117, doi:10.1007/s11214-025-01244-9, 2025.
- Rankin, J. S., McComas, D. J., Alimaganbetov, M., ... **Zirnstein, E. J.**, et al., *Solar Wind and Pickup Ion (SWAPI) Instrument on NASA's Interstellar Mapping and Acceleration Probe (IMAP)*, SSRv, 221, 108, doi:10.1007/s11214-025-01229-8, 2025.
- **Zirnstein, E. J.**, McComas, D. J., Giacalone, J., Zank, G. P., Guo, F., Heerikhuisen, J., Li, H., Reisenfeld, D. B., *Slab Turbulence in the Very Local Interstellar Medium and the IBEX Ribbon*, ApJ, 993, 219, doi:10.3847/1538-4357/ae12a1, 2025.
- Kim, T. K., Reisenfeld, D. B., **Zirnstein, E. J.**, Janzen, P. H., Merrill, A. S., Noh, S., Walia,

N. K., Chen, Y., Guo, F., Osthus, D., Beesley, L. J., Shin, D., Sokol, J. M., Bzowski, M., Kubiak, M. A., Porowski, C., Funsten, H. O., *Spectral Properties of Globally Distributed ENA Fluxes Across Diverse Regions of the Heliosphere*, ApJ, 992, 119, doi:10.3847/1538-4357/ae0183, 2025.

- **Zirnstein, E. J.**, Kumar, R., Shrestha, B. L., Swaczyna, P., Dayeh, M. A., Heerikhuisen, J., Szalay, J. R., *Global Heliospheric Termination Shock Strength in the Solar-Interstellar Interaction*, NatAs, doi:10.1038/s41550-025-02634-3, 2025.
- Walia, N. K., Reisenfeld, D. B., Beesley, L. J., Janzen, P. H., Kim, T. K., Merrill, A. S., Noh, S. J., Osthus, D., **Zirnstein, E. J.**, *An Investigation of the Evolution of Heliosheath Energetics Using a Pressure Enhancement Even Observed by IBEX*, ApJ, 987, 201, doi:10.3847/1538-4357/add476, 2025.
- Huang, Y., Guo, F., **Zirnstein, E. J.**, Noh, S., Li, H., Reisenfeld, D. B., Heerikhuisen, J., *A Numerical Model for the Dynamics of Pickup Ions Outside the Heliopause and IBEX “Ribbon” Observation*, ApJ, 987, 192, doi:10.3847/1538-4357/addbe3, 2025.
- **Zirnstein, E. J.**, McComas, D. J., Shrestha, B. L., Elliott, H. A., Brandt, P. C., Stern, S. A., Poppe, A. R., Parker, J., Provornikova, E., Singer, K., Verbiscer, A., *New Horizons Heliophysics Team, Predictions for New Horizons’ SWAP Measurements Downstream of the Heliospheric Termination Shock*, ApJL, 987, L23, doi:10.3847/2041-8213/ade670, 2025.
- Fuselier, S. A., **Zirnstein, E. J.**, Heerikhuisen, J., Galli, A., Richardson, J. D., Reisenfeld, D. B., Schwadron, N. A., Dayeh, M. A., McComas, D. J., Funsten, H. O., Sokol, J. M., Opher, M., Kornbleuth, M. Z., Gasser, J., *Energetic Neutral Atom Fluxes from the Voyager 1 and 2 Directions*, ApJ, 987, 15, doi:10.3847/1538-4357/addd12, 2025.
- **Zirnstein, E. J.**, McComas, D. J., Shrestha, B. L., Elliott, H. A., Brandt, P. C., Stern, S. A., Poppe, A. R., Parker, J., Provornikova, E., Singer, K., Verbiscer, A., *New Horizons Heliophysics Team, Formation of H^+ PUI Tails Downstream of Distant Interplanetary Shocks*, ApJ, 986, 205, doi:10.3847/1538-4357/addf45, 2025.
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- Shrestha, B. L., McComas, D. J., **Zirnstein, E. J.**, Livadiotis, G., Elliott, H., Brandt, P. C., Stern, S. A., Poppe, A. R., Parker, J., Provornikova, E., Singer, K. N., Verbiscer, A., *High-resolution Observations of Pickup Ion Mediated Shocks to 60 au*, ApJ, 984, 11, doi:10.3847/1538-4357/adc0a1, 2025.
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- Noh, S., Reisenfeld, D. B., Beesley, L. J., Chen, Y., Guo, F., Funsten, H. O., Janzen, P. H., Kim, T., Merrill, A., Osthus, D., Walia, N. K., **Zirnstein, E. J.**, *Characteristics of the IBEX ribbon and their implications for a source region outside the heliopause*, ApJ, 980, 8, doi:10.3847/1538-4357/ada36a, 2025.

2024 (4 total, 1 first author)

- Heerikhuisen, J., **Zirnstein, E. J.**, Pogorelov, N. V., *Simulating a Steady-state Heliosphere*, ApJS, 276, 13, doi:10.3847/1538-4365/ad927a, 2024.
- **Zirnstein, E. J.**, Kim, T. K., Rankin, J. S., Dayeh, M. A., McComas, D. J., Swaczyna, P., Beesley, L. J., Reisenfeld, D. B., *Evolving Outer Heliosphere: Tracking Solar Wind Transients*

from 1 au to the VLISM with IBEX and Voyager 1, *ApJ*, 974, 213, doi:10.3847/1538-4357/ad725a, 2024.

- Szalay, J. R., Saur, J., McComas, D. J., Allegrini, F., Bagenal, F., Bolton, S. J., Ebert, R. W., Kim, T., Livadiotis, G., Poppe, A. R., Sarkango, Y., Valek, P., Wilson, R. J., **Zirnstein, E. J.**, *Europa modifies Jupiter's plasma sheet*, *GRL*, 51, e2023GL105809, doi:10.1029/2023GL105809.
- Shrestha, B. L., **Zirnstein, E. J.**, McComas, D. J., Brandt, P., Stern, A., Poppe, A. R., Singer, K. N., Verbischer, A., Elliott, H. A., *Suprathermal H^+ Pickup Ion Tails in the Outer Heliosphere*, *ApJ*, 960, 35, doi:10.3847/1538-4357/ad08b9, 2024.

2023 (12 total, 1 first author)

- Rahmanifard, F., Swaczyna, P., **Zirnstein, E. J.**, Heerikhuisen, J., Galli, A., Sokół, J. M., Schwadron, N. A., Möbius, E., McComas, D. J., Fuselier, S. A., *The Effect of Angular Scattering Imposed by Charge Exchange and Elastic Collisions on Interstellar Neutral Hydrogen Atoms*, *ApJ*, 959, 129, doi:10.3847/1538-4357/ad0be1, 2023.
- Osthus, D., Weaver, B., Beesley, L. J., Moran, K. R., Stricklin, M. A., **Zirnstein, E. J.**, Janzen, P., Reisenfeld, D. B., *Towards Improved Heliosphere Sky Map Estimation with Theseus*, *Technometrics*, 0, 0, doi:10.1080/00401706.2023.2271017, 2023.
- Swaczyna, P., Bzowski, M., Heerikhuisen, J., Kubiak, M. A., Rahmanifard, F., **Zirnstein, E. J.**, Fuselier, S. A., Galli, A., McComas, D. J., Möbius, E., Schwadron, N. A., *Interstellar Conditions Deduced from Interstellar Neutral Helium Observed by IBEX and Global Heliosphere Modeling*, *ApJ*, 953, 107, doi:10.3847/1538-4357/ace719, 2023.
- Dayeh, M. A., **Zirnstein, E. J.**, Swaczyna, P., McComas, D. J., *Investigating the IBEX Ribbon Structure a Solar Cycle Apart*, *ApJ*, 952, 19, doi:10.3847/1538-4357/acda8b, 2023.
- Livadiotis, G., McComas, D. J., **Zirnstein, E. J.**, *Temperature of the Polar Inner Heliosheath: Connection to Solar Activity*, *ApJ*, 951, 21, doi:10.3847/1538-4357/acd1e1, 2023.
- Swaczyna, P., Dayeh, M. A., **Zirnstein, E. J.**, *Spherical Harmonic Representation of Energetic Neutral Atom Flux Components Observed by IBEX*, *ApJS*, 266, 26, doi:10.3847/1538-4365/accf0f, 2023.
- **Zirnstein, E. J.**, Swaczyna, P., Dayeh, M. A., Heerikhuisen, J., *Constraints on the IBEX Ribbon's Origin from its Evolution over a Solar Cycle*, *ApJ*, 949, 45, doi:10.3847/1538-4357/acc577, 2023.
- Dayeh, M. A., **Zirnstein, E. J.**, McComas, D. J., *Determining the IBEX Ribbon Transverse Profile from ENA Temporal Variations: A Proof-of-concept for IMAP Observations*, *ApJL*, 945, L33, doi:10.3847/2041-8213/acbe00, 2023.
- Rankin, J. S., McComas, D. J., **Zirnstein, E. J.**, Burlaga, L. F., Heerikhuisen, J., *Unified Picture of the Local Interstellar Magnetic Field from Voyager and IBEX*, *ApJL*, 945, L31, doi:10.3847/2041-8213/acbd4e, 2023.
- Brandt, P. C., Bale, S., Cocoros, A., DeMajistre, R., Dialynas, K., Eriksson, S., Fields, B., Galli, A., Hill, M. E., Horanyi, M., Horbury, T., Kollmann, P., Kinnison, J., Fountain, G., Krimigis, S. M., Kurth, W. S., Linsky, J., Lisse, C. M., Mandt, K. E., Magnes, W., McNutt, R. L., Miller, J., Moebius, E., Mostafavi, P., Opher, M., Paxton, L., Plaschke, F., Poppe, A., Provornikova, E., Roelof, E. C., Runyon, K., Redfield, S., Schwadron, N., Sterken, V., Swaczyna, P., Szalay, J., Turner, D., Wimmer-Schweingruber, R., Wurz, P., **Zirnstein, E. J.**, *Future Exploration of the Outer Heliosphere and Very Local Interstellar Medium by Interstellar Probe*, *SSRv*, 219, 18, doi:10.1007/s11214-022-00943-x, 2023.
- Swaczyna, P., Rahmanifard, F., **Zirnstein, E. J.**, Heerikhuisen, J., *Filtration of Interstellar*

Neutral Helium by Elastic and Charge Exchange Collisions in Heliospheric Boundaries, ApJ, 943, 74, doi:10.3847/1538-4357/aca36, 2023.

- Shrestha, B. L., **Zirnstein, E. J.**, McComas, D. J., *Tracking the Rapid Opening and Closing of Polar Coronal Holes through IBEX ENA Observations*, ApJ, 943, 34, doi:10.3847/1538-4357/aca891, 2023.

2022 (9 total, 3 first author)

- Livadiotis, G., McComas, D. J., Funsten, H. O., Schwadron, N. A., **Zirnstein, E.**, *Thermodynamics of the Inner Heliosheath*, ApJS, 262, 53, doi:10.3847/1538-4365/ac8b88, 2022.
- **Zirnstein, E. J.**, Shrestha, B. L., McComas, D. J., Dayeh, M. A., Heerikhuisen, J., Reisenfeld, D. B., Sokół, J. M., Swaczyna, P., *Oblique and rippled heliosphere structures from the Interstellar Boundary Explorer*, NatAs, 6, 1398, doi:10.1038/s41550-022-01798-6, 2022.
- **Zirnstein, E. J.**, Kim, T. K., Dayeh, M. A., Rankin, J. S., McComas, D. J., Swaczyna, P., *Explanation of Heliospheric Energetic Neutral Atom Fluxes Observed by the Interstellar Boundary Explorer*, ApJL, 937, L38, doi:10.3847/2041-8213/ac92e2, 2022.
- McComas, D. J., Shrestha, B. L., Swaczyna, P., Rankin, J. S., Weidner, S. E., **Zirnstein, E. J.**, Elliott, H. A., Singer, K. N., Spencer, J., Stern, S. A., Weaver, H. A., *First High-resolution Observations of Interstellar Pickup Ion Mediated Shocks in the Outer Heliosphere*, ApJ, 934, 147, doi:10.3847/1538-4357/ac7956, 2022.
- Dayeh, M. A., **Zirnstein, E. J.**, Fuselier, S. A., Funsten, H. O., McComas, D. J., *Evolution of the Heliotail Lobes over a Solar Cycle as Measured by IBEX*, ApJS, 261, 27, doi:10.3847/1538-4365/ac714e, 2022.
- **Zirnstein, E. J.**, Möbius, E., Zhang, M., Bower, J., Elliott, H. A., McComas, D. J., Pogorelov, N. V., Swaczyna, P., *In Situ Observations of Interstellar Pickup Ions from 1 au to the Outer Heliosphere*, SSRv, 218, 28, doi:10.1007/s11214-022-00895-2, 2022.
- Szalay, J. R., Smith, H. T., **Zirnstein, E. J.**, McComas, D. J., Begley, L. J., Bagenal, F., Delamere, P. A., Wilson, R. J., Valek, P. W., Poppe, A. R., Nénon, Q., Allegrini, F., Ebert, R. W., Bolton, S. J., *Water-Group Pickup Ions From Europa-Genic Neutrals Orbiting Jupiter*, GRL, 49, e2022GL098111, doi:10.1029/2022GL098111, 2022.
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- Swaczyna, P., Eddy, T. J., **Zirnstein, E. J.**, Dayeh, M. A., McComas, D. J., Funsten, H. O., Schwadron, N. A., *IBEX Ribbon Separation Using Spherical Harmonic Decomposition of the Globally Distributed Flux*, ApJS, 258, 6, doi:10.3847/1538-4365/ac2f47, 2022.

2021 (11 total, 3 first author)

- Sokół, J. M., Dayeh, M. A., Fuselier, S. A., Nicolaou, G., McComas, D. J., **Zirnstein, E. J.**, *Breathing of the Heliosphere*, ApJ, 922, 250, doi:10.3847/1538-4357/ac21cd, 2021.
- Kornbleuth, M., Opher, M., Baliukin, I., Dayeh, M. A., **Zirnstein, E. J.**, Gkioulidou, M., Dialynas, K., Galli, A., Richardson, J. D., Izmodenov, V., Zank, G. P., Fuselier, S., *Signature of a heliotail organized by the solar magnetic field and the role of non-ideal processes in modeled IBEX ENA maps: A comparison of the BU and Moscow MHD models*, ApJ, 921, 164, doi:10.3847/1538-4357/ac1e2a, 2021.
- **Zirnstein, E. J.**, Kumar, R., Bandyopadhyay, R., Dayeh, M. A., Heerikhuisen, J., McComas,

D. J., *Turbulent Acceleration of Interstellar Pickup Ions at the Heliospheric Termination Shock Forms the Global ENA Spectrum*, ApJL, 916, L21, doi:10.3847/2041-8213/ac12cc, 2021.

- Bagenal, F., McComas, D. J., Elliott, H. A., **Zirnstein, E. J.**, McNutt Jr., R. L., Lisse, C. M., Kollmann, P., Delamere, P. A., Barnes, N. P., *Solar Wind Interaction with the Pluto System*, in *The Pluto System After New Horizons*, pp. 379-392, doi:10.2458/azu_uapress_9780816540945-ch016, 2021.
- Fuselier, S. A., Galli, A., Richardson, J. D., Reisenfeld, D. B., **Zirnstein, E. J.**, Heerikhuisen, J., Dayeh, M. A., Schwadron, N. A., McComas, D. J., Elliott, H. A., Gomez, R. G., Starkey, M. J., Kornbleuth, M. Z., Opher, M., Dialynas, K., *Energetic Neutral Atom Fluxes from the Heliosheath: Constraints from in situ Measurements and Models*, ApJL, 915, L26, doi:10.3847/2041-8213/ac0d5c, 2021.
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- Shrestha, B., L., **Zirnstein, E. J.**, Heerikhuisen, J., Zank, G. P., *Strength of the Termination Shock Inferred from the Globally Distributed Energetic Neutral Atom Flux from IBEX*, ApJS, 254, 32, doi:10.3847/1538-4365/abf659, 2021.
- McComas, D. J., Swaczyna, P., Szalay, J. R., **Zirnstein, E. J.**, Rankin, J. S., Elliott, H. A., Singer, K., Spencer, J., Stern, S. A., Weaver, H., *Interstellar Pickup Ion Observations Halfway to the Termination Shock*, ApJS, 254, 19, doi:10.3847/1538-4365/abee76, 2021.
- Swaczyna, P., Rahmanifard, F., **Zirnstein, E. J.**, McComas, D. J., Heerikhuisen, J., *Slowdown and Heating of Interstellar Neutral Helium by Elastic Collisions Beyond the Heliopause*, ApJL, 911, L36, doi:10.3847/2041-8213/abf436, 2021.
- **Zirnstein, E. J.**, Dayeh, M. A., Heerikhuisen, J., *Dependence of the IBEX Ribbon Geometry on Pitch Angle Scattering Outside the Heliopause*, ApJ, 908, 35, doi:10.3847/1538-4357/abd4e8, 2021.
- **Zirnstein, E. J.**, Dayeh, M. A., Heerikhuisen, J., McComas, D. J., Swaczyna, P., *Heliosheath Proton Distribution in the Plasma Reference Frame*, ApJS, 252, 26, doi:10.3847/1538-4365/abd092, 2021.

2020 (9 total, 4 first author)

- Swaczyna, P., McComas, D. J., **Zirnstein, E. J.**, Sokół, J. M., Elliott, H. A., Bzowski, M., Kubiak, M. A., Richardson, J. D., Kowalska-Leszczynska, I., Stern, S. A., Weaver, H. A., Olkin, C. B., Spencer, J., *Density of Neutral Hydrogen in the Sun's Interstellar Neighborhood*, ApJ, 903, 48, doi:10.3847/1538-4357/abb80a, 2020.
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- **Zirnstein, E. J.**, Heerikhuisen, J., McComas, D. J., Schwadron, N. A., *Simulating the Compton-Getting Effect for Hydrogen Flux Measurements: Implications for IBEX-Hi and -Lo Observations*, ApJ, 778, 112, doi:10.1088/0004-637X/778/2/112, 2013.
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2012 (1 total, 1 first author)

- **Zirnstein, E.**, Heerikhuisen, J., Pogorelov, N., *Numerical simulations of primary and secondary hydrogen ENA fluxes at 1 AU*, AIP Conf. Proc., 1500, 262, doi:10.1063/1.4768776, 2012.

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- **Zirnstein, E. J.**, Reisenfeld, D. B., DeMajistre, R., Janzen, P. H., *Revealing the 3D Structure of the Heliosphere through Long Baseline ENA Parallax and Tomography*, Heliophysics Decadal Survey 2024-2034.
- Swaczyna, P., Rankin, J. S., Shrestha, B. L., **Zirnstein, E. J.**, Hill, M. E., Kucharek, H., Mostafavi, P., Spitzer, S. A., Turner, D. L., *Ubiquitous Nature of Pickup Ions in the Outer Heliosphere and Beyond*, Heliophysics Decadal Survey 2024-2034.
- Mostafavi, P., Zank, G. P., Brandt, P., Burlaga, L., Chen, T., Decker, R., DeMajistre, B., Dialynas, K., Florinski, V., Hill, M. E., McNutt, R., Merkin, V. G., Opher, M., Provornikova, E., Rankin, J., Richardson, J., Roelof, E., Turner, D. L., **Zirnstein, E. J.**, Heliophysics Decadal Survey 2024-2034.
- Brandt, P. C., **Zirnstein, E. J.**, and The Interstellar Probe Study Team, *Pushing the Frontier of Solar & Space Physics: Exploration of the Heliosphere and the Very Local Interstellar Medium by an Interstellar Probe*, Heliophysics Decadal Survey 2024-2034.

HONORS & AWARDS

- NASA Group Achievement Award, Parker Solar Probe Team, 2023
- NASA Outstanding Achievement Award, Parker Solar Probe IS[⊙]IS Team, 2022

- NASA Group Achievement Award, New Horizons Team, 2016
- NASA Certificate in Recognition of the Outstanding Contribution to the IBEX Star Tracker Anomaly Diagnosis and Recovery, 2016
- College of Science Outstanding GRA Award, University of Alabama in Huntsville, 2013-2014
- NASA Earth and Space Science Fellowship in Heliophysics, 2011-2014
- Science and Engineering Scholarship, Von Braun Astronomical Society, 2010-2011
- Air, Space and Missile Defense Association (ASMDA) Loretta Spencer Scholarship, 2009

MISSION/INSTRUMENT TEAM MEMBER OR ANALYSIS EXPERIENCE

- **IBEX** – IBEX-Lo and IBEX-Hi
- **New Horizons** – Solar Wind Around Pluto (SWAP)
- **Voyager 1 and 2** – Plasma Science (PLS) and Magnetometer (MAG)
- **PSP** – Integrated Science Investigation of the Sun (IS \odot IS)
- **IMAP** –Solar Wind and Pickup Ion (SWAPI), IMAP-Lo, IMAP-Hi, IMAP-Ultra

PAST MISSION ORGANIZATION

- Coauthors IBEX Senior Review proposals
- Coauthors IBEX annual grant reports
- Coauthors IBEX annual GPRAMA reports
- Co-organizes and chairs the annual IBEX/IMAP Science Team Meetings
- SWAPI Lead Data Analyst; Rep. for SWAPI in IMAP Science Data Working Group

MISSION GUEST INVESTIGATOR

- Interstellar Mapping and Acceleration Probe (IMAP), Outer Heliosphere Guest Investigators Program (2020-2023)
- Interstellar Boundary Explorer (IBEX), Outer Heliosphere Guest Investigators Program (2020-2023)

RESEARCH GRANT SELECTIONS

- Los Alamos Laboratory Directed Research & Development: “The Boundaries of the Heliosphere” (**Co-I**, 2025-2028)
- NASA ROSES Heliophysics Supporting Research Program: “Energetic neutral atom populations at energies 0.2 to 2 keV based on IBEX-Lo and IBEX-Hi observations” (**Co-I**, 2024-2027)
- NASA ROSES Heliophysics Supporting Research Program: “Transport of Neutral Helium and Hydrogen Throughout the Heliosphere” (**Co-I**, 2023-2026)
- Los Alamos Laboratory Directed Research & Development: “Discovering the Structure and Dynamics of the Sun-Interstellar Medium System” (**Co-I**, 2021-2024)
- NASA ROSES Heliophysics Supporting Research Program: “Mapping the Heliospheric Termination Shock with IBEX Observations and Modeling” (**PI**, 2021-2025)
- NASA ROSES Outer Heliosphere Investigators Program: “Identifying the Origin of Energetic Neutral Atoms Measured by IBEX along the Voyager Directions” (**PI**, 2020-2023)
- NASA ROSES Outer Heliosphere Investigators Program: “Angular Scattering of Neutral Atoms: Observations and Interpretation from IBEX and Consequences for IMAP” (**Co-I**, 2020-2023)

- NASA ROSES Phase I DRIVE Program: “Our Heliospheric Shield” (Co-I, 2020-2021)
- NASA ROSES Heliophysics Supporting Research Program: “Helium and the Heliosphere” (Co-I, 2018-2021)
- NASA ROSES Heliophysics Supporting Research Program: “Understanding Pickup Ion Processes outside the Heliopause: Modeling and Analysis of the *IBEX* Ribbon Observables” (PI, 2017-2020)
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IN THE PRESS (main press features only)

- NASA, August 19, 2025: “We live inside a giant bubble” (<https://x.com/NASASolarSystem/status/1957804782841663708>)
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- NASA’s Voyager Spacecraft 40th Anniversary Celebration, Panel Discussion, September 5, 2017 (<https://www.nasa.gov/press-release/nasa-and-iconic-museum-honor-voyager-spacecraft-40th-anniversary>)
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- NASA Feature, Feb. 26, 2016: “NASA’s *IBEX* Observations Pin Down Interstellar Magnetic Field” (<http://www.nasa.gov/feature/goddard/2016/nasa-s-ibex-observations-pin-down-interstellar-magnetic-field>)

INVITED CONFERENCE/MEETING PRESENTATIONS

2026

- *Kelvin-Helmholtz Instability and Energetic Neutral Atoms in the Heliosphere*, Zirnstein, E. J. (SHIELD Annual Meeting, Virtual-Oral, April 2026)

2024

- *IMAP Mission Summary and Science Expectations*, Zirnstein, E. J. (SHIELD Annual Meeting, Virtual-Oral, February 2024)

2023

- *The *IBEX* Ribbon and its Relation to the Solar-Interstellar Interaction*, Zirnstein, E. J. (CRA-

2023, Oral, May 2023)

- *Oblique and Rippled Heliosphere Structures from the Interstellar Boundary Explorer*, **Zirnstein, E. J.**, Shrestha, B. L., McComas, D. J., Dayeh, M. A., Heerikhuisen, Reisenfeld, D. B., Sokół, J. M., Swaczyna, P. (Outer Heliosphere and VLISM Seminar, Oral, February 2023)
- *Oblique and Rippled Heliosphere Structures from the Interstellar Boundary Explorer*, **Zirnstein, E. J.**, Shrestha, B. L., McComas, D. J., Dayeh, M. A., Heerikhuisen, Reisenfeld, D. B., Sokół, J. M., Swaczyna, P. (NH STM, Oral, January 2023)

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- *Observations of Interstellar Pickup Ions in the Heliosphere*, **Zirnstein, E. J.**, Moebius, E., Zhang, M., Bower, J., Elliott, H. A., McComas, D. J., Pogorelov, N. V., Swaczyna, P. (NH STM, Oral, September 2022)
- *Differentiating the Ribbon and Globally Distributed ENA Flux in IBEX Observations*, **Zirnstein, E. J.** (EGU, Oral, May 2022)

2021

- *Proton Distribution in the Heliosheath: From Particle Acceleration to ENA Observation*, **Zirnstein, E. J.** (AGU, Oral, December 2021)
- *Proton Distribution in the Heliosheath: From Particle Acceleration at the Termination Shock to Energetic Neutral Atom Observation near Earth*, **Zirnstein, E. J.** (APS-DPP, Oral, November 2021)

2020

- *Insights into the Heliospheric Energetic Neutral Atom Source with Modeling*, **Zirnstein, E. J.** (AGU, Oral, December 2020)

2019

- *Pickup Ions in the Outer Heliosphere: New Horizons, Voyager, IBEX, and the Upcoming IMAP Mission*, **Zirnstein, E. J.** (AGU, Oral, December 2019)

2018

- *Pickup Ions in the Outer Heliosphere: Revelations by IBEX and the Upcoming IMAP Mission*, **Zirnstein, E. J.** (AGU, Oral, December 2018)

2017

- *IBEX Observations and Simulations of the Ribbon: Implications for the Very Local Interstellar Medium*, **Zirnstein, E. J.** (AGU, Oral, December 2017)
- *What We've Learned from IBEX ENA Imaging of the Heliosheath*, **Zirnstein, E. J.** (AGU, Oral, December 2017)

2014

- *Distinguishing Tests of the Interstellar Boundary Explorer Ribbon through Numerical Modeling: Current Results and Future Prospects*, **Zirnstein, E. J.** (AGU, Oral, December 2014)

CONFERENCE/MEETING PRESENTATIONS

2026

- *Does IMAP Observe ENA Signatures of the Kelvin-Helmholtz Instability?*, **Zirnstein, E. J.**, et al. (IMAP STTM, Oral, April 2026)

2025

- *First Observations from IMAP's Solar Wind and Pickup Ion (SWAPI) Instrument*, Rankin, J. S., ..., **Zirnstein, E. J.**, et al. (AGU, Oral, December 2025)
- *Mesoscale Characteristics of the IBEX Ribbon and Its Temporal Variations*, Noh, S., et al.,

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- *Viewing Global Changes in the Heliosheath with IMAP's Energetic Neutral Atom Imagers*, **Zirnstein, E. J.**, et al. (AGU, Poster, December 2025)
- *Dynamics of the Heliospheric Boundary Inferred from IBEX-Derived Line-of-Sight Pressures*, Cuesta, M. E., ..., **Zirnstein, E. J.**, et al. (AGU, Poster, December 2025)
- *A New Global Heliosphere Model with Pickup Ion and ENA Production and Transport*, Guo, F., ..., **Zirnstein, E. J.**, et al. (AGU, Poster, December 2025)
- *Energetic Neutral Helium and Hydrogen Atom Fluxes from a Data-Driven MHD/Kinetic Model with Pickup He⁺ and H⁺ Ions*, Fraternali, F., et al., **Zirnstein, E. J.** (AGU, Poster, December 2025)
- *IMAP's Role in Understanding Particle Injection and Energization Throughout the Heliosphere*, Cohen, C., et al., **Zirnstein, E. J.** (AGU, Oral, December 2025)
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- *A Forward Modeling Approach to Compton-Getting Corrections for IBEX Measurements*, Farooki, H., ..., **Zirnstein, E. J.**, et al. (AGU, Poster, December 2025)
- *Exploring the Outer Heliosphere through ENA observations from IMAP*, Reisenfeld, D. B., et al., **Zirnstein, E. J.** (AGU, Oral, December 2025)

2024

- *A Numerical Model for Understanding the Pickup Ion Dynamics Outside the Heliopause and IBEX Ribbon Observations*, Huang, Y., Guo, F., **Zirnstein, E.**, et al. (AGU, Poster, December 2024)
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- *Evolving Outer Heliosphere: Tracking Solar Wind Transients from 1 au to the VLISM with IBEX and Voyager 1*, **Zirnstein, E.**, Kim, T. K., Rankin, J. S., et al. (AGU, Poster, December 2024)
- *Interstellar Helium Distributions at 1 au from Global Simulations and Implications for IMAP*, Heerikhuisen, J., Shrestha, B., Swaczyna, P., **Zirnstein, E.** (AGU, Poster, December 2024)
- *Anomalous Behavior of Solar Wind at Distant Interplanetary Shocks*, Shrestha, B. L., **Zirnstein, E.**, McComas, D. J. (AGU, Oral, December 2024)
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- *A Study of Changes in Heliosheath Properties Using IBEX*, Walia, N. K., Reisenfeld, D. B., VanDervort, L., et al., **Zirnstein, E.** (AGU, Oral, December 2024)
- *Theseus: Progress of an Advanced Method for Rendering ENA Sky Maps*, Janzen, P. H., Osthus, D., Reisenfeld, D. B., Weaver, B. P., **Zirnstein, E.** (AGU, Poster, December 2024)

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- *An Investigation of the Evolution of Heliosheath Energetics Using ENA Measurements from IBEX*, Walia, N. K., Reisenfeld, D. B., VanDervort, L., et al., **Zirnstein, E.** (AGU, eLightning Oral, December 2023)
- *A Numerical Model for Understanding the Pickup Ion Dynamics Outside the Heliopause and IBEX “Ribbon” Observation*, Huang, Y., Guo, F., **Zirnstein, E.**, et al. (AGU, eLightning Oral, December 2023)
- *Stability of a Pickup-Ion Ring-beam Population in the Outer Heliosheath*, Guo, F., Huang, Y., Noh, S., et al., **Zirnstein, E.** (AGU, Poster, December 2023)
- *Constraining Interstellar Conditions around the Heliosphere Using IBEX Observations of Interstellar Neutral Helium and Global Heliosphere Modeling*, Swaczyna, P., Bzowski, M., Heerikhuisen, J., et al., **Zirnstein, E.** (AGU, eLightning Oral, December 2023)
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2022

- *Oblique and Rippled Heliosphere Structures from the Interstellar Boundary Explorer*, **Zirnstein, E. J.**, Shrestha, B. L., McComas, D. J., Dayeh, M. A., Heerikhuisen, Reisenfeld, D. B., Sokół, J. M., Swaczyna, P. (AGU, Oral, December 2022)
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- *Turbulence and Waves in the Heliosphere-Interstellar Medium Interaction Regions and Implications for the IBEX Ribbon*, Guo, F., Li, H., **Zirnstein, E. J.**, Huang, Y., Reisenfeld, D. B. (AGU, Oral, December 2022)
- *A Numerical Model for Understanding Pickup-Ion Dynamics in the Outer Heliosphere and IBEX Observations of the ENA Ribbon* (AGU, Poster, December 2022)
- *Water-group ions from Europa and Ganymede: A window into surface ice evolution*, Szalay, J. R., Allegrini, F., Bagenal, F., Bolton, S. J., Mogan, S. C., Delamere, P. A., Ebert, R. W., Fatemi, S., McComas, D. J., Nenon, Q., Poppe, A. R., Sarkango, Y., Smith, H. T., Valek, P. W., Vance, S., Vorburger, A., Wilson, R. J., Wurz, P., **Zirnstein, E. J.** (AGU, Oral, December 2022)
- *The Evolution of Polar Coronal Holes Observed by IBEX*, Shrestha, B. L., **Zirnstein, E. J.**, McComas, D. J., Szalay, J. R. (AGU, Poster, December 2022)
- *High-resolution Heliosphere Boundary Structures from IBEX*, **Zirnstein, E. J.**, Shrestha, B. L., McComas, D. J., Dayeh, M. A., Heerikhuisen, Reisenfeld, D. B., Sokół, J. M., Swaczyna,

P. (IBEX/IMAP STM, Oral, June 2022)

- *Explaining the Origin of IBEX ENA Observations with a Dynamic Heliosphere Model*, **Zirnstein, E. J.**, Dayeh, M. A., Rankin, J. S., McComas, D. J., Swaczyna, P. (IBEX/IMAP STM, Oral, June 2022)

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- *A comparison of heliotail configurations arising from different treatments of non-ideal MHD effects with ENA maps at IBEX energies*, Kornbleuth, M. Z., Opher, M., Baliukin, I., Dayeh, M., **Zirnstein, E. J.**, Gkioulidou, M., Dialynas, K., Galli, A., Richardson, J. D., Izmodenov, V., Zank, G. P., Fuselier, S. A., Michael, A., Toth, G., Tenishev, V., Alexashov, D., Drake, J. F. (AGU, Oral, December 2021)
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- *Complete Solar Cycle Observations of Interstellar Neutral Helium with IBEX: Consequences of Modulation in Heliospheric Boundaries*, Swaczyna, P., Bower, J., Bzowski, M. A., Fuselier, S. A., Galli, A., Heerikhuisen, J., Heirtzler, D., Kubiak, M. A., McComas, D. J., Moebius, E., Rahmanifard, F., Schwadron, N., **Zirnstein, E. J.** (AGU, Oral, December 2021)
- *Whence the Interstellar Magnetic Field Shaping the Heliosphere*, Frisch, P. C., Piirola, V., Berdyugin, A., Heiles, C., Cole, A., Hill, K., Magalhaes, A. M., Wiktorowicz, S., Cotton, D., Bailey, J., Kedziora-Chudczer, L., Schwadron, N., Bzowski, M. A., McComas, D. J., **Zirnstein, E. J.**, Funsten, H. O., Harlinton, C. (AGU, Oral, December 2021)
- *Breathing of the Heliosphere*, Sokol, J. M., Dayeh, M., Fuselier, S. A., Nicolaou, G., McComas, D. J., **Zirnstein, E. J.** (AGU, Oral, December 2021)
- *Pickup Ion Spectrum Downstream of the Termination Shock Inferred from IBEX ENA observations and Comparison with Kinetic Simulations*, Shrestha, B. L., Zank, G. P., **Zirnstein, E. J.**, Heerikhuisen, J., Giacalone, J., McComas, D. J. (AGU, Oral, December 2021)
- *A Three-Dimensional Map of the Heliosphere from IBEX*, Reisenfeld, D. B., Bzowski, M. A., Funsten, H. O., Heerikhuisen, J., Janzen, P. H., Kubiak, M. A., McComas, D. J., Schwadron, N., Sokol, J. M., Zimorino, A., **Zirnstein E. J.** (AGU, Poster, December 2021)
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- *Higher-resolution IBEX-Hi Sky Maps*, Janzen, P. H., Maldonado, C., Osthus, D., Reisenfeld, D. B., Weaver, B. P., **Zirnstein, E. J.** (AGU, Poster, December 2021)
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- *Factors Influencing a Model Heliosphere*, Heerikhuisen, J., Pogorelov, N. V., **Zirnstein, E. J.**, Swaczyna, P., Fraternali, F. (AGU, Poster, December 2021)
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- *The Role of Pickup Ion Dynamics Outside of the Heliopause in the Limit of Weak Pitch Angle Scattering: Implications for the Source of the IBEX Ribbon*, **Zirnstein, E. J.** (AIAC, Oral, March 2018)
- *Diagnosing the Local Interstellar Medium Using the Warm Breeze and IBEX Ribbon*, Bzowski, M., Kubiak, M. A., Heerikhuisen, J., Czechowski, A., Grygorczuk, J., Swaczyna, P., **Zirnstein, E.**, Sokół, J. M. (AIAC, Oral, March 2018)
- *Exploring IBEX Observations through Global Simulations*, **Zirnstein, E. J.**, Dayeh, M. A., Funsten, H. O., Heerikhuisen, J., McComas, D. J., Pogorelov, N. V., Reisenfeld, D. B., Schwadron, N. A., Zank, G. P. (Voyager/NH STM, Oral, January 2018)

- *Spectral Properties of ENAs in the Presence of Multiple PUI Populations*, Shrestha, B. L., Heerikhuisen, J., **Zirnstein, E.** (AGU, Poster, December 2017)
- *Reduced Solar Wind Speeds at New Horizons Beyond 30 AU*, Elliott, H. A., McComas, D. J., **Zirnstein, E.**, Delamere, P. A., Bagenal, F., Stern, A., Weaver, H. A. Jr., Young, L. A., Ennico, K., Olkin C., and New Horizons Plasma and Particles Theme Team (AGU, Poster, December 2017)
- *Observational Evidence for The Comet-Like Heliosphere*, Bzowski, M., Czechowski, A., Funsten, H. O., Grygorczuk, J., Heerikhuisen, J., Kubiak, M. A., Moebius, E., McComas, D. J., Schwadron, N., Sokół, J. M., Swaczyna, P., **Zirnstein, E.** (AGU, Oral, December 2017)
- *Spatial, temporal, and circularity variations of the ENA ribbon over seven years of IBEX observations*, Dayeh, M. A., **Zirnstein, E.**, Funsten, H. O., Fuselier, S. A., McComas, D. J., Schwadron, N. A., Szalay, J. R. (AGU, Poster, December 2017)
- *How does the presence of suprathermal protons impact the heliosheath on global scales?*, Heerikhuisen, J., **Zirnstein, E.**, Zank, G. P., Pogorelov, N. V., Desai, M. I. (AGU, Poster, December 2017)
- *Observations of the Very Local Interstellar Medium with the IBEX and Voyager Spacecraft*, **Zirnstein, E. J.** (TeVPA, Oral, August 2017)
- *Imprint of the Sun's Evolving Polar Winds on IBEX ENA All-Sky Maps*, **Zirnstein, E. J.**, Dayeh, M. A., McComas, D. J., Sokół, J. M. (IBEX STM, Oral, June 2017)
- *Structure of the Heliotail from IBEX Observations: Implications for the 11 Year Solar Cycle and Pickup Ions in the Heliosheath*, **Zirnstein, E. J.**, Heerikhuisen, J., Zank, G. P., Pogorelov, N. V., Funsten, H. O., McComas, D. J., Reisenfeld, D. B., Schwadron, N. A. (AIAC, Oral, March 2017)

2016

- *Multi-Fluid MHD study of the solar wind interaction with Pluto*, Dong, C., Ma, Y., McComas, D. J., Bhattacharjee, A., **Zirnstein, E.**, Toth, G., Luhmann, J. G., Wang, L. (AGU, Poster, December 2016)
- *Structure and Dynamics of the IBEX Ribbon of Enhanced ENA Emission: The Role of ENA Transport in the Interstellar Medium*, Funsten, H. O., Demajistre, R., Fernandes, P. A., Frisch, P. C., Heerikhuisen, J., Janzen, P. H., McComas, D. J., Pittman, K. T., Reisenfeld, D. B., Schwadron, N., Theiler, J. P., **Zirnstein, E.**, Larsen, B. (AGU, December 2016)
- *Neutral atom distributions in the direction of the ribbon from global simulations*, Heerikhuisen, J., Gamayunov, K. V., **Zirnstein, E.**, Pogorelov, N. (AGU, December 2016)
- *Structure of the Heliotail from Interstellar Boundary Explorer (IBEX) Observations: Implications for the 11 Year Solar Cycle and Pickup Ions in the Heliosheath*, **Zirnstein, E.**, Heerikhuisen, J., Zank, G. P., Pogorelov, N., Funsten, H. O., McComas, D. J., Reisenfeld, D. B., Schwadron, N. (AGU, Poster, December 2016)
- *Evolution of heliospheric energetic neutral atom emissions over seven years of IBEX observations*, Dayeh, M. A., Desai, M. I., Fuselier, S. A., Heerikhuisen, J., McComas, D. J., Schwadron, N., Szalay, J., **Zirnstein, E.** (AGU, December 2016)
- *Structure and Characteristics of the Heliotail from ENAs*, **Zirnstein, E. J.**, Funsten, H. O., Heerikhuisen, J., McComas, D. J., Pogorelov, N. V., Reisenfeld, D. B., Schwadron, N. A., Zank, G. P. (IBEX STM, Oral, August 2016)
- *Local Interstellar Magnetic Field Determined from the IBEX Ribbon*, **Zirnstein, E. J.**, Heerikhuisen, J., Funsten, H. O., Livadiotis, G., McComas, D. J., Pogorelov, N. V. (AIAC,

Oral, April 2016)

2015

- *Observational Constraints on a Pluto Torus of Circumsolar Neutral Gas*, Hill, M. E., Kollmann, P., McNutt, R. L., Jr., Smith, H. T., Bagenal, F., Brown, L. E., Elliott, H. A., Haggerty, D. K., Horanyi, M., Krimigis, S. M., Kusterer, M. B., Lisse, C. M., McComas, D. J., Piquette, M. R., Sidrow, E. J., Strobel, D. F., Szalay, J., Vandegriff, J. D., **Zirnstein, E.**, Ennico Smith, K., Olkin, C.; Weaver, H. A., Jr., Young, L. A., Stern, S. A. (AGU, December 2015)
- *Escape of Pluto's Atmosphere: In Situ Measurements from New Horizons and Remote Observations from Chandra*, McNutt, R. L., Jr., Hill, M. E., Kollmann, P., Krimigis, S. M., Brown, L. E., Kusterer, M. B., Lisse, C. M., Mitchell, D. G., Vandegriff, J. D., McComas, D. J., Bagenal, F., Elliott, H. A., Ennico Smith, K., Horanyi, M., Olkin, C., Piquette, M. R., Stern, A., Strobel, D. F., Szalay, J., Valek, P. W., Weaver, H. A., Jr., Weidner, S., Young, L. A., **Zirnstein, E.**, Wolk, S. J. (AGU, December 2015)
- *Energetic Particles in the far and near Environment of Pluto*, Kollmann, P., Hill, M. E., McNutt, R. L., Jr., Brown, L. E., Kusterer, M. B., Vandegriff, J. D., Smith, H. T., Mitchell, D. G., Haggerty, D. K., Bagenal, F., Krimigis, S. M., Lisse, C. M., Delamere, P. A., Elliott, H. A., Horanyi, M., McComas, D. J., Piquette, M. R., Poppe, A. R., Sidrow, E. J., Strobel, D. F., Szalay, J., Valek, P. W., Weidner, S., **Zirnstein, E.**, Ennico Smith, K., Olkin, C., Weaver, H. A., Jr., Young, L. A., Stern, A. (AGU, December 2015)
- *Properties of ENA Source Regions Outside the Heliopause*, Heerikhuisen, J., **Zirnstein, E.**, Gamayunov, K. V., Pogorelov, N., Funsten, H. O., Florinski, V., Ernst, A. E. (AGU, December 2015)
- *The Local Interstellar Magnetic Field Determined from the IBEX Ribbon*, **Zirnstein, E.**, Funsten, H. O., Heerikhuisen, J., Livadiotis, G., McComas, D. J., Pogorelov, N. V. (AGU, December 2015)
- *Spectral Modulation of the IBEX Ribbon Flux by the Dynamic Draping of the Interstellar Medium over the Heliosphere*, Funsten, H. O., Pittman, K. T., Frisch, P. C., Heerikhuisen, J., Janzen, P. H., McComas, D. J., Reisenfeld, D. B., Schwadron, N., **Zirnstein, E.** (AGU, December 2015)
- *Pluto, Near and Far: PEPSSI Measurements of Energetic Particles During the New Horizons Flyby and Investigating a Pluto Torus of Circumsolar Neutral Gas*, Hill, M. E., Kollmann, P., McNutt, R. L., Smith, H. T., Bagenal, F., Brown, L. E., Elliott, H. A., Haggerty, D. K., Horanyi, M., Krimigis, S. M., Kusterer, M., Lisse, C. M., McComas, D. J., Piquette, M., Strobel, D., Szalay, J., Vandegriff, J., **Zirnstein, E.**, Ennico, K., Olkin, C. B., Weaver, H. A., Young, L. A., Stern, S. A. (DPS, November 2015)
- *First Results on Pluto's Energetic Particle Environment from the PEPSSI Instrument*, Kollmann, P., Hill, M. E., McNutt, R., Smith, H. T., Vandegriff, J., Kusterer, M., Brown, L., Haggerty, D. K., Lisse, C. M., Elliott, H. A., Strobel, D., Bagenal, F., Sidrow, E., McComas, D. J., Horanyi, M., **Zirnstein, E.**, Krimigis, S. M., Ennico, K., Young, L. A., Weaver, H. A., Olkin, C. B., Stern, S. A. (DPS, November 2015)
- *The Local Interstellar Magnetic Field Determined from the IBEX Ribbon*, **Zirnstein, E. J.**, McComas, D. J., Livadiotis, G., Heerikhuisen, J., Pogorelov, N. V., Funsten, H. O. (IBEX SWT, Oral, August 2015)
- *The Effects of Slow, Intermediate, and Fast SW Speeds on the IBEX Ribbon*, **Zirnstein, E. J.**, Funsten, H. O., Heerikhuisen, J., McComas, D. J. (AIAC, March 2015)

2014

- *How Do κ -Distributed Protons in the Heliosheath Affect Energetic Neutral Atoms*, Heerikhuisen, J., **Zirnstein, E. J.**, Pogorelov, N. V. (AGU, December 2014)
- *Simulating a Dynamic Solar Cycle and Its Effects on the Interstellar Boundary Explorer Ribbon*, **Zirnstein, E. J.**, Heerikhuisen, J., Pogorelov, N. V., McComas, D. J., Dayeh, M. A. (AGU, Poster, December 2014)
- *Heliospheric Structure: The Bow Wave and the Hydrogen Wall*, Zank, G. P., Heerikhuisen, J., Wood, B. E., Pogorelov, N. V., **Zirnstein, E.**, McComas, D. J. (ASPC, May 2014)
- *Global Properties of the Heliospheric Termination Shock as inferred from Energetic Neutral Atoms measured by the Interstellar Boundary Explorer (IBEX)*, Desai, M., Heerikhuisen, J., McComas, D., Pogorelov, N., Zank, G., Dayeh, M., Schwadron, N., Allegrini, F., **Zirnstein, E.** (COSPAR, Oral, August 2014)
- *Latest Modeling Results from the Alabama Group*, **Zirnstein, E. J.**, Heerikhuisen, J., Pogorelov, N. V., Zank, G. P. (IBEX SWT, Oral, August 2014)
- *A Time-Dependent Simulation of the IBEX Ribbon Flux*, **Zirnstein, E. J.**, Heerikhuisen, J., Pogorelov, N. V. (AIAC, Oral, March 2014)

2013

- *Spectral properties of ~ 0.03 -6 keV Energetic Neutral Atoms Measured by the Interstellar Boundary Explorer (IBEX) Along the Lines-of-Sight of Voyager*, Desai, M. I., Allegrini, F., Dayeh, M. A., Funsten, H. O., Heerikhuisen, J., McComas, D. J., Pogorelov, N. V., Schwadron, N. A., Fuselier, S. A., Zank, G. P., **Zirnstein, E. J.** (AGU, Oral, December 2013)
- *Spectral Properties of Energetic Neutral Atoms Measured by the Interstellar Boundary Explorer (IBEX) Along the Lines-of-Sight of Voyager*, Desai, M.; McComas, D., Fuselier, S., Dayeh, M., Funsten, H., Heerikhuisen, J., **Zirnstein, E.**, Pogorelov, N., Zank, G. (EGU, Oral, April 2013)
- *Numerical Simulations of the Compton-Getting Effect for H ENAs*, **Zirnstein E. J.**, Heerikhuisen, J. (IBEX SWT, Oral, March 2013)

2012

- *Global Modeling of the Heliosphere and the IBEX Ribbon*, Heerikhuisen, J., **Zirnstein, E. J.**, Pogorelov, N. V., Zank, G. P. (AGU, Poster, December 2012)
- *Numerical Simulations of Primary and Secondary Hydrogen ENA Fluxes at 1 AU*, **Zirnstein, E. J.**, Heerikhuisen, J., Pogorelov, N. V. (AGU, Poster, December 2012)
- *Numerical Simulations of Primary and Secondary Hydrogen ENA Fluxes at 1 AU*, **Zirnstein, E. J.**, Heerikhuisen, J., Pogorelov, N. V. (AIAC, Oral, March 2012)

2011

- *Numerical simulations of hydrogen ENAs from 1 AU to the heliopause*, **Zirnstein, E. J.**, Heerikhuisen, J., Pogorelov, N. V. (AGU, Poster, December 2011)

2010

- *Simulations of Energetic Neutral Hydrogen Within the Heliosphere: Creation, Transport, and Loss*, **Zirnstein, E. J.**, Heerikhuisen, J., Pogorelov, N. V. (AGU, Poster, December 2010)

STUDENT ADVISORY

- Ph.D. Committee Member for Graduate Student Bishwas Lal Shrestha, University of Alabama in Huntsville, Spring 2019-Summer 2021
- Ph.D. Senior Thesis Co-Advisor for Graduate Student Tyler Eddy, Princeton University,

Spring 2020

- USRP Mentor for Undergraduate Student Ariella Katz, Princeton University, Summer 2025
- Junior Paper Advisor for Undergraduate Student Ariella Katz, Princeton University, Fall 2025

COMMITTEES

- Serving member of NASA's Heliophysics Advisory Committee (HPAC), 2023-2024
 - November 14-16, 2023, NASA Headquarters, Washington, DC
 - February 12-13, 2024, NASA Headquarters, Washington, DC (remote)
 - June 17-18, 2024, NASA Headquarters, Washington, DC
 - October 22-24, 2024, NASA Headquarters, Washington, DC

PROPOSAL PANELS

- NSF SHINE Geospace Program, Primary, January 2024
- NASA Postdoctoral Program, Heliophysics and Astrophysics, Primary, Fall 2023
- NASA Postdoctoral Program, Heliophysics and Astrophysics, Primary, Spring 2023
- NASA Postdoctoral Program, Heliophysics and Astrophysics, Primary, Fall 2022

SEMINARS & COLLOQUIA

2025

- *Formation of H⁺ PUI Tails Downstream of Distant Interplanetary Shocks*, **Zirnstein, E. J.** (New Horizons Heliophysics Team Meeting, Virtual, July 2025)
- *Evolving Outer Heliosphere: Tracking Solar Wind Transients from 1 au to the VLISM with IBEX and Voyager 1*, **Zirnstein, E. J.** (Outer Heliosphere and VLISM Seminar Series, Virtual, February 2025)

2023

- *Modeling IMAP-Lo, IMAP-Hi, and IMAP-Ultra ENA Measurements*, **Zirnstein, E. J.** (LANL Theory Group, Oral, November 2023)

2022

- *Observations of Interstellar Pickup Ions in the Heliosphere*, **Zirnstein, E. J.** (Space Sciences Lab, UC Berkeley, October 2022)

2017

- *IBEX Observations and Simulations of Energetic Neutral Hydrogen from the Heliosphere*, **Zirnstein, E. J.** (Los Alamos National Lab, Theory Seminar, August 2017)

2016

- *IBEX Observations and Simulations of Energetic Neutral Hydrogen from the Heliosphere*, **Zirnstein, E. J.** (Princeton University, Astroplasmas Seminar, December 2016)

2015

- *The IBEX Ribbon and the Local Interstellar Magnetic Field*, **Zirnstein, E. J.** (Southwest Research Institute, Space Science Seminar, June 2015)

2014

- *Simulating Hydrogen Energetic Neutral Atom Flux Measurements for NASA's IBEX Mission*, **Zirnstein, E. J.** (Los Alamos National Lab, Theory Seminar, June 2014)
- *Interpretation of Hydrogen Energetic Neutral Atom Emission Observed by NASA's IBEX Mission*, **Zirnstein, E. J.** (Southwest Research Institute, Space Science Seminar, August 2014)

WORKSHOPS

2025

- *Global ENA Mapping and Methods*, **Zirnstein, E. J.** (International Space Science Institute, “Physical Processes and Drivers of Particle Acceleration in the Heliospheric Tail as Seen Through ENAs and Interstellar Lyman- α Absorption”, Team Workshop, June 2025)
- *IMAP ENA Imagers’ Capabilities and Simulations*, **Zirnstein, E. J.** (International Space Science Institute, “Physical Processes and Drivers of Particle Acceleration in the Heliospheric Tail as Seen Through ENAs and Interstellar Lyman- α Absorption”, Team Workshop, June 2025)

2021

- *Role of Pickup Ions in the Outer Heliosphere – Shock Modification*, **Zirnstein, E. J.** (Outer Heliosphere Workshop, Boulder, CO, July 2021)
- *Topical Questions for “Low Energy ENA” Science (<10 keV)*, **Zirnstein, E. J.** (Heliophysics 2050 Workshop, “Outer Heliosphere and Local Interstellar Medium” Session, May 2021)
- *Pickup Ions and Energetic Neutrals: New Horizons’ SWAP and IBEX (and then IMAP)*, **Zirnstein, E. J.** (International Space Science Institute, “The Heliosphere in the Local Interstellar Medium 2.020”, Team Workshop, February 2021)

2018

- *Modeling the IBEX Ribbon in the 3D Heliosphere: An Update*, **Zirnstein, E. J.** (International Space Science Institute, “The Physics of the Very Local Interstellar Medium and its Interaction with the Heliosphere”, Team Workshop, September 2018)

2017

- *IBEX Observations and Simulations of the Ribbon: Implications for the VLISM*, **Zirnstein, E. J.** (International Space Science Institute, “The Physics of the Very Local Interstellar Medium and its Interaction with the Heliosphere”, Team Workshop, May 2017)

JOURNAL/PROPOSAL REVIEWER

- *The Astrophysical Journal, The Astrophysical Journal Letters, The Astrophysical Journal Supplement Series, Nature Astronomy, Space Science Reviews, Monthly Notices of the Royal Astronomical Society, Journal of Geophysical Research, Geoscience Letters, Journal of Physics: Conference Series*
- *NASA ROSES – Heliophysics, NASA NESSF – Heliophysics, NASA PP – Heliophysics, Astrophysics, NSF SHINE – Geospace*

MEMBERSHIPS

American Geophysical Union (AGU), American Physical Society (APS) Division of Plasma Physics (DPP), European Geosciences Union (EGU), Sigma Pi Sigma Physics Honor Society (SPS)