Cassandra Lochhaas

Postdoctoral Scholar
Space Telescope Science Institute
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Education

PhD in Astronomy 2019 — The Ohio State University, Columbus, OH
Master's of Astronomy 2016 — The Ohio State University, Columbus, OH
Bachelor of Science in Physics 2013 — California Institute of Technology, Pasadena, CA

Research Interests and Experience

Analytic and computational theory of the circumgalactic medium and galaxy evolution, baryon cycle, galactic accretion modes, galactic winds, and star formation feedback

Postdoctoral Scholar at Space Telescope Science Institute — September 2019 - present
Led research projects and collaborated with others in the FOGGIE group (PI Molly S. Peeples, Co-Is Jason Tumlinson & Brian W. O'Shea) on circumgalactic medium and galaxy evolution studies

PhD student at The Ohio State University — August 2013 - July 2019
Led several research projects on galactic winds, stellar feedback, the circumgalactic medium, and Lyα forest large scale structure with Todd A. Thompson, David H. Weinberg, and Smita Mathur

Kavli Summer Program in Astrophysics Student Fellow at Flatiron Institute — June - August 2018
Led research project on idealized simulations of circumgalactic medium with Greg Bryan

Successful Proposals and Grants

Hubble Space Telescope Archive Research Theory Cycle 28 #16140 — January 2021
PI: Cassandra Lochhaas
"What Holds up the CGM?"
$137,400, 2 years, 9.375 million CPU-hours on NASA Pleiades computer ($146,875)
Co-Is: Molly S. Peeples, Jason Tumlinson, Brian W. O'Shea, Yong Zheng

First Author Publications

1. Cassandra Lochhaas, Jason Tumlinson, Molly S. Peeples, Brian W. O'Shea, et al., "Figuring Out Gas & Galaxies In Enzo (FOGGIE) VI: The Circumgalactic Medium of $L^\star$ Galaxies is Supported in an Emergent, Non-Hydrostatic Equilibrium", 2022, submitted to ApJ, arXiv:2206.09925

2. Cassandra Lochhaas, Jason Tumlinson, Brian W. O'Shea, Molly S. Peeples, et al., "Figuring Out Gas & Galaxies In Enzo (FOGGIE) V: The Virial Temperature Does Not Describe Gas in a Virialized Galaxy Halo", 2021, ApJ, 922, 121

3. Cassandra Lochhaas, Todd A. Thompson, & Evan E. Schneider, "The Characteristic Momentum of Radiatively Cooling Energy-Driven Galactic Winds", 2021, MNRAS, 504, 3412

4. Cassandra Lochhaas, Greg L. Bryan, Yuan Li, et al., "Properties of the Simulated Circumgalactic Medium." 2020, MNRAS 493, 1461

5. Cassandra Lochhaas, Smita Mathur, Stephan Frank, et al., "A High Signal-to-Noise HST Spectrum Toward J1009+0713: Precise Absorption Measurements and the Origin of O VI." 2019, MNRAS 489, 78

6. Cassandra Lochhaas, Todd A. Thompson, Eliot Quataert, et al., "Fast Winds Drive Slow Shells: A Model for the CGM as Galactic Wind-Driven Shells." 2018, MNRAS, 481, 1873

7. Cassandra Lochhaas & Todd A. Thompson, "Second Generation Stars in Globular Clusters from Rapid Radiative Cooling of Pre-Supernova Massive Star Winds." 2017, MNRAS, 470, 977

8. Cassandra Lochhaas, David H. Weinberg, Sébastien Peirani, et al. "Modeling Lyman-α Forest Cross-Correlations with LyMAS." 2016, MNRAS, 461, 4353

Substantial Contribution Publications

1. Raymond C. Simons, Molly S. Peeples, Jason Tumlinson, et al., "Figuring Out Gas & Galaxies In Enzo (FOGGIE). IV. The Stochasticity of Ram Pressure Stripping in Galactic Halos", 2020, ApJ 905, 167

2. Yong Zheng, Molly S. Peeples, Brian W. O'Shea, et al., "Figuring Out Gas & Galaxies In Enzo (FOGGIE). III. The Mocky Way: Investigating Biases in Observing the Milky Way's Circumgalactic Medium", 2020, ApJ 896, 143

3. Yuan Li, Marie-Lou Gendron-Marsolais, Irina Zhuravleva, et al., "Direct Detection of Black Hole-driven Turbulence in the Centers of Galaxy Clusters", 2020, ApJL 889, 1

Other Publications

1. Keith Horne, G. De Rosa, B. M. Peterson, et al., "Space Telescope and Optical Reverberation Mapping Project. IX. Velocity-Delay Maps for Broad Emission Lines in NGC 5548", 2021, ApJ 907, 76

2. Williams, P. R., Pancoast, A., Treu, T., et al., "Space Telescope and Optical Reverberation Mapping Project. XII. Broad-Line Region Modeling of NGC 5548", 2020, ApJ 902, 74

3. G. A. Kriss, G. De Rosa, J. Ely, et al., "Space Telescope and Optical Reverberation Mapping Project. VIII. Time Variability of Emission and Absorption in NGC 5548 Based on Modeling the Ultraviolet Spectrum", 2019, ApJ 881, 153

4. G. De Rosa, M. M. Fausnaugh, C. J. Grier, et al., "Velocity-resolved Reverberation Mapping of Five Bright Seyfert 1 Galaxies." 2018, ApJ 866, 133

5. M. M. Fausnaugh, D. A. Starkey, Keith Horne, et al., "Continuum Reverberation Mapping of the Accretion Disks in Two Seyfert 1 Galaxies." 2018, ApJ, 854, 107

6. M. M. Fausnaugh, C. J. Grier, M. C. Bentz, et al., "Reverberation Mapping of Optical Emission Lines in Five Active Galaxies." 2017, ApJ, 840, 97

7. L. Pei, M. M. Fausnaugh, A. J. Barth, et al., "Space Telescope and Optical Reverberation Mapping Project. V. Optical Spectroscopic Campaign and Emission-line Analysis for NGC 5548." 2017, ApJ, 837, 131

Invited Talks

"How well do equilibrium theories characterize the CGM?" February 21, 2023
Oases in the Cosmic Desert: Understanding the Structure of the Circumgalactic Medium conference
Arizona State University, Tempe, AZ

"Impact of CGM Kinematics of Galaxy Evolution" November 3, 2022
Astronomy Colloquium

University of Wisconsin Madison, Madison, WI

"How CGM Kinematics Affect More Than You Think" March 22, 2022
Arthur M. Wolfe Symposium 2022
University of Santa Cruz, Santa Cruz, CA

"Structure of the Circumgalactic Medium in High-Resolution Cosmological Simulations" December 10, 2021
Astronomy Seminar
University of Pittsburgh/Carnegie Mellon University, Pittsburg, PA

"Structure of the Circumgalactic Medium in High-Resolution Cosmological Simulations" December 8, 2021
Astronomy Seminar
Michigan State University, East Lansing, MI

"Impact of Galactic Winds on Circumgalactic Medium Structure" August 20, 2021
Baltimore Winds Workshop
Johns Hopkins University, Baltimore, MD

"Using Simulations to Understand the Structure of the Circumgalactic Medium" October 13, 2020
Astrophysics Seminar
University of Notre Dame, Notre Dame, IN

"Thermal and Kinetic Properties of the Simulated Circumgalactic Medium" June 24, 2020
The Circumgalactic Medium Around Galaxies: When Baryons Invest Halos (virtual meeting)
Institut d'Astrophysique de Paris, Paris, France

"Multiphase CGM: Fast Winds, Slow Shells" November 7, 2019
Cosmic Turbulence and Magnetic Fields: Physics of Baryonic Matter Across Time and Scales
Institut d'Etudes Scientifiques de Cargèse, Corsica, France

Contributed Talks

"Tracking the Fuel for Galaxy Growth" November 14-17, 2022
Supercomputing 2022 conference, NASA Exhibit
Dallas, TX

"Impact of CGM Kinematics on Hot and Cold Mode Accretion" September 15, 2022
What Matter(s) Around Galaxies conference 2022
Champoluc, Italy

"Structure of the Circumgalactic Medium in High-Resolution Cosmological Simulations" March 1, 2022
Discovery Seminar Series
Space Telescope Science Institute, Baltimore, MD

"Using Simulations to Understand the Structure of the Circumgalactic Medium" June 16, 2021
HotSci Colloquium Series
Space Telescope Science Institute, Baltimore, MD

Fellowships and Honors

American Astronomical Society Rodger Doxsey Travel Prize January 2019
American Astronomical Society 233rd Meeting, Seattle, WA

Ann S. Tuttle Citizenship, Engagement, and Outreach Prize — December 2018
The Ohio State University, Columbus, OH

Presidential Fellow, The Ohio State University — August 2018-July 2019
The Ohio State University, Columbus, OH

Student Fellow, Kavli Summer Program in Astrophysics — June 2018-August 2018
Flatiron Institute, New York City, NY

Graduate Student Fellow, The Ohio State University — September 2013-August 2014
The Ohio State University, Columbus, OH

Robert L. Blinkenberg SURF Fellow — Summers 2011, 2012
California Institute of Technology, Pasadena, CA

Outreach, Teaching, and Mentoring Experience

Co-mentor for Space Astronomy Summer Program, Space Telescope Science Institute — June-August 2022

- Was designated point-of-contact when primary mentor was unavailable
- Helped undergraduate student with interpretation and presentation of results

Mentor for Space Astronomy Summer Program, Space Telescope Science Institute — June-August 2021

- Developed a project for an undergraduate student to investigate the spread of CGM metallicity and inward and outward metal mass fluxes through the CGM using cosmological zoom-in simulations
- Mentored student through project with minimum twice-weekly meetings, including background on the field, how to read in and analyze simulation data, produce and interpret scientific plots
- Coached student through final presentation and interpreting main results: hotter CGM gas has higher average and spread of metallicity, and metal mass primarily flows through and out of CGM without being retained

Planetarium TA, The Ohio State University — May 2015-May 2017

- Scheduled planetarium shows, trained volunteers, produced software documention and show scripts
- Presented a total of 89 shows for the public, private field trip groups, and college classes
- Developed new content, including an all-new full-length production, "Pluto: The Distant, Icy World"

TA for introductory-level astronomy courses, The Ohio State University — Spring 2015

- Developed problems for homework sets, generated exams, quizzes, and study guides, graded all student work, held review sessions and office hours