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BREN E. BACKHAUS

Post-Doctoral Researcher **University of Kansas**

SUMMARY

Research: Emission-Line Galaxies, Galaxy Evolution, Active Galactic Nuclei, Broad-Line AGN, High-Redshift Galaxies, Spatially-Resolved Galaxies

Techniques: UV/Optical/Near-IR Spectroscopy

Collaborations: CLEAR, CEERS, NGDEEP, MEGA, PRIMER

Publications: First Author Papers: 3, Co-Author Papers: 30, Citations: 1,417, H-index: 18

Presentations: 8 research (7 Talks, 1 Poster)

EDUCATION AND ACADEMIC APPOINTMENTS

Post-Doctoral Researcher University of Kansas May 2024-Present
Advisor: Allison Kirkpatrick

Ph.D. in Physics University of Connecticut Sept 2018 – May 2024
Advisor: Jonathan Trump
Thesis title: Emission-Line Properties of High-Redshift Galaxies and their Black Holes

M.A. in Physics University of Connecticut Sept 2018 – May 2021
Advisor: Jonathan Trump

B.Sc. in Physics University of Massachusetts Sept 2014 – May 2018
Submajor: Astrophysics Minors: Mathematics and Anthropology
Undergraduate Research: Electromagnetic fields of the Early Universe

AWARDED PROPOSALS

Principal Investigator:

2023 Gemini: GS-2023A-Q-136: Optical Spectroscopy of JWST ERO Galaxies (21.3 hrs)

Co-Investigator:

2024 JWST Cycle 3 - AR 5558: A Census of Optical Diagnostics of Ionizing Sources Across Cosmic Time (PI: N. Cleri)

2021 HST Cycle 29 - AR 16609: (∼135k) Peering Through the Dust: Paschen-beta Indicators of Star Formation and Dust Attenuation (PI: N. Cleri)

HONORS AND AWARDS

2019	Summer Research Fellowship Award (4.5k)	UConn
2018	Dean's List- College of Liberal Arts and Sciences	UMass
2014-18	Chancellor's Award Scholarship (∼8k/yr)	UMass

TEACHING EXPERIENCE/MENTORING

2022-Pres	Undergraduate Mentor	UConn, KU
2023	Guest Lecturer- PHYS 4720/6720: Galaxies and the Interstellar Medium	UConn
2018-21	TA- PHYS 1501: Physics for Engineers I	UConn

COLLABORATIONS

JWST	MEGA: MIRI EGS Galaxy and AGN	Member
JWST	PRIMER: Public Release IMaging for Extragalactic Research	Member
JWST	NGDEEP: The Next Generation Deep Exploratory Public Survey	Member
JWST	CEERS: The Cosmic Evolution Early Release Science Survey	Member
HST	CLEAR: The CANDELS Lyα Emission at Reionization Survey	Member

TECHNICAL SKILLS AND PROGRAMMING LANGUAGES

Programming:

Fluent: Python, LaTeX

Familiar: Mathematica, MATLAB, Java

Software:

Fluent: PyNeb

Familiar: IRAF, DS9, grizli

PUBLICATIONS

Lead Author

3. **Backhaus, B.E.**, Trump, Jonathan R. Pirzkal, Nor, eal. 2024, ***CEERS Key Paper VIII: Emission Line Ratios from NIRSpec and NIRCam Wide-Field Slitless Spectroscopy at z>2***, ApJ published (ApJ: 10.3847/1538-4357/ad1520)

   Summary: Used and compared NIRSpec and NIRCam WFSS emission-line ratios such as [OIII]/Hβ vs [NeIII]/[OII] to observe galaxy evolution. Focusing on the conditions of the Intersellar Medium and galaxy properties.

2. **Backhaus, B.E.**, Cleri, N.J., Bridge J.S., Trump, J.R., et al. 2023, ***CLEAR: Detecting Low-Luminosity Active Galactic Nuclei at*** $0.6 < z < 1.3$ ***via Spatially Resolved Hubble Space Telescope Grism Emission Line Ratios***, ApJ published (ApJ: 10.3847/1538-4357/aca668)

   Summary: Investigate the spatially-resolved emission line ratios in a sample of 219 galaxies ($0.6 < z < 1.3$) to search for low-luminosity active galactic nuclei (AGN) not detectable by traditional methods.

1. **Backhaus, B.E.**, Trump, J.R., Cleri, N.J., et al. 2022, ***CLEAR: Emission Line Ratios at Cosmic High Noon***, ApJ published (ApJ: 10.3847/1538-4357/ac3919)

   Summary: Defined and analysed the use of the unVO87, [OIII]/Hβ vs [SII]/(Hα+[NII], and OHNO, [OIII]/Hβ vs [NeIII]/[OII], in terms of galaxy classification, redshift evolution, and galaxy properties using the CLEAR observations.

Co-Author

29. Seillé, L. -M., et al. (incl. **Backhaus, Bren**) 2024, *Physical properties of strong 1 < z < 3 Balmer and Paschen lines emitters observed with JWST*, arXiv e-prints (arXiv:2404.09659)

28. Bagley, Micaela B., et al. (incl. **Backhaus, Bren**) 2024, *The Next Generation Deep Extragalactic Exploratory Public (NGDEEP) Survey*, ApJ published (ApJ: 10.3847/2041-8213/ad2f31)

27. Zavala, Jorge A., et al. (incl. **Backhaus, Bren**) 2024, *Detection of ionized hydrogen and oxygen from a very luminous and young galaxy 13.4 billion years ago*, arXiv e-prints (arXiv:2403.10491)

26. Llerena, M., et al. (incl. **Backhaus, Bren**) 2024, *Physical properties of extreme emission-line galaxies at z$\sim$4-9 from the JWST CEERS survey*, arXiv e-prints (arXiv:2403.05362)

25. Shen, Lu, et al. (incl. **Backhaus, Bren**) 2024, *NGDEEP Epoch 1: Spatially Resolved Hα Observations of Disk and Bulge Growth in Star-forming Galaxies at z $\sim$ 0.6–2.2 from JWST NIRISS Slitless Spectroscopy*, ApJ published (ApJ: 10.3847/2041-8213/ad28bd)

24. Pirzkal, Nor, et al. (incl. **Backhaus, Bren**) 2023, *The Next Generation Deep Extragalactic Exploratory Public Near-Infrared Slitless Survey Epoch 1 (NGDEEP-NISS1): Extra-Galactic Star-formation and Active Galactic Nuclei at* $0.5 < z < 3.6$, arXiv e-prints (arXiv:2312.09972)

23. Davis, Kelcey, et al. (incl. **Backhaus, Bren**) 2023, *A Census from JWST of Extreme Emission Line Galaxies Spanning the Epoch of Reionization in CEERS*, arXiv e-prints (arXiv:2312.07799)

22. Chworowsky, Katherine, et al. (incl. **Backhaus, Bren**) 2023, *Evidence for a Shallow Evolution in the Volume Densities of Massive Galaxies at z=4 to 8 from CEERS*, arXiv e-prints (arXiv:2311.14804)

21. Finkelstein, Steven L., et al. (incl. **Backhaus, Bren**) 2023, *The Complete CEERS Early Universe Galaxy Sample: A Surprisingly Slow Evolution of the Space Density of Bright Galaxies at $z \sim 8.5$-14.5*, arXiv e-prints (arXiv:2311.04279)
20. Kocevski, Dale D., et al. (incl. **Backhaus, Bren**) 2023, *Hidden Little Monsters: Spectroscopic Identification of Low-mass, Broad-line AGNs at $z > 5$ with CEERS*, ApJ published (ApJ: 10.3847/2041-8213/ace5a0)
19. Cleri, Nikko J., et al. (incl. **Backhaus, Bren**) 2023, *Using [Ne V]/[Ne III] to Understand the Nature of Extreme-ionization Galaxies*, ApJ published (ApJ: 10.3847/1538-4357/acde55)
18. Arrabal Haro, Pablo, et al. (incl. **Backhaus, Bren**) 2023, *Spectroscopic Confirmation of CEERS NIRCam-selected Galaxies at z = 8-10*, ApJ published (ApJ: 10.3847/2041-8213/acdd54)
17. Shen, Lu, et al. (incl. **Backhaus, Bren**) 2023, *CEERS: Spatially Resolved UV and Mid-infrared Star Formation in Galaxies at $0.2 < z < 2.5$: The Picture from the Hubble and James Webb Space Telescopes*, ApJ published (ApJ: 10.3847/1538-4357/acc944)
16. Fujimoto, Seiji , et al. (incl. **Backhaus, Bren**) 2023, *CEERS Spectroscopic Confirmation of NIRCam-selected z $\geq$ 8 Galaxy Candidates with JWST/NIRSpec: Initial Characterization of Their Properties*, ApJ published (ApJ: 10.3847/2041-8213/acd2d9)
15. Simons, Raymond C., et al. (incl. **Backhaus, Bren**) 2023, *CLEAR: Survey Overview, Data Analysis, and Products*, ApJ published (ApJ: 10.3847/1538-4365/acc517)
14. Jung, Intae, et al. (incl. **Backhaus, Bren**) 2023, *CEERS: Diversity of Lyman-Alpha Emitters during the Epoch of Reionization*, arxiv eprint (arXiv:2304.05385)
13. Pérez-González, Pablo G., et al. (incl. **Backhaus, Bren**) 2023, *CEERS Key Paper. IV. A Triality in the Nature of HST-dark Galaxies*, ApJ published (ApJ: 10.3847/2041-8213/acb3a5)
12. Kartaltepe, Jeyhan S., et al. (incl. **Backhaus, Bren**) 2023, *CEERS Key Paper. III. The Diversity of Galaxy Structure and Morphology at z = 3-9 with JWST*, ApJ published (ApJ: 10.3847/2041-8213/acad01)
11. Kocevski, Dale D., et al. (incl. **Backhaus, Bren**) 2023, *CEERS Key Paper. II. A First Look at the Resolved Host Properties of AGN at $3 < z < 5$ with JWST*, ApJ published (ApJ: 10.3847/2041-8213/acad00)
10. Guo, Yuchen, et al. (incl. **Backhaus, Bren**) 2023, *First Look at $z > 1$ Bars in the Rest-frame Near-infrared with JWST Early CEERS Imaging*, ApJ published (ApJ: 10.3847/2041-8213/acacfb)
9. Trump, Jonathan R.; Arrabal Haro, Pablo; Simons, Raymond C.; **Backhaus, B. E.** et al. 2023, *The Physical Conditions of Emission-line Galaxies at Cosmic Dawn from JWST/NIRSpec Spectroscopy in the SMACS 0723 Early Release Observations*, ApJ published (ApJ: 10.3847/1538-4357/acba8a)
8. Cleri, Nikko J.; Yang, Guang; Papovich, Casey; Trump, Jonathan R.; **Backhaus, B. E.** et al. 2022, *CLEAR: High-Ionization [Ne V] λ3426 Emission-line Galaxies at 1.4<z<2.3*, ApJ published (ApJ: 10.3847/1538-4357/acc1e6)
7. Zavala, Jorge A., et al. (incl. **Backhaus, Bren**) 2022, *Dusty Starbursts Masquerading as Ultra-high Redshift Galaxies in JWST CEERS Observations*, ApJ published (ApJ: 10.3847/2041-8213/acacfe)
6. Finkelstein, Steven L., et al. (incl. **Backhaus, Bren**) 2022, *A Long Time Ago in a Galaxy Far, Far Away: A Candidate $z \sim 12$ Galaxy in Early JWST CEERS Imaging*, ApJ published (ApJ: 10.3847/2041-8213/ac966e)
5. Papovich, Casey, et al. (incl. **Backhaus, Bren**) 2022, *CLEAR: The Ionization and Chemical-enrichment Properties of Galaxies at $1.1 < z < 2.3$*, ApJ published (ApJ: 10.3847/1538-4357/ac8058)
4. Matharu, J.K., et al. (incl. **Backhaus, Bren**) 2022, *CLEAR: The evolution of inside-out growth via star formation between $0.5 \leq z \leq 1.7$ from spatially resolved Hα maps*, ApJ published (ApJ: 10.3847/1538-4357/ac8471)
3. Jung, I., et al. (incl. **Backhaus, Bren**) 2021, *CLEAR: Boosted Lyα Transmission of the Intergalactic Medium in UV bright Galaxies*, ApJ published (ApJ: 10.3847/1538-4357/ac6fe7)
2. Cleri, N. J., Trump, J. R., **Backhaus, B. E.** et al. 2020, *CLEAR: Paschen-β Star Formation Rates and Dust Attenuation in Low Redshift Galaxies*, ApJ published, (ApJ: 10.3847/1538-4357/ac5a4c)
1. Simons, R. C., et al. (incl. **Backhaus, Bren**) 2022, *CLEAR: Gas-Phase Metallicity Gradients of $0.6 < z < 2.6$ Star-Forming Galaxies*, ApJ published (ApJ: 10.3847/1538-4357/ac3919)

PRESENTATIONS

8. Talk: Emission Line Diagnostics z>4 at San Lorenzo de El Escorial, Spain — 13 May 2024
7. Talk: ISM Conditions and Emission-Line Ratios Evolving through Cosmic Time at AAS 243th Meeting, New Orleans, Louisiana, USA — 9 Jan. 2024
6. Poster: Emission Line Ratios through Cosmic Time at First Light MEETING Massachusetts Institute of Technology, Cambridge, MA, USA — 8 June 2023
5. Talk: Emission Lines: Identifying AGN with OHNO at NERQUAM 31th Meeting, University of Rhode Island, RI, USA — 25 May 2023
4. Talk: Emission Line Ratios through Cosmic Time at University of Texas, Austin, TX, USA — 10 May 2023
3. Talk: Emission Lines through Cosmic Time at University of Connecticut, Storrs, CT, USA — 8 Feb. 2023
2. Talk: Emission Line Ratios through Cosmic Time at AAS 241th Meeting, Seattle, WA, USA — 9 Jan. 2023
1. Talk: Emission Lines AGN Identification at Cosmic Noon at NERQUAL 30th Meeting, University of Connecticut, Storrs, CT, USA — 26 May 2022

REFERENCES

Postdoctoral Advisor — Prof. Allison Kirkpatrick — KU

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