

Sean Ressler

CONTACT INFORMATION	University of Toronto Canadian Institute for Theoretical Astrophysics 1302 McLennan Physical Laboratories Toronto, ON, M5S 3H8 Canada https://smressle.bitbucket.io/index.html sressler@cita.utoronto.edu
RESEARCH INTERESTS	Accretion disks, astrophysical jets, supermassive black holes, Sagittarius A*, collisionless plasmas, fluid dynamics, black hole binaries, large scale simulations, GRMHD, MHD, Be star disks, GRB afterglows
EDUCATION AND POSITIONS HELD	University of Toronto Postdoctoral Fellow, Canadian Institute for Theoretical Astrophysics (Fall 2022–present) University of California Santa Barbara Postdoctoral Fellow, Kavli Institute for Theoretical Physics (Fall 2019–Summer 2022) University of California Berkeley Ph.D., Physics (Summer 2019) [GPA: 4.0/4.0] <ul style="list-style-type: none">• Dissertation Topic: Towards More Predictive Models of Galactic Center Accretion• Advisor: Eliot Quataert North Carolina State University B.S. in Physics and Applied Mathematics, May 2013 [GPA: 4.0/4.0]
SELECTED PRESENTATIONS	<i>Invited Talk</i> , Waterloo Centre for Astrophysics Astroseminar (11/2023) <i>Discussion Leader</i> , “Advances In Large-Scale Simulations and Hardware Acceleration,” CITA/Perimeter Institute Day (5/2023) <i>Invited Talk</i> , Athena++ User Meeting at the Center for Computational Astrophysics (5/2023) <i>Invited Talk</i> , PCTS (Princeton) Improving Black Hole Accretion Models with Plasma Theory (2/2023) <i>Invited Talk</i> , Black hole astrophysics with VLBI 2023 at NAOJ Mitaka campus (2/2023) <i>Colloquium</i> , Harvard Institute for Theory and Computation (12/2022) <i>Discussion Leader</i> , “Relativistic MHD Simulations of Black Hole Accretion,” Plasmas in Strong Gravity Workshop at Aspen Center for Physics (7/2022)

Invited Talk, PCTS (Princeton) Polarized Radiation Near Supermassive Black Holes (5/2021)

Invited Talk, COSPAR E1.18 (1/2021)

Colloquium, Texas Tech University (11/2020)

Colloquium, Black Hole Initiative, Harvard University (10/2020)

JILA Seminar, University of Colorado Boulder (10/2019)

Contributed Talk, Athena++ User Meeting at UNLV (3/2019)

Invited Talk, The Central Arcsecond: Towards Testing General Relativity in the Galactic Center Conference at Castle Ringberg (11/2018)

Seminar, Columbia (10/2018)

TAPIR Seminar, Caltech (06/2018)

Contributed Talk, Dynamics and Accretion At the Galactic Center Conference at the Aspen Center For Physics (2/2016)

PROFESSIONAL
SERVICE,
TEACHING, AND
MENTORING

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|--------------|---|
| 9/23–present | Research Mentor for undergraduate student Mayank Shenoy |
| 5/23–present | External Member of Trung Ha’s (University of North Texas) Thesis Committee |
| 3/21–12/22 | Research Mentor for Post-bacch student Siddhant Solanki |
| 3/21 | External Reviewer for NASA’s FINESST Graduate Fellowship |
| 10/20 | Co-organizer of the KITP <i>The Frontiers of Event Horizon Scale Accretion</i> Conference |
| 2016–present | Referee, ApJ, MNRAS, and A& A |
| Fall 2014 | Graduate Student Instructor, Astronomy 160, Stellar Physics (Undergraduate level) |
| Spring 2014 | Graduate Student Instructor, Physics 8B, Introductory Physics (E&M and Relativity) |
| Fall 2013 | Graduate Student Instructor, Physics 8A, Introductory Physics (Mechanics) |

- GRANTS
- 2023–pres. XSEDE TG-PHY220053: \sim 2.5 MSUs on Anvil/Stampede2 *Modeling Supermassive Black Hole Feeding and Feedback in Massive Galaxies and Galaxy Clusters* (PI: Yuan Li, Co-Is: **Sean Ressler**, Trung Ha)
- 2020–2023 XSEDE TG-AST200005: \sim 10.3 MSUs on Bridges-2/Stampede2 *Low Angular Momentum Accretion Flows Around Supermassive Black Holes Revisited in GRMHD* (PI: **Sean Ressler**, Co-Is: Christopher White, Eliot Quataert, Omer Blaes)
- 2018–2020 XSEDE TG-AST090038: \sim 3.5 MSUs on Comet/Stampede *Simulating the Large Scale Accretion Onto Sagittarius A* via Stellar Winds* (PI: Eliot Quataert, Co-I: **Sean Ressler**)
- 2016 *Chandra* Theory Grant Cycle 18 *Modeling the X-ray Variability of Sagittarius A* in GRMHD Simulations* (PI: Eliot Quataert, Co-Is: **Sean Ressler**, Alexander Tchekhovskoy, Joseph Neilsen)
- OUTREACH
- Research/Academic Career Path Talk*, Cheryl Harper’s Physics Class at Greensburg Salem High School (virtual, 5/2021)
- Podcast Appearance*, Parker’s Pensees: “The Physics of Time Travel and the Speed of Light” <https://www.youtube.com/watch?v=fA-D11jDNcU> (2/2021)
- Podcast Appearance*, Parker’s Pensees: “What in the World Are Black Holes” <https://www.youtube.com/watch?v=bIDyuGKRA98> (12/2020)
- Astronomy On Tap*, Santa Barbara, “How To Draw A Fuzzy Doughnut: A Portrait of The Largest Black Hole In The Milky Way” (5/2019) (2/2020)
- Research/Academic Career Path Talk*, Jeff Dennison’s Class at Covenant Day High School (1/2020)
- Astro Night Public Talk*, UC Berkeley, “How To Draw A Fuzzy Doughnut: A Portrait of The Largest Black Hole In The Milky Way” (5/2019)
- Science Demo Volunteer*, “Cal Day,” Bay Area Science Festival, Discovery Day
- AWARDS
- Mary Elizabeth Uhl Prize*, UC Berkeley, “For outstanding scholarly achievement by a graduate student close to finishing his/her dissertation in Astronomy or in Physics with preference to Astronomy” (5/2019)
- NASA NESSF Graduate Fellowship*, Fall 2015–Spring 2018
- The Carl and Betty Helmholtz Gateway Fellowship* Fall 2013–Spring 2014
- College of Physical and Mathematical Sciences Scholarly Achievement Award*, NC State, “Presented to a graduating senior in the Physical and Mathematical Sciences in recognition of outstanding scholarship” 2013

Wesley Doggett Award for Scholarly Achievement, NC State, “Presented to a graduating senior in physics in recognition of outstanding scholarship” 2013

PUBLICATIONS

S. M. Ressler, L. Combi, X. Li, B. Ripperda, H. Yang, in prep., *On the Black Hole Perturber Scenario in Supermassive Black Hole Accretion Disks Using Time-Dependent Metric GRMHD*

S. M. Ressler, C. J. White, E. Quataert, 2023, *Wind-Fed GRMHD Simulations of Sagittarius A*: Tilt and Alignment of Jets and Accretion Discs, Electron Thermodynamics, and Multi-Scale Modeling of the Rotation Measure*, MNRAS, 521, 4277

S. Solanki, **S. M. Ressler**, L. Murchikova, J. M. Stone, M. R. Morris, 2023, *The Inner 2 pc of Sagittarius A*: Simulations of the Circumnuclear Disk and Multiphase Gas Accretion in the Galactic Center*, ApJ, 953, 22 [I mentored S. Solanki as a post-bach student for this project]

L. Murchikova, C. J. White, **S. M. Ressler**, 2022, *Remarkable Correspondence of Sagittarius A* Submillimeter Variability with a Stellar-Wind-fed Accretion Flow Model*, ApJL, 932, L21 [All three authors made significant contributions to this project]

H. Jia, C. J. White, E. Quataert, **S. M. Ressler**, 2022, *Observational Signatures of Black Hole Accretion: Rotating vs. Spherical Flows with Tilted Magnetic Fields*, MNRAS, 515, 1392 [I provided the GRMHD simulations and several analysis scripts used in this work and I provided comments and suggestions for the manuscript]

Event Horizon Telescope Collaboration et al. (including **S. M. Ressler**), 2022, *First Sagittarius A* Event Horizon Telescope Results. V. Testing Astrophysical Models of the Galactic Center Black Hole*, ApJL, 930, L16 [I provided wind-fed GRMHD simulations used in analyzing the 230 GHz images]

Event Horizon Telescope Collaboration et al. (including **S. M. Ressler**), 2022, *First Sagittarius A* Event Horizon Telescope Results. I. The Shadow of the Supermassive Black Hole in the Center of the Milky Way*, ApJL, 930, L12 [I provided wind-fed GRMHD simulations used in analyzing the 230 GHz images]

B. S. Prather, G. N. Wong, V. Dhruv, B. R. Ryan, J. C. Dolence, **S. M. Ressler**, C. F. Gammie, 2021, *iharm3D: Vectorized General Relativistic Magnetohydrodynamics*, Journal of Open Source Software, 6 (66), 3336 [I implemented the electron thermodynamics module in this now publicly available version of the GRMHD code iHARM.]

S. M. Ressler, 2021, *3D MHD Simulation of a Pulsationally-Driven MRI Decretion Disc*, MNRAS, 508, 4887

A. Jiménez-Rosales, J. Dexter, **S. M. Ressler**, A. Tchekhovskoy, M. Bauböck, Y. Dallilar, P. T. de Zeeuw, F. Eisenhauer, S. von Fellenberg, F. Gao, R. Genzel, S. Gillessen, M. Habibi, T. Ott, J. Stadler, O. Straub, F. Widmann, 2021, *Relative depolarization of the black hole photon ring in GRMHD models*

of *Sgr A** and *M87**, MNRAS, 503, 4563 [This work used my own personal version of the two-temperature GRMHD HARM and I provided comments and suggestions for the manuscript.]

S. M. Ressler, E. Quataert, C. J. White, & O. Blaes, 2021, *Magnetically Modified Spherical Accretion in GRMHD: Reconnection-Driven Convection and Jet Propagation*, MNRAS, 504, 6076

J. Dexter, A. Tchekhovskoy, A. Jiménez-Rosales, **S. M. Ressler**, M. Bauböck, Y. Dallilar, P. T. de Zeeuw, F. Eisenhauer, S. von Fellenberg, F. Gao, R. Genzel, S. Gillessen, M. Habibi, T. Ott, J. Stadler, O. Straub, F. Widmann, 2020, *Sgr A* near-infrared flares from reconnection events in a magnetically arrested disc*, MNRAS, 497, 4999 [This work used my own personal version of the two-temperature GRMHD HARM and I contributed to the editing of the manuscript.]

S. M. Ressler, C. J. White, E. Quataert, & J. M. Stone, 2020, *Ab Initio Horizon-Scale Simulations of Magnetically Arrested Accretion in Sagittarius A* Fed by Stellar Winds*, ApJL, 896, L6

J. Dexter, A. Jiménez-Rosales, **S. M. Ressler**, A. Tchekhovskoy, M. Bauböck, Y. Dallilar, P. T. de Zeeuw, F. Eisenhauer, S. von Fellenberg, F. Gao, R. Genzel, S. Gillessen, M. Habibi, T. Ott, J. Stadler, O. Straub, F. Widmann, 2020, *A parameter survey of Sgr A* radiative models from GRMHD simulations with self-consistent electron heating*, MNRAS, 494, 4168 [This work used my own personal version of the two-temperature GRMHD HARM and I provided comments and suggestions for the manuscript.]

R. Anantua, **S. M. Ressler**, E. Quataert, 2020, *On the Comparison of AGN with GRMHD Simulations: I. Sgr A**, MNRAS 493, 1404 [I taught R. Anantua how to use the GR radiative transfer calculations, provided the GRMHD simulations with electron temperature, and significantly contributed to the writing of the manuscript.]

S. M. Ressler, E. Quataert, & J. M. Stone, 2020, *The Surprisingly Small Impact of Magnetic Fields On The Inner Accretion Flow of Sagittarius A* Fueled By Stellar Winds*, MNRAS, 492, 3272

S. M. Ressler, E. Quataert, & J. M. Stone, 2019, *Accretion of Magnetized Stellar Winds in the Galactic Center: Implications for Sgr A* and PSR J1745-2900*, MNRAS, 482, L123

B. R. Ryan, **S. M. Ressler**, J. C. Dolence, C. F. Gammie, & E. Quataert, 2018, *Two-Temperature GRMHD Simulations of M87*, ApJ, 866, 126 [The code used in this project was the same as Ryan et. al 2017, which I helped develop, and I provided comments and suggestions for the manuscript.]

S. M. Ressler, E. Quataert, & J. M. Stone, 2018, *Hydrodynamic Simulations of the Inner Accretion Flow of Sagittarius A* Fueled By Stellar Winds*, MNRAS, 478, 3544

B. Ryan, **S. M. Ressler**, J. C. Dolence, A. Tchekhovskoy, C. F. Gammie, & E.

Quataert, 2017, *The Radiative Efficiency and Spectra of Slowly Accreting Black Holes*, ApJL, 844, L24 [I implemented and tested electron thermodynamics in `bhlight`, the coupled Monte Carlo/GRMHD code.]

S. M. Ressler & T. Laskar, 2017, *Thermal Electrons in Gamma-Ray Burst Afterglows*, ApJ, 845, 150

S. M. Ressler, A. Tchekhovskoy, E. Quataert, & C. F. Gammie, 2017, *The Disc-Jet Symbiosis Emerges: Modeling the Emission of Sagittarius A* with Electron Thermodynamics*, MNRAS, 467, 3604

Z. Tang, S.P. Reynolds, & **S. M. Ressler**, 2017, *X-Ray and Gamma-Ray Emission from Middle-aged Supernova Remnants in Cavities. I. Spherical Symmetry*, ApJ, 227, 28 [I implemented inverse Compton scattering, bremsstrahlung, and neutral pion decay emission processes in the supernova remnant imaging code that was the basis for this project.]

S. M. Ressler, A. Tchekhovskoy, E. Quataert, M. Chandra, & C. F. Gammie, 2015, *Electron Thermodynamics in GRMHD Simulations of Low-Luminosity Black Hole Accretion*, MNRAS, 454, 1848

A. Tran, B. J. Williams, R. Petre, **S.M. Ressler**, & S. P. Reynolds, 2015, *Energy Dependence of Synchrotron X-Ray Rims in Tycho's Supernova Remnant*, ApJ, 812, 101 [I provided the computational framework to accomplish this project and instructed A. Tran on how to use it.]

S. M. Ressler, S. Katsuda, S. P. Reynolds, K.S. Long, R. Petre, B. J. Williams, & P. F. Winkler, 2014, *Magnetic-field amplification in the thin X-ray rims of SN1006*, ApJ 790, 85