

MICHAEL S. CALZADILLA

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EDUCATION

Massachusetts Institute of Technology (MIT) Ph.D. in Physics (Astrophysics) Advisor: Prof. Michael McDonald	<i>2017 - Present</i>
University of Cambridge , Trinity College, UK M.Phil. in Astronomy Advisor(s): Prof. Andrew Fabian, Dr. Helen Russell	<i>2015 - 2016</i>
University of South Florida (USF) B.S. in Physics, Minor in Astronomy <i>Summa cum laude</i>	<i>2011 - 2015</i>

AWARDS & HONORS

MIT Physics Sergio Vasquez Prize	<i>2022</i>
NASA FINESST Fellowship	<i>2021 - Present</i>
Fred Kavli Graduate Fellowship	<i>2016 - 2017</i>
Gates Cambridge Scholarship (<i>declined</i>)	<i>2016 - 2019</i>
Gates Cambridge Scholarship	<i>2015 - 2016</i>
NSF Graduate Research Fellowship (<i>declined</i>)	<i>2015</i>
USF Undergraduate Scholar Award	<i>2015</i>
USF Golden Bull Award	<i>2015</i>
USF College of Arts & Sciences Special Project Grant: Radio Telescope	<i>2014</i>
NSF REU: MIT Haystack Observatory	<i>2014</i>
Barry M. Goldwater Scholarship	<i>2014</i>
NSF REU: Harvard-Smithsonian Center for Astrophysics	<i>2013</i>

SELECTED PRESS

NASA	“SPT-CL J2215-3537” : <i>Unexpectedly Calm and Remote Galaxy Cluster Discovered</i>	<i>July 2023</i>
NASA	“RBS 797” : <i>Astronomers Spy Quartet of Cavities from Giant Black Holes</i>	<i>Dec 2021</i>
MIT	“The Billion Year Belch” : <i>Michael Calzadilla and colleagues describe a violent black hole outburst that provides new insight into galaxy cluster evolution.</i>	<i>Dec 2019</i>

PUBLICATIONS

First Author or Significant Contributions

8. Calzadilla, M. S., McDonald, M., et al. (2023), “The SPT-Chandra BCG Spectroscopic Survey I: Evolution of the Entropy Threshold for Cooling and Feedback in Galaxy Clusters Over the Last 10 Gyr,” submitted to ApJ. [arXiv:2311.00396](https://arxiv.org/abs/2311.00396)
7. Calzadilla, M. S., Bleem, L. E., McDonald, M., et al. (2023), “SPT-CL J2215-3537: A Massive Starburst at the Center of the Most Distant Relaxed Galaxy Cluster,” ApJ, 947, 44. [arXiv:2303.10185](https://arxiv.org/abs/2303.10185)

6. **Calzadilla, M. S.**, McDonald, M., Donahue, M., McNamara, B. R., Fogarty, K., Gaspari, M., Gitti, M., Russell, H. R., Tremblay, G. R., Voit, G. M., Ubertosi, F. (2022), “*Testing the Limits of AGN Feedback and the Onset of Thermal Instability in the Most Rapidly Star Forming Brightest Cluster Galaxies.*” ApJ, 140, 940, [arXiv:2207.01624](#)
5. Khullar, G., Bayliss, M. B., Gladders, M. D., Kim, K. J., **Calzadilla, M.**, et al. (2022), “*Synthesizing Stellar Populations in South Pole Telescope Galaxy Clusters: I. Ages of Quiescent Member Galaxies at $0.3 < z < 1.4$.*” ApJ, 934, 177K, [arXiv:2111.09318](#).
4. McKinley, B., Tingay, S. J., Gaspari, M., Kraft, R. P., Matherne, C., Offringa, A. R., McDonald, M., **Calzadilla, M. S.**, Veilleux, S., Shabala, S. S., Gwyn, S. D. J., et al. (2021), “*Multi-scale feeding and feedback in the closest radio galaxy Centaurus A.*” Nature Astronomy, 6, 109M, [arXiv:2111.02683](#)
3. McDonald, M., McNamara, B. R., **Calzadilla, M. S.**, et al. (2021), “*Observational Evidence for Enhanced Black Hole Accretion in Giant Elliptical Galaxies.*” ApJ, 908, 85M, [arXiv:2012.09168](#)
2. **Calzadilla, M. S.**, McDonald, M., Bayliss, M., et al. (2019), “*Discovery of a Powerful $\gtrsim 10^{61}$ erg AGN Outburst in the Distant Galaxy Cluster SPT-CLJ0528-5300.*” ApJL, 887, L17, [arXiv:1911.12828](#)
1. **Calzadilla, M. S.**, Russell, H. R., McDonald, M. A., et al. (2019), “*Revealing a Highly Dynamic Cluster Core in Abell 1664 with Chandra.*” ApJ, 875, 65, [arXiv:1810.00881](#)

Nth Author

13. Bleem, L. E., ..., **Calzadilla, M. S.**, et al. (2023), “*Galaxy Clusters Discovered by the Thermal Sunyaev-Zel’dovich Effect in the 500-square-degree SPTpol Survey,*” Submitted to The Open Journal of Astrophysics. [arXiv:2311.07512](#)
12. Panagiotou, C., De, K., Masterson, M., ..., **Calzadilla, M. S.**, et al. (2023), “*A Luminous Dust-obscured Tidal Disruption Event Candidate in a Star-forming Galaxy at 42 Mpc,*” ApJL, 948, L5. [arXiv:2303.02710](#)
11. Masterson, M., McDonald, M., Ansarinejad, B., ..., **Calzadilla, M. S.**, et al. (2023), “*Evidence for AGN-Regulated Cooling in Clusters at $z \sim 1.4$: A Multi-Wavelength View of SPT-CL J0607-4448.*” ApJ, 944, 164M, [arXiv:2301.00830](#)
10. Ubertosi, F., Gitti, M., Brighenti, F., ..., **Calzadilla, M. S.**, et al. (2022), “*Multiple shock fronts in RBS 797: the Chandra window on shock heating in galaxy clusters.*” ApJ, 944, 216U [arXiv:2212.10581](#)
9. Ruppin, F., McDonald, M., Hlavacek-Larrondo, J., ..., **Calzadilla, M.**, et al. (2022), “*Redshift Evolution of the Feedback-Cooling Equilibrium in the Core of 48 SPT Galaxy Clusters: A Joint Chandra-SPT-ATCA Analysis.*” ApJ, 948, 49R, [arXiv:2207.13351](#)
8. Salvati, L., Saro, L., Bocquet, S. ; Costanzi, M., ..., **Calzadilla, M. S.**, et al. (2022), “*Combining Planck and SPT cluster catalogs: cosmological analysis and impact on Planck scaling relation calibration.*” ApJ, 934, 129S, [arXiv:2112.03606](#).
7. Somboonpanyakul, T. ; McDonald, M., Noble, A., ..., **Calzadilla, M.**, et al. (2022), “*The Evolution of AGN Activity in Brightest Cluster Galaxies.*” AJ, 163, 146S, [arXiv:2201.08398](#)
6. Anbajagane, D., Chang, C., Jain, B., ..., **Calzadilla, M.**, et al. (2021), “*Shocks in the Stacked Sunyaev-Zel’Dovich Profiles of Clusters II: Measurements from SPT-SZ + Planck Compton- γ Map.*” MNRAS, 514, 1645A, [arXiv:2111.04778](#).

5. Ubertosi, F., ..., **Calzadilla, M.**, et al. (2021), “*The Deepest Chandra View of RBS 797: Evidence for Two Pairs of Equidistant X-ray Cavities.*” ApJL, 923, L25, [arXiv:2111.03679](#)
4. Flores, A. M., ..., **Calzadilla, M. S.**, et al. (2021), “*The history of metal enrichment traced by X-ray observations of high redshift galaxy clusters.*” MNRAS, 507, 5195F, [arXiv:2108.12051](#)
3. Ruppin, F., McDonald, M., Bleem, L. E., ..., **Calzadilla, M.**, et al. (2021), “*Stability of Cool Cores During Galaxy Cluster Growth: A Joint Chandra/SPT Analysis of 67 Galaxy Clusters Along a Common Evolutionary Track Spanning 9 Gyr.*” ApJ, 918, 43R, [arXiv:2012.14669](#)
2. Ghirardini, V., ..., **Calzadilla, M. S.**, et al. (2021), “*Evolution of the Thermodynamic Properties of Clusters of Galaxies Out to Redshift of 1.8.*” ApJ, 910, 14G, [arXiv:2004.04747](#)
1. Mahler, G., Sharon, K., Gladders, M. D., ..., **Calzadilla, M. S.**, et al. (2020), “*Strong Lensing Model of SPT-CLJ0356-5337, a Major Merger Candidate at Redshift 1.0359.*” ApJ, 894, 150, [arXiv:1910.14006](#)

INVITED TALKS (COLLOQUIA, SEMINARS & WORKSHOPS)

Talk	“ <i>Evolution of the Entropy Threshold for Cooling and Feedback in Galaxy Clusters.</i> ” Stanford KIPAC Tea Talk (virtual)	Dec 2023
Talk	“ <i>Evolution of the AGN Feedback Cycle in Galaxy Clusters.</i> ” University of Cambridge IoA X-ray Group Seminar, Cambridge, UK (virtual)	Nov 2023
Talk	“ <i>Evolution of the Entropy Threshold for Cooling and Feedback in Galaxy Clusters.</i> ” Harvard-Smithsonian Center for Astrophysics, CfA Seminar, Cambridge, MA	Nov 2023
Talk	“ <i>The Limits and Evolution of the AGN Feedback Cycle in Galaxy Clusters.</i> ” Université Claude Bernard Lyon 1, Institute of Physics of the 2 Infinities Seminar, Lyon, France	Jun 2023
Talk	“ <i>Evolution of the AGN Feedback Cycle and the Onset of Thermal Instabilities in Galaxy Clusters.</i> ” University of Michigan, Galaxy Clusters Seminar (virtual)	Nov 2022
Talk	“ <i>Testing the Limits of AGN Feedback.</i> ” Sesto Center for Astrophysics, Italy. Multi-phase AGN Feeding & Feedback II: Linking the Micro to Macro Scales in Galaxies, Groups, and Clusters, Sexten, Italy	Jun 2022
Talk	“ <i>Evolution of the AGN Feedback Cycle and the Onset of Thermal Instabilities in Galaxy Clusters.</i> ” Harvard-Smithsonian Center for Astrophysics, Galaxy Clusters Group Seminar, Cambridge, MA	Nov 2019

CONTRIBUTED TALKS & POSTERS

Talk	“ <i>Evolution of the Cooling Flow Problem in SPT-Selected Galaxy Clusters</i> ” Observing the Universe at mm Wavelengths, Grenoble, France	Jun 2023
Talk	“ <i>Evolution of the Cooling Flow Problem in SPT-Selected Galaxy Clusters</i> ” The X-ray Universe 2023, Athens, Greece	Jun 2023
Poster	“ <i>SPT-CLJ2215-3537: The Most Distant Starbursting BCG.</i> ” 20 th HEAD Meeting, Waikōloa, HI	Mar 2023
Talk	“ <i>Evolution of the Cooling Flow Problem in SPT BCGs.</i> ” SPT Collaboration Face to Face Meeting, Argonne, Chicago, IL	Oct 2022
Talk	“Testing the Limits of AGN Feedback in the Most Rapidly Star Forming Brightest Cluster Galaxies.” What Drives the Growth of Black Holes? Reykjavik, Iceland	Sep 2022
Talk	“Testing the Limits of AGN Feedback in the Most Rapidly Star Forming Brightest Cluster Galaxies.” Galaxy Clusters 2022: Challenging Our Cosmological Perspectives (virtual)	Apr 2022
Talk	“ <i>Testing the Limits of AGN Feedback in the Most Rapidly Star Forming Central Cluster Galaxies.</i> ” 19 th HEAD Meeting, Pittsburgh, PA	Mar 2022

Talk	<i>“Testing the Limits of AGN Feedback in the Most Rapidly Star Forming Central Cluster Galaxies.”</i> KIAA Forum on Gas in Galaxies (virtual)	Nov 2021
Talk	<i>“Understanding the Evolution of the Cooling Flow Problem: Update on Optical Spectroscopy of SPT BCGs.”</i> SPT Collaboration Face to Face Meeting (virtual)	Oct 2021
Talk	<i>“Understanding the Regulation of Cooling Flows in Massive Clusters and the Growth of BCGs.”</i> SPT Collaboration Face to Face Meeting (virtual)	Sep 2020
Talk	<i>“Discovery of a Powerful $\gtrsim 10^{61}$ erg AGN Outburst in the Distant Galaxy Cluster SPT-CLJ0528-5300.”</i> AAS 235 th Winter Meeting, Honolulu, HI.	Jan 2020
Poster	<i>“Revealing a Highly Dynamic Cluster Core in Abell 1664 with Chandra.”</i> 20 Years of Chandra Science Symposium, Boston, MA.	Dec 2019
Talk	<i>“Discovery of a Powerful $\gtrsim 10^{61}$ erg AGN Outburst in the Distant Galaxy Cluster SPT-CLJ0528-5300”</i> & <i>“Understanding the Regulation of Cooling Flows in Massive Clusters and the Growth of BCGs.”</i> SPT Collaboration Face to Face Meeting, UChicago/KICP, Chicago, IL.	Aug 2019
Poster	<i>“Discovery of an Extreme $\gtrsim 10^{61}$ erg AGN Outburst in a Distant SPT-SZ Galaxy Cluster.”</i> Tracing Cosmic Evolution with Clusters of Galaxies IV, Sesto, BZ, IT.	Jul 2019
Poster	<i>“Revealing a Highly Dynamic Cluster Core in Abell 1664 with Chandra.”</i> AAS 17 th HEAD Meeting, Monterey, CA.	Mar 2019
Talk	<i>“Revealing a Highly Dynamic Cluster Core in Abell 1664 with Chandra.”</i> Boston-area Universities Clusters Hangout (BUnCH) Meeting, Boston, MA.	Oct 2018
Talk	<i>“Active Galactic Nuclei and Bubbles in the Intracluster Medium.”</i> Gates Cambridge Scholars Day of Research Symposium, Cambridge, UK.	Apr 2016
Poster	<i>“Observing Black Holes with the Event Horizon Telescope: Characterizing the Jet Precession of Quasar 3C273 at 1.3mm.”</i> AAS 225 th Winter Meeting, Seattle, WA.	Jan 2015
Talk	<i>“Observing Black Holes with the Event Horizon Telescope: Characterizing the Jet Precession of Quasar 3C273 at 1.3mm.”</i> REU Intern Symposium, MIT Haystack Observatory, Westford, MA.	Jan 2015
Poster	<i>“The Transition of AGN from Radiatively Bright to Dim.”</i> University of South Florida Undergraduate Research and Arts Colloquium, Tampa, FL.	Apr 2014
Poster	<i>“Fueling the Brightest AGN – Characterizing their Hot Gas Environments and the Accretion of Cooling Gas onto their SMBHs.”</i> APS April Meeting, Savannah, GA.	Apr 2014
Poster	<i>“Fueling the Brightest AGN – Characterizing their Hot Gas Environments and the Accretion of Cooling Gas onto their SMBHs.”</i> AAS 223 rd Winter Meeting, Washington, D.C.	Jan 2014
Talk	<i>“Hot and Cold: Measuring the Feedback, Heating and Cooling Properties of the Brightest AGNs in the Universe.”</i> 2013 Harvard SAO Astronomy Intern Symposium, Harvard-Smithsonian Center for Astrophysics, Cambridge, MA.	Aug 2013

TEACHING & MENTORING

Teaching Assistant, MIT 8.287: Observational Techniques of Optical Astronomy *Fall 2019*

Students I advised or co-advised:

Obinna Modilim, MIT undergrad *2022*
Kylie Hansen, MIT undergrad *2022*

SELECTED OUTREACH & SERVICE

Graduate Student Chair 2023 MIT Astrophysics Faculty Search Committee *2023*
Referee for Monthly Notices of the Royal Astronomical Society (MNRAS) *2020 - Present*
Reviewer for Hubble Space Telescope proposals *2020 - Present*
Volunteer Latino STEM Alliance *2019*
Volunteer STEAM Ahead Learning Academy for Boston Public Schools *2019*

Panelist	USF UK Scholarships Information Session Panel	2019
Co-director & Founding Member	MIT Sidewalk Astronomy Club	2017 - Present
Lead Lab Instructor & Founding Member	Warrior Scholar Program at MIT	2017 - Present
Volunteer	Cambridge Science Festival (UK and US)	2017 - Present
Public Talk	“ <i>Astronomy From Our Backyard to Beyond</i> ” <i>Scientist in Every Florida School</i> program, Miami, FL (virtual). 4th grade classroom.	Apr 2023
Public Talk	“ <i>What do Astronomers do?</i> ” Great American Teach-in, FL (virtual). 4th grade classroom.	Nov 2021
Public Talk	“ <i>Capturing the Night Sky: How to Obtain and Process Astronomical Images</i> ” Cambridge Science Festival (virtual).	Apr 2021
Public Talk	“ <i>Capturing the Night Sky: How to Obtain and Process Astronomical Images</i> ” Harvard-MIT Science Research Mentoring Program (virtual).	Apr 2021
Public Talk	“ <i>The Universe in X-rays</i> ”. Public Open Evening lecture, Institute of Astronomy, University of Cambridge, UK. 180 in attendance.	Feb 2016