

# PROF. CARA BATTERSBY

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CONTACT INFORMATION	University of Connecticut, Dept. of Physics 196A Auditorium Road, Unit 3046 Storrs, CT 06269-3046	Phone: (860) 486-3988 E-mail: <a href="mailto:cara.battersby@uconn.edu">cara.battersby@uconn.edu</a> <a href="https://battersby.physics.uconn.edu/">https://battersby.physics.uconn.edu/</a>
RESEARCH INTERESTS	1) Star formation, gas dynamics, and the 3-D structure of our Galaxy's Central Molecular Zone (CMZ), 2) clustered star formation and its potential variation with environment, 3) the future of Far-IR astrophysics, and 4) how galaxy-scale processes affect the detailed physics of star formation.	
PROFESSIONAL PREPARATION	<b>Assistant Professor</b> University of Connecticut (on research leave AY16/17)	<b>August 2016 - present</b>
	<b>Research Associate</b> Smithsonian Astrophysical Observatory	<b>September 2017 - present</b>
	<b>National Science Foundation (NSF) Postdoctoral Fellow</b> Harvard-Smithsonian Center for Astrophysics	<b>August 2016 - July 2017</b>
	<b>Submillimeter Array (SMA) Postdoctoral Fellow</b> Harvard-Smithsonian Center for Astrophysics	<b>Sept. 2013 - July 2016</b>
	<b>Ph.D. Astrophysics, University of Colorado, Boulder, CO, Adviser: John Bally</b> <i>"The Structure, Kinematics, and Evolution of Massive Star and Cluster Forming Regions"</i>	<b>2013</b>
	<b>M.A. Astronomy, Boston University, Adviser: Jim Jackson</b>	<b>2008</b>
	<b>B.S. Physics &amp; Astronomy, University of Massachusetts Amherst</b> <i>summa cum laude, Advisers: Min S. Yun &amp; Grant Wilson</i>	<b>2006</b>
PUBLICATIONS	Cara Battersby has an h-index of 36, is an author on 79 refereed publications with a total citation count of 4,627 (computed August 2022 from the NASA Astrophysics Data Service Page). Complete publication list follows this CV.	
SELECTED HONORS, GRANTS, AND AWARDS	<b>Summary:</b> Cara Battersby has been awarded \$3.0M in extramural funding to UConn as PI or co-PI on ten grants from NSF, NASA, NRAO, and the Templeton Foundation.	
	<ul style="list-style-type: none"><li>● <b>Co-PI: National Science Foundation Astronomy and Astrophysics Grant</b> <b>2022</b> "Collaborative Research: ACES Galactic Center Mass Flow" (\$232k)</li><li>● <b>PI: NSF Early CAREER Faculty Award,</b> <b>2022</b> "CAREER: Shining STARS Amidst the Turbulence" (\$697k)</li><li>● <b>PI: NASA Astrophysics Data Analysis Program Grant,</b> <b>2021</b> "3-D MC: Mapping Circumnuclear Molecular Clouds from X-ray to Radio" (\$466k)</li><li>● <b>PI: National Science Foundation Astronomy and Astrophysics Grant,</b> <b>2021</b> "Uncovering the Seeds of Star Clusters across the Galaxy" (\$389k)</li><li>● <b>UConn Internal Grants</b> (\$59k total): <i>PI: UConn STARS Program Awarded under CLAS DEI Initiative \$4k, Co-I: BRIDGE+ Program Awarded under the President's Commitment to Community Grant 2021 \$13k, Scholarship Facilitation Fund: 2019 \$1k, NFIP: 2017-2021 \$5k total, Co-I: Provost's Open Educational Resources Award 2017 \$10k, Co-I: Provost's Large Course Redesign Award 2017 \$26k.</i></li></ul>	

- **Co-PI NASA SOFIA Archival Research Program** **2021**  
*“IGNITES: Investigating Galactic Nuclear Infrared Thermal Evolution of young Stars” (\$166k)*
  - **Robert H. Goddard Honor Award** (<https://science.gsfc.nasa.gov/sci/awardswon>) **2019**  
*“For outstanding team performance resulting in the delivery of a scientifically compelling, executable, low-risk Origins Space Telescope mission concept.”*
  - **PI: National Radio Astronomy Observatory** **2019**  
*Student Observing Support Grant (\$34k)*
  - **Co-PI: National Science Foundation Campus Cyberinfrastructure Grant** **2019**  
*CC\* Compute: Shared Computing Infrastructure for Large-scale Science Problems (\$400k)*
  - **Co-I: NASA Balloon Mission:** **2019**  
*ASTHROS: Astrophysics Stratospheric Telescope for High-spectral Resolution Observations at Submillimeter-wavelengths (\$18k to UConn)*
  - **NASA Group Achievement Award** **2019**  
*for the “substantial and effective scientific, technical, and management work in developing the Large Mission Concept Studies for the 2020 Astrophysics Decadal Survey.”*
  - **Provost’s Letter of Recognition for Teaching Excellence** **2017, 2018, & 2019**
  - **Shortlisted (top 5 of candidates worldwide) for the** **2018**  
*Nature Research Awards for Inspiring Science*
  - **PI: National Science Foundation Astronomy and Astrophysics Grant,** **2018**  
*“3-D CMZ: Unveiling the Structure of our Galaxy’s Central Molecular Zone” (\$390k)*
  - **PI: Templeton Foundation Grant,** *“BiteScis: K12 Research Brief Engagement Pilot” (\$215k)* **2017**
  - **Appointed by NASA: Science & Technology Definition Team,** *Origins Space Telescope* **2016**
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SELECTED PRESS

- 2022 Astrobites: [Writing Astrobites in Your Courses!](#)
- 2022 CAREER Award Press: UConn Today: [2021-22 NSF CAREER Award Recipients](#), CT Mirror: [UConn faculty winning NSF CAREER awards at record-breaking pace](#), UConn Today: [UConn faculty winning NSF CAREER awards at record-breaking pace](#)
- 2021 Scientific American: [This Report Could Make or Break the Next 30 Years of U.S. Astronomy](#)
- 2021 UConn Today: [The Study of Big Data: How CLAS Researchers Use Data Science](#)
- 2021 How Stuff Works: [Gravitational Constant Is the “G” in Newton’s Law of Universal Gravitation](#)
- 2021 Ask a Scientist Podcast: [Dr. Cara Battersby – Stars and the Universe](#)
- 2021 Universe Today: [The Core of the Milky Way is an Extreme Place](#)
- 2021 Center for Astrophysics | Harvard & Smithsonian Weekly Science Update: [Cold Dust Cores in the Central Zone of the Milky Way](#)
- 2020 NASA Goddard Feature [Piercing the Dark Birthplaces of Massive Stars with Webb](#)
- 2019 Sky & Telescope [Astronomers Dream Big, Consider Four Future Space Telescopes](#)
- 2018 UConn Today [Researcher Profile](#)
- 2018 [Nature Research Awards for Inspiring Science](#)
- 2018 Forbes [NASA’s Next Flagship Mission May Be a Crushing Disappointment for Astrophysics](#)
- 2017 UConn Eclipse Viewing in the News: *Hartford Courant: [UConn Eclipse Viewing](#); [Partial Eclipse, Complete Awe for CT](#), [Patch.com: Eclipse Viewing Tips](#); [Eclipse Event](#); [It was Eclipse and Ice Cream](#), [Stamford Advocate: Sky Gazers Ready for Solar Eclipse](#)*
- 2017 phys.org [The Lifetimes of Massive Star-Forming Regions](#)
- 2016 phys.org [The Milky Way’s central molecular zone](#)
- 2016 SciTechDaily [Astronomers Take A Closer Look at the Milky Way’s Central Molecular Zone](#)

- 2016 Astronomy Now *Unravelling the Milky Way's Central Molecular Zone*
- 2016 United Press International *New study details skeleton of the Milky Way galaxy*
- 2015 astrobit.es *The Skeleton of the Milky Way*
- 2015 AAS Nova *Companions for "Nessie" in the Milky Way's Skeleton*
- 2015 Sky & Telescope *Making Massive Stars*
- 2015 space.com *Milky Way 'Bones' Could Reveal Secrets About Our Galaxy*
- 2014 Sky & Telescope *Cooking up High-Mass Stars*

SELECTED  
SUCCESSFUL  
OBSERVING  
PROPOSALS

<b>Co-I, 9 hours</b> , James Webb Space Telescope (JWST) Cycle 1	<b>2021</b>
<i>"Star Formation along the Galactic Dust Ridge: The Brick and Cloud C"</i>	
<b>Over 130 hours as Co-I</b> on the Jansky Very Large Array (JVLA)	<b>2013-2022</b>
<b>Co-PI, 121 hours</b> , Atacama Large Millimeter Array (ALMA) Large Program	<b>2021</b>
<i>"ACES: The ALMA CMZ Exploration Survey"</i>	
<b>Co-PI, 119 hours</b> , Atacama Large Millimeter Array (ALMA) Large Program	<b>2019</b>
<i>"ALMAGAL: ALMA Evolutionary study of High Mass Protocluster Formation in the Galaxy"</i>	
<b>Over 150 hours as Co-I</b> on the Atacama Large Millimeter Array (ALMA)	<b>2013-2021</b>
<b>PI, 550 hours</b> , Submillimeter Array (SMA)	<b>2014-2017</b>
<i>"CMZoom: The SMA Legacy Survey of the Central Molecular Zone"</i>	
<b>PI, 60 hours</b> , IRAM 30-m	<b>2015</b>
<i>"Mapping the Bones of the Milky Way"</i>	
<b>Co-I, 200 hours</b> , Atacama Pathfinder Experiment (APEX)	<b>2014</b>
<i>"H<sub>2</sub>CO Thermometry of the CMZ to understand its low star formation rate"</i>	

INVITED  
SCIENTIFIC  
PRESENTATIONS

**Summary:** Cara Battersby has given 7 invited review/keynote talks, 54 invited conference presentations and colloquia, and 14 invited public talks since 2013.

**Invited Review Talks** (7 since 2013):

- Harvard-Heidelberg Star Formation Workshop Review Talk, Cambridge, MA (11/13/19), Kavli Institute of Astronomy and Astrophysics *Forum on Gas in Galaxies*, Peking, China (09/10/19), Oxford *Origins Space Telescope Meeting*, Oxford, UK (09/05/2018), EWASS *Star formation at the centre of the Galaxy* Prague (06/26/2017), CIERA Fellows at the Frontiers at Northwestern (09/01/2016), Keynote speaker for *Mass Assembly from Clouds to Clusters* at the Sixten Center for Astrophysics, Italy (07/07/2014), BASH Symposium at the University of Texas Austin (10/07/2013).

**Invited Conference Presentations and Colloquia** (54 since 2013):

- **2022:** Max Planck Institute for Radio Astronomy in Bonn Colloquium, Germany (Virtual - 07/01/22), Bath, Bristol and Cardiff - Great Western Seminar Series, UK (Virtual - 05/25/22), Pontificia Universidad Católica de Chile, Chile (Virtual - 04/26/22), Queen's University Astronomy Seminar, Canada (Virtual - 01/31/22).
- **2021:** Colby College (Virtual - 10/25/21), University of California at Santa Cruz Astrophysics Colloquium (Virtual - 05/05/21), University of Cologne Astrophysics Colloquium, Germany (Virtual - 04/26/21), American Museum of Natural History Astronomy Seminar (Virtual - 04/13/21).
- **2020:** 11th CMB-S4 Workshop: Cosmology and Astrophysics in the Next Decade Talk in the *Our Galaxy* Session (Virtual - 08/11/2020), NASA Decadal Studies Session at the American Astronomical Society (01/08/2020)
- **2019:** NASA SOFIA Science Center Colloquium (12/18/19), University of Toronto Astrophysics Colloquium (12/11/19), Purdue University Astrophysics Seminar (10/28/19), NASA

Goddard Space Flight Center Colloquium (10/01/19), Max Planck Institute for Astronomy Koenigstuhl Colloquium, Germany (07/05/2019), University of Toledo Astrophysics Colloquium (04/18/2019), Origins Space Telescope Overview at the Center for Computational Astrophysics (06/21/19), University of Massachusetts Astrophysics Colloquium (04/11/2019), The Space Astrophysics Landscape for the 2020s and Beyond, Invited Overview and Panel Chair of *Extreme Star Formation and Time Domain in Astrophysics* (04/03/2019), Yale Astrophysics Colloquium (01/24/2019)

- **2018:** Brown University Astronomy Seminar (11/29/2018), MIT Astrophysics Colloquium (11/06/2018), University of Arizona Astrophysics Colloquium (10/4/2018), Harvard-Smithsonian Center for Astrophysics Galaxies & Cosmology Seminar (03/27/2018), Oxford Workshop on Giant Molecular Clouds Oxford, UK (03/12/2018), Caltech Astrophysics Colloquium (03/07/2018), Wesleyan Astrophysics Colloquium (02/28/2018), SMA Special Session at the American Astronomical Society meeting (01/08/2018).
- **2017:** Union of Radio Science General Assembly and Scientific Symposium (08/22/2017), Trinity College Physics Seminar (03/31/2017), National Radio Astronomy Observatory Charlottesville Astronomy Colloquium (02/09/2017), Far-IR Science Interest Group Webinar (02/02/2017).
- **2016:** National Radio Astronomy Observatory Socorro Astronomy Colloquium (12/02/2016), Harvard-Heidelberg Workshop on Star Formation Heidelberg, Germany (11/08/2016), SMA Science in the Next Decade Taipei, Taiwan (10/27/2016), University of Texas Austin Astronomy Colloquium (09/14/2016), Kavli Institute for Theoretical Physics Santa Barbara *The Cold Universe* (04/25/2016), DRAO Astronomy Colloquium Penticton, BC (03/01/2016), NRC Herzberg Institute for Astronomy Colloquium Victoria, BC (02/29/2016), University of Connecticut Physics Seminar (02/11/2016), University of California, Berkeley Astronomy Colloquium (02/04/2016), Amherst College Physics and Astronomy Colloquium (01/26/2016),
- **2015:** Bates College Physics and Astronomy Colloquium (12/4/2015), University of Arizona Tucson FLASH and Origins Talks (11/13/2015), UMass Amherst Astronomy Colloquium (11/5/2015), IAU 'Scale-Free Processes' Focus Meeting Honolulu (08/13/2015), University of Florida, *Star & Planet Formation Workshop* (03/12/2015), American Museum of Natural History Colloquium, (02/05/2015).
- **2014:** National Radio Astronomy Observatory Filaments Workshop Charlottesville (10/10/2014), Boston University Astrophysics Seminar (10/14/2014), MIT Haystack Observatory Colloquium (07/24/2014), Yale University Seminar (04/07/2014).
- **2013:** University of Florida *ASTROWIN* (02/15/2013), University of Florida Seminar, (02/12/2013).

**Invited Public Talks** (14 since 2016):

- "Girls Who Code" club of Avon High presentation (05/23/22), Avon High School Classroom Presentation (12/09/19), Early College Experience Presentation to Visiting High School Teachers (09/30/19), Manchester Public Library (08/21/19), UConn Astronomy Association (04/24/2019), Wachusett Science Seminar at Holden public High School, MA (11/13/2018), Science Seminar at Avery Heights Assisted Living, Hartford, CT (10/31/2018), Sky Scrapers Amateur Astronomy Club, RI (05/11/2018), Keene Public Library in New Hampshire (03/09/2017), Sturbridge Rotary Club Massachusetts (01/30/2017), Arlington Retired Men's Club Massachusetts (10/12/2016), Aldrich Astronomical Society Massachusetts (10/08/2016), Astronomy on Tap in Cairns, Australia, (07/20/2016), Center for Astrophysics Observatory Nights, Posted online: [The Wild West of Star Formation](#) (04/21/2016).

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### Postdoctoral Fellows Advised:

**Summary:** Cara Battersby has advised 4 postdoctoral researchers.

- Dr. H Perry Hatchfield - Postdoc leading our NASA SOFIA Program “*IGNITES: Investigating Galactic Nuclear Infrared Thermal Evolution of young Stars*” program (July 2022 - present)
- Dr. Samantha Brunner - Postdoc leading our NASA ADAP program “*3-D MC: Mapping Circumnuclear Molecular Clouds from X-ray to Radio*” (June 2022 - present)
- Dr. Daniel Walker - Postdoc leading our NSF program “*3-D CMZ: Unveiling the Structure of our Galaxy’s Central Molecular Zone*”. (July 2020 - April 2022). Now an astrophysicist at the UK ALMA Regional Center.
- Dr. Molly Gallagher - Postdoc who joined to work the group to lead our NSF program “*3-D CMZ: Unveiling the Structure of our Galaxy’s Central Molecular Zone*” but had to resign early due to medical issues. (Fall 2019).

### Students Advised and Co-Advised:

**Summary:** Cara Battersby has advised or co-advised 35 research students since 2013.

- **Two Current Graduate Students:**
  - Dani Lipman - UConn Graduate Student - “*3-D CMZ: Uncovering the Structure of our Galaxy’s Central Molecular Zone*” (Fall 2020 - present)
  - Jennifer Wallace - UConn Graduate Student - “*Cataloging High-Mass Star Formation from the Galactic Disk to the Galactic Center*” (Spring 2020 - present)
- **Six former Graduate Students**
  - H Perry Hatchfield - UConn Graduate Student - “*Star Formation in the Central Molecular Zone*” (Summer 2017 - Spring 2022), completed PhD in Spring 2022.
  - Yiyang Kuang - UConn Graduate Student - “*Simulated Observations of the Core Mass Function*” (Fall 2020), short-term project.
  - Steven Walczyk - UConn Graduate Student - “*Tidal Compression of Clouds in the Central Molecular Zone*” (Spring 2019 - Fall 2019), short-term project.
  - Mark Graham - Southampton Master’s Student at Harvard - “*Extreme Star Formation in the Center of Our Galaxy*” (2014 - 2015), completed Master’s in 2015.
  - Catherine Zucker - Harvard Graduate Student (primary adviser Alyssa Goodman) - “*Milky Way Bones*” (2014 - 2018), completed PhD in 2020.
  - Brian Svoboda - Graduate Student at University of Arizona (primary adviser Yancy L. Shirley) - “*The Nature of Starless Clumps*” (2013 - 2018), completed PhD in 2018.
- **Twenty UConn Undergraduate Students:** Taevis Kolz (Spring 2022 - present), Stefania Schuler (Fall 2021 - present), Lexie DeMarco (Summer 2021 - Spring 2022), Danya Albolani (Spring 2021 - present), Eric Hilhorst (Spring 2020 - Spring 2021), Hannah Koziol (Spring 2020 - Spring 2022), Payal Shah (Spring 2020 - Spring 2022), Eddie Herndon (Fall 2019 - Spring 2021), Sean Oh (Fall 2019 - Spring 2020), Bryan Garcia-Medina (Fall 2019 - Spring 2020), Jonah Cerbin (Spring 2019), Joseph Giangregorio (Fall 2017 - Spring 2019), Alice Hall (Spring 2018 - Summer 2019), Aisha Massiah (2018, Spring 2021), Brian Zelickovics (Spring 2018), Anthony (Josh) Machado (Spring 2018 - Summer 2020), Alexa Abul (Fall 2017 - Spring 2018), Christopher Annuzzi (Fall 2017 - Fall 2018), Cooper Biancur (Fall 2017 - Spring 2018), Stephanie Santillo (Fall 2017).
- **Seven other Undergraduate and High School Students:** Elizabeth Gutierrez - Harvard Banner Summer Student (co-adviser: Meredith MacGregor) (2017), Emma Kleiner - Nyack High School Student (2016-2018), Irene Vargas-Salzar - Harvard Summer REU student (2016), Dennis Lee - Harvard undergraduate student (2015 - 2016), Jimmy Castaño - Harvard undergraduate student (2015 - 2016), Liz Gehret - Harvard Summer REU student (2015 - 2016), AJ Cohn - Harvard undergraduate student (2015 - 2017).



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TEACHING

**Developed and Instructed an Advanced Physics Course for Undergraduate Majors and Graduate Students:** PHYS 4720/6720: Galaxies and the Interstellar Medium, University of Connecticut, Storrs, CT.

- Taught Spring 2021 online. *SET median scores of 5.0 for instructor and 5.0 for course*

**Helped to Overhaul and Instructed a Large, Interactive Physics Course for Non-Majors:** PHYS 1025Q: Introductory Astronomy, University of Connecticut, Storrs, CT.

- Taught Spring 2022. *SET median scores of 5.0 for instructor and 4.5 for course Spring 2022*
- Taught Spring 2020. *SET median scores of 5.0 for instructor and 5.0 for course Spring 2020*
- Taught Spring 2019. *SET median scores of 5.0 for instructor and 5.0 for course Spring 2019*

**Developed and Instructed a New Interactive Physics Course for Majors:** PHYS 2701: The Foundations of Modern Astrophysics, University of Connecticut, Storrs, CT.

- Taught Fall 2017, Fall 2018, Fall 2019, Fall 2021. *SET median scores of 5.0 for instructor and 5.0 for course 2017, 2018, 2019, 2021.*
- [Six student Astrobites published](#) based on work in this class. The Astrobite activity for this class was highlighted on their website: [Writing Astrobites in Your Courses!](#)

**Additional Teaching:**

***Measuring the Stars for the Astronomy Summer Course at the Stedu Association,*** a youth-led non-profit that is focused on making STEM education more accessible.

- Taught July 16, 2021.

***Big Data and Computation Workshop***

- Taught at the UConn Summer BRIDGE+ Program August 19, 2021 • Guest lecture in the PHYS 2200 Computation Physics, November 3, 2021

***The Holistic STEMInist: Work Life Balance***

- Taught at the UConn Summer BRIDGE+ Program August 24, 2021 • Astronomy Seminar Series Professional Development Workshop, December 8, 2021
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SELECTED  
SERVICE

**UConn Service:**

- **Advising and Mentorship:**
  - Founder of the UConn STARs Program, Spring 2022-present.
  - Co-founder of the UConn Graduate BRIDGE+ Program, Summer 2021.
  - Cientifico Latino Graduate Student Mentoring Initiative ([GSMI](#)) Mentor Fall 2020, Fall 2021
  - Informal Mentor (meet for career advice, navigating challenges, etc.) for tens of UConn graduate and undergraduate students in the Astronomy program (Fall 2017 - present)
  - Research Mentor to 20 UConn undergraduate students and 5 graduate students. Wrote over 100 reference letters for over 40 students and postdocs, including 36 UConn undergraduate and 2 UConn graduate students (Fall 2017-present)
  - UConn Physics Club Faculty Advisor (Fall 2018 - Spring 2022)
  - Undergrad Faculty Mentor for SPS Chapter (Spring 2019, 2020, 2021, 2022)
  - UConn Astronomy Association Faculty Advisor (2018 - present)
  - Organizer for Graduate Student Fellowship Information Presentation (Fall 2017 & 2018)
- **Student Project / Thesis Committees**
  - PhD Thesis Exam Committee Member for Gloria Fonseca Alvarez (06/08/22)
  - Dissertation Proposal Defense Committee Member for J. Andrew Casey-Clyde (05/17/22)
  - General Oral Exam Committee Chair for Jennifer Wallace (04/28/22)
  - Dissertation Proposal Defense Committee Member for Bren Backhaus (04/18/22)
  - PhD Thesis Exam Committee Chair for H Perry Hatchfield (04/08/22)

- University Scholar Program Committee Member for Nathan Wetherell (2020-2022)
- PhD Thesis Exam Committee Member for Mohammad Akhshik (02/04/22)
- Dissertation Proposal Defense Committee Member for Jonathan Mercedes-Feliz (01/24/22)
- Dissertation Proposal Defense Committee Member for Gloria Fonseca Alvarez (07/14/21)
- Master's Thesis Exam Committee Member for Nikko Cleri (03/18/2021)
- PhD Thesis Exam Committee Member for Yasaman Homayouni (02/26/2021)
- Dissertation Proposal Defense Chair for H Perry Hatchfield (04/25/2019)
- Dissertation Proposal Defense Committee Member for Mohammed Akhshik (11/02/2018)
- University Scholar Program Committee Member for Emmerson Dang (2017-2018)
- Dissertation Proposal Defense Committee Member for Yasaman Homayouni (05/19/2017)
- **Committees:**
  - Department of Physics Advisory Committee (Fall 2019 - Spring 2022)
  - Astronomy Seminar Committee Chair (Fall 2019 - present)
  - CLAS Big Data Task Force Committee Member (Spring 2019)
  - Faculty Search Committee Member (Fall 2018 - Spring 2019)
  - Furniture Committee Member (Fall 2018 - Spring 2019)
- **Development of UConn Astrophysics Program:**
  - Facilitator of Professional Development Seminars / Discussions at least once per semester in UConn Astronomy (Fall 2017 - present)
  - Lead Development of Interactive New Advanced Astrophysics Course PHYS 4720/6720 (2021) and New Astrophysics Course for Majors PHYS 2701 (2017)
  - Addition and co-development of 6 new Astrophysics Courses: PHYS 2701, 2702, 4710, 4720, 4740, and 1040QE along with Profs. Whitaker and Trump (2016-2021)
  - Helped to overhaul and update PHYS1025Q (2019)
  - Co-Development of Astrophysics Minor, along with Profs. Whitaker and Trump (2017)

#### **Service to Scientific Community:**

- **NSF Program Reviews**
  - Green Bank Observatory (GBO) NSF Program Review (2021)
  - National Radio Astronomy Observatory (NRAO) NSF Program Review (2018)
- **Proposal Review Panels:**
  - NASA Astrophysics Data Analysis Program, Chair (2020)
  - Large Millimeter Telescope Proposal Review Committee (2020)
  - Atacama Large Millimeter Array Time Allocation Committee (2019)
  - NASA Hubble Postdoctoral Fellowship Program (2018)
  - Smithsonian Astrophysics Observatory Submillimeter Array (2015-2017)
  - NASA Astrophysics Data Analysis Program (2015)
- **External PhD Thesis Defense Committee Member:**
  - Boston University, Taylor Hogge, (Dec. 2018 - Oct. 2021)
  - University of Victoria, Jared Keown (Sept. 2019)
- **Referee:** Astrophysical Journal (*ApJ*), Astronomy & Astrophysics (*A&A*), Nature Astronomy
- **Co-I and Science Working Group Lead for the PRIMA Far-IR Probe Mission Concept** (February 2022 - present)
- **NASA-appointed member of the Science & Technology Definition Team (STDT): Origins Space Telescope (OST)** (March 2016 - January 2020)
- **NASA OST Group Leader** for:
  - The Milky Way, ISM, and Local Galaxy Science Group (2016 - 2020)
  - The OST Advocacy Group (2017 - 2020)

- **Science Organizing Committees:**

- European Astronomical Society Symposium *The golden decade of infrared astrophysics*, Valencia, Spain, Summer 2022
- New England Star Formation Workshop, UConn (01/17/20)
- Galactic Center Workshop, *New Horizons in the Galactic Center Astronomy and Beyond*, Keio University, Japan 2019
- Olympian Symposium *Gas and Stars from milli- to mega-parsecs*, Greece in 2018
- Chair of the Science and Local Organizing Committees for the [Harvard-Heidelberg Workshop on Star Formation](#) in 2015

**Founder of UConn STARS** (Science Technology & Astronomy Recruits, Spring 2022 - present):

- New program to recruit and retain students from historically excluded groups in the physics major. Launched in Spring 2022, supported by a CLAS DEI grant. Program will be supported by Battersby's NSF CAREER grant for five years starting in Fall 2022
- Professional development, social activities, and community engagement as well as dedicated one-on-one mentorship for each participant.
- Spring 2022 highlights: 7 participants with 3 returning as co-leads. We hosted 15 SAND elementary school students at UConn, including bus transport, a power plant tour, and a visit to the Dairy Bar (04/29/22). We developed 4 lesson plans and led four class sessions over two days at the SAND Elementary School in Hartford (5/9/22 and 5/13/22).

**Co-Founder of the UConn Graduate BRIDGE+ program (2021 - present):**

- Co-founded in 2021, led by the Vergano Institute for Inclusion in the School of Engineering and funded through the Presidents Commitment to Community Initiative.
- A summer bridge program for incoming UConn STEM graduate students from traditionally underrepresented backgrounds.
- Taught two course sessions in Summer 2021, one entitled Big Data and Computation and the other The Holistic STEMInist: Work-Life Balance. (08/19/21 and 08/24/21)

**Co-Founder and Leader of BiteScis (2014 - 2020):**

- A program that brings together science graduate students with K-12 teachers to develop lesson plans to bring modern science research into the K-12 classroom.
- BiteScis has produced more than 25 new classroom-tested, scientist-approved lesson plans, freely available on our website [bitescिस.org](http://bitescिस.org).
- Granted \$215k from the Templeton Foundation

**Co-Founder and Leader of CU-STARs (2010-2013):** Founded a new program at CU-Boulder to retain undergraduate students from traditionally underrepresented backgrounds in STEM during their first year. Estimated to have impacted 50 undergraduate and hundreds of high school students.

**Additional Highlighted Outreach Activities:**

- Led Astronomy Activity at Hartford Schools Physics Open House. (April 2018)
- Co-organized solar eclipse viewing party. (August 2017)
- Science Advisor for the Play "The Women who Mapped the Stars" by Joyce Van Dyke, premiering at the Central Square Theater. (07/01/2016 - 09/01/2017)
- [ComSciCon](#) workshop organizer (2015-2017)
- [WorldWide Telescope Ambassador](#) (2014-2016)
- Leader of the Colorado Women in Astronomy Group (2010-2012)



# PROF. CARA BATTERSBY

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## PUBLICATIONS

**Summary:** Cara Battersby has an h-index of 36, is an author on 79 refereed publications with a total citation count of 4,627 (computed August 2022 from the NASA Astrophysics Data Service Page). Complete publication list is below.

### First and Second Author or Advised Student Lead

- [1] Wallace, J., **Battersby, Cara**, Mills, E. A. C., Henshaw, J. D., Sormani, M. C., Ginsburg, A., Barnes, A. T., Hatchfield, H. P., Glover, S. C. O., & Anderson, L. D., *ALMA Uncovers Highly Filamentary Structure Towards the Sgr E Region*, August. 2022, Submitted to ApJ
- [2] Hatchfield, H. P., Sormani, M. C., Tress, R. G., **Battersby, Cara**, Smith, R. J., Glover, S. C. O., & Klessen, R. S., *Dynamically Driven Inflow onto the Galactic Center and its Effect upon Molecular Clouds*, November. 2021, ApJ, 922, 79 [\[ADS\]](#)
- [3] Hatchfield, H. P., **Battersby, Cara**, Keto, E., Walker, D., Barnes, A., Callanan, D., Ginsburg, A., Henshaw, J. D., Kauffmann, J., Kruijssen, J. M. D., Longmore, S. N., Lu, X., Mills, E. A. C., Pillai, T., Zhang, Q., Bally, J., Butterfield, N., Contreras, Y. A., Ho, L. C., Ott, J., Patel, N., & Tolls, V., *CMZoom. II. Catalog of Compact Submillimeter Dust Continuum Sources in the Milky Way's Central Molecular Zone*, November. 2020, ApJS, 251, 14 [\[ADS\]](#)
- [4] **Battersby, C.**, Keto, E., Walker, D., Barnes, A., Callanan, D., Ginsburg, A., Hatchfield, H. P., Henshaw, J., Kauffmann, J., Kruijssen, J. M. D., Longmore, S. N., Lu, X., Mills, E. A. C., Pillai, T., Zhang, Q., Bally, J., Butterfield, N., Contreras, Y. A., Ho, L. C., Ott, J., Patel, N., & Tolls, V., *CMZoom: Survey Overview and First Data Release*, August. 2020, ApJS, 249, 35 [\[ADS\]](#)
- [5] Zucker, C., **Battersby, Cara**, & Goodman, A., *Physical Properties of Large-scale Galactic Filaments*, September. 2018, ApJ, 864, 153 [\[ADS\]](#)
- [6] **Battersby, Cara**, Armus, L., Bergin, E., Kataria, T., Meixner, M., Pope, A., Stevenson, K. B., Cooray, A., Leisawitz, D., Scott, D., Bauer, J., Bradford, C. M., Ennico, K., Fortney, J. J., Kaltenegger, L., Melnick, G. J., Milam, S. N., Narayanan, D., Padgett, D., Pontoppidan, K., Roellig, T., Sandstrom, K., Su, K. Y. L., Vieira, J., Wright, E., Zmuidzinas, J., Staguhn, J., Sheth, K., Benford, D., Mamajek, E. E., Neff, S. G., Carey, S., Burgarella, D., De Beck, E., Gerin, M., Helmich, F. P., Moseley, S. H., Sakon, I., & Wiedner, M. C., *The Origins Space Telescope*, August. 2018, Nature Astronomy, 2, 596 [\[ADS\]](#)
- [7] **Battersby, C.**, Bally, J., & Svoboda, B., *The Lifetimes of Phases in High-mass Star-forming Regions*, February. 2017, ApJ, 835, 263 [\[ADS\]](#)
- [8] Mills, E. A. C. & **Battersby, C.**, *Origins of Scatter in the Relationship between HCN 1-0 and Dense Gas Mass in the Galactic Center*, January. 2017, ApJ, 835, 76 [\[ADS\]](#)
- [9] Svoboda, B. E., Shirley, Y. L., **Battersby, C.**, Rosolowsky, E. W., Ginsburg, A. G., Ellsworth-Bowers, T. P., Pestalozzi, M. R., Dunham, M. K., Evans, II, N. J., Bally, J., & Glenn, J., *The Bolocam Galactic Plane Survey. XIV. Physical Properties of Massive Starless and Star-forming Clumps*, May. 2016, ApJ, 822, 59 [\[ADS\]](#)
- [10] Zucker, C. & **Battersby, C.** and Goodman, A., *The Skeleton of the Milky Way*, December. 2015, ApJ, 815, 23 [\[ADS\]](#)
- [11] **Battersby, C.**, Ginsburg, A., Bally, J., Longmore, S., Dunham, M., & Darling, J., *The Onset of Massive Star Formation: The Evolution of Temperature and Density Structure in an Infrared Dark Cloud*, June. 2014, ApJ, 787, 113 [\[ADS\]](#)

- [12] **Battersby, C.**, Bally, J., Dunham, M., Ginsburg, A., Longmore, S., & Darling, J., *The Comparison of Physical Properties Derived from Gas and Dust in a Massive Star-forming Region*, May. 2014, ApJ, 786, 116 [\[ADS\]](#)
- [13] **Battersby, C. D.** 2013, in *The Formation of Massive Stars and Star Clusters in the Milky Way New Horizons in Astronomy (BASH 2013) - Invited Review Paper* [\[ADS\]](#)
- [14] **Battersby, C.**, Bally, J., Ginsburg, A., Bernard, J.-P., Brunt, C., Fuller, G. A., Martin, P., Molinari, S., Mottram, J., Peretto, N., Testi, L., & Thompson, M. A., *Characterizing precursors to stellar clusters with Herschel*, November. 2011, A&A, 535, A128 [\[ADS\]](#)
- [15] **Battersby, C.**, Bally, J., Jackson, J. M., Ginsburg, A., Shirley, Y. L., Schlingman, W., & Glenn, J., *An Infrared Through Radio Study of the Properties and Evolution of IRDC Clumps*, September. 2010, ApJ, 721, 222 [\[ADS\]](#)

## Other Collaborative Publications

- [1] Williams, B. A., Walker, D. L., Longmore, S. N., Barnes, A. T., **Battersby, Cara**, Garay, G., Ginsburg, A., Gomez, L., Henshaw, J. D., Ho, L. C., Kruijssen, J. M. D., Lu, X., Mills, E. A. C., Petkova, M. A., & Zhang, Q., *The initial conditions for young massive cluster formation in the Galactic Centre: convergence of large-scale gas flows*, July. 2022, MNRAS, 514, 578 [\[ADS\]](#)
- [2] Ginsburg, A., Csengeri, T., Galván-Madrid, R., Cunningham, N., Álvarez-Gutiérrez, R. H., Baug, T., Bonfand, M., Bontemps, S., Busquet, G., Díaz-González, D. J., Fernández-López, M., Guzmán, A., Herpin, F., Liu, H., López-Sepulcre, A., Louvet, F., Maud, L., Motte, F., Nakamura, F., Nony, T., Olguin, F. A., Pouteau, Y., Sanhueza, P., Stutz, A. M., Towner, A. P. M., ALMA-IMF Consortium, Armante, M., **Battersby, C.**, Bronfman, L., Braine, J., Brouillet, N., Chapillon, E., Di Francesco, J., Gusdorf, A., Izumi, N., Joncour, I., Walker Lu, X., Men'shchikov, A., Menten, K. M., Moraux, E., Molet, J., Mundy, L., Nguyen Luong, Q., Reyes-Reyes, S. D., Robitaille, J., Rosolowsky, E., Sandoval-Garrido, N. A., Svoboda, B., Tatematsu, K., Walker, D. L., Whitworth, A., Wu, B., & Wyrowski, F., *ALMA-IMF. II. Investigating the origin of stellar masses: Continuum images and data processing*, June. 2022, A&A, 662, A9 [\[ADS\]](#)
- [3] Motte, F., Bontemps, S., Csengeri, T., Pouteau, Y., Louvet, F., Stutz, A. M., Cunningham, N., López-Sepulcre, A., Brouillet, N., Galván-Madrid, R., Ginsburg, A., Maud, L., Men'shchikov, A., Nakamura, F., Nony, T., Sanhueza, P., Álvarez-Gutiérrez, R. H., Armante, M., Baug, T., Bonfand, M., Busquet, G., Chapillon, E., Díaz-González, D., Fernández-López, M., Guzmán, A. E., Herpin, F., Liu, H. L., Olguin, F., Towner, A. P. M., Bally, J., **Battersby, C.**, Braine, J., Bronfman, L., Chen, H. R. V., Dell'Ova, P., Di Francesco, J., González, M., Gusdorf, A., Hennebelle, P., Izumi, N., Joncour, I., Lee, Y. N., Lefloch, B., Lesaffre, P., Lu, X., Menten, K. M., Mignion-Risse, R., Molet, J., Moraux, E., Mundy, L., Nguyen Luong, Q., Reyes, N., Reyes Reyes, S. D., Robitaille, J. F., Rosolowsky, E., Sandoval-Garrido, N. A., Schuller, F., Svoboda, B., Tatematsu, K., Thomasson, B., Walker, D., Wu, B., Whitworth, A. P., & Wyrowski, F., *ALMA-IMF. I. Investigating the origin of stellar masses: Introduction to the Large Program and first results*, June. 2022, A&A, 662, A8 [\[ADS\]](#)
- [4] Myers, P. C., Hatchfield, H. P., & **Battersby, Cara**, *Virial Clumps in Central Molecular Zone Clouds*, April. 2022, ApJ, 929, 34 [\[ADS\]](#)
- [5] Henshaw, J. D., Barnes, A. T., **Battersby, Cara**, Ginsburg, A., Sormani, M. C., & Walker, D. L., *Star Formation in the Central Molecular Zone of the Milky Way*, March. 2022, To appear in Protostars and Planets VII; Editors: Shu-ichiro Inutsuka, Yuri Aikawa, Takayuki Muto, Kengo Tomida, and Motohide Tamura, arXiv:2203.11223 [\[ADS\]](#)
- [6] Henshaw, J. D., Krumholz, M. R., Butterfield, N. O., Mackey, J., Ginsburg, A., Haworth, T. J., Noguerras-Lara, F., Barnes, A. T., Longmore, S. N., Bally, J., Kruijssen, J. M. D., Mills, E. A. C., Beuther, H., Walker, D. L., **Battersby, Cara**, Bulatek, A., Henning, T., Ott, J., & Soler, J. D., *A wind-blown bubble in the Central Molecular Zone cloud G0.253+0.016*, February. 2022, MNRAS, 509, 4758 [\[ADS\]](#)

- [7] Stephens, I. W., Myers, P. C., Zucker, C., Jackson, J. M., Andersson, B. G., Smith, R., Soam, A., **Battersby, Cara**, Sanhueza, P., Hogge, T., Smith, H. A., Novak, G., Sadavoy, S., Pillai, T. G. S., Li, Z.-Y., Looney, L. W., Sugitani, K., Coudé, S., Guzmán, A., Goodman, A., Kusune, T., Santos, F. P., Zuckerman, L., & Encalada, F., *The Magnetic Field in the Milky Way Filamentary Bone G47*, February. 2022, ApJ, 926, L6 [\[ADS\]](#)
- [8] Walker, C. K., Chin, G., Aalto, S., Anderson, C. M., Arenberg, J. W., **Battersby, Cara**, Bergin, E., Bergner, J., Biver, N., BJORAKER, G. L., Carr, J., Cavalié, T., De Beck, E., DiSanti, M. A., Hartogh, P., Hunt, L. K., Kim, D., Takashima, Y., Kulesa, C., Leisawitz, D., Najita, J., Rigopoulou, D., Schwarz, K., Shirly, Y., Stark, A. A., Tielens, X., Viti, S., Wilner, D., Wollack, E., & Young, E. 2021, in Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, Vol. 11820, Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, 1182000 [\[ADS\]](#)
- [9] Walker, D. L., Longmore, S. N., Bally, J., Ginsburg, A., Kruijssen, J. M. D., Zhang, Q., Henshaw, J. D., Lu, X., Alves, J., Barnes, A. T., **Battersby, Cara**, Beuther, H., Contreras, Y. A., Gómez, L., Ho, L. C., Jackson, J. M., Kauffmann, J., Mills, E. A. C., & Pillai, T., *Star formation in 'the Brick': ALMA reveals an active protocluster in the Galactic centre cloud G0.253+0.016*, May. 2021, MNRAS, 503, 77 [\[ADS\]](#)
- [10] Lu, X., Li, S., Ginsburg, A., Longmore, S. N., Kruijssen, J. M. D., Walker, D. L., Feng, S., Zhang, Q., **Battersby, Cara**, Pillai, T., Mills, E. A. C., Kauffmann, J., Cheng, Y., & Inutsuka, S.-i., *ALMA Observations of Massive Clouds in the Central Molecular Zone: Ubiquitous Protostellar Outflows*, March. 2021, ApJ, 909, 177 [\[ADS\]](#)
- [11] Orr, M. E., Hatchfield, H. P., **Battersby, Cara**, Hayward, C. C., Hopkins, P. F., Wetzel, A., Benincasa, S. M., Loebman, S. R., Sormani, M. C., & Klessen, R. S., *Fiery Cores: Bursty and Smooth Star Formation Distributions across Galaxy Centers in Cosmological Zoom-in Simulations*, February. 2021, ApJ, 908, L31 [\[ADS\]](#)
- [12] Leisawitz, D., Amatucci, E., Allen, L., Arenberg, J., Armus, L., **Battersby, Cara**, Bauer, J., Beaman, B. G., Bell, R., Beltran, P., Benford, D., Bergin, E., Bolognese, J., Bradford, C. M., Bradley, D., Burgarella, D., Carey, S., Carter, R., (Danny) Chi, J. D., Cooray, A., Corsetti, J., D'Asto, T., De Beck, E., Denis, K., Derkacz, C., Dewell, L., DiPirro, M., Earle, C. P., East, M., Edgington, S., Ennico, K., Fantano, L., Feller, G., Folta, D., Fortney, J., Gavares, B. J., Generie, J., Gerin, M., Granger, Z., Greene, T. P., Griffiths, A., Harpole, G., Harvey, K., Helmich, F., Hilliard, L., Howard, J., Jacoby, M., Jamil, A., Jamison, T., Kaltenecker, L., Kataria, T., Knight, J. S., Knollenberg, P., Lawrence, C., Lightsey, P., Lipsky, S., Mamajek, E., Martins, G., Mather, J. C., Meixner, M., Melnick, G., Milam, S., Mooney, T., Moseley, S. H., Narayanan, D., Neff, S., Nguyen, T., Nordt, A., Olson, J., Padgett, D., Petach, M., Petro, S., Pohner, J., Pontoppidan, K., Pope, A., Ramspacker, D., Rao, A., Roellig, T., Sakon, I., Sandin, C., Sandstrom, K., Scott, D., Seals, L., Sheth, K., Sokolsky, L. M., Staguhn, J., Steeves, J., Stevenson, K., Stoneking, E., Su, K., Tajdaran, K., Tompkins, S., Vieira, J., Webster, C., Wiedner, M. C., Wright, E. L., Wu, C., & Zmuidzinas, J., *Origins Space Telescope: baseline mission concept*, January. 2021, Journal of Astronomical Telescopes, Instruments, and Systems, 7, 011002 [\[ADS\]](#)
- [13] Leisawitz, D., Amatucci, E., Allen, L., Arenberg, J., Armus, L., **Battersby, Cara**, Bauer, J., Bell, R., Benford, D., Bergin, E., Booth, J. T., Bradford, C. M., Bradley, D., Carey, S., Carter, R., Cooray, A., Corsetti, J., Dewell, L., DiPirro, M., Drake, B. G., East, M., Ennico, K., Feller, G., Flores, A., Fortney, J., Granger, Z., Greene, T. P., Howard, J., Kataria, T., Knight, J. S., Lawrence, C., Lightsey, P., Mather, J. C., Meixner, M., Melnick, G., McMurtry, C., Milam, S., Moseley, S. H., Narayanan, D., Nordt, A., Padgett, D., Pontoppidan, K., Pope, A., Rafanelli, G., Redding, D. C., Rieke, G., Roellig, T., Sakon, I., Sandin, C., Sandstrom, K., Sengupta, A., Sheth, K., Sokolsky, L. M., Staguhn, J., Steeves, J., Stevenson, K., Su, K., Vieira, J., Webster, C., Wiedner, M., Wright, E. L., Wu, C., Yanatsis, D., Zmuidzinas, J., & Origins Space Telescope Mission Concept and Study Team, *Origins Space Telescope: trades and decisions leading to the baseline mission concept*, January. 2021, Journal of Astronomical Telescopes, Instruments, and Systems, 7, 011014 [\[ADS\]](#)
- [14] Meixner, M., Cooray, A., Leisawitz, D. T., Staguhn, J. G., Armus, L., **Battersby, Cara**, Bauer, J., Benford, D., Bergin, E., Bradford, C. M., Burgarella, D., Carey, S., De Beck, E., Ennico-Smith, K., Fortney, J. J., Gerin, M., Helmich, F. P., Kataria, T., Mamajek, E. E., Melnick, G. J., Milam, S. N., Moseley, S. H., Narayanan, D., Neff, S. G., Padgett, D., Pontoppidan, K., Pope, A., Roellig, T. L.,

- Sakon, I., Sandstrom, K., Scott, D., Sheth, K., Stevenson, K. B., Su, K. Y., Vieira, J., Wiedner, M. C., Wright, E., Zmuidzinas, J., & Origins Study Team, *Origins Space Telescope science drivers to design traceability*, January. 2021, *Journal of Astronomical Telescopes, Instruments, and Systems*, 7, 011012 [ADS]
- [15] Wiedner, M. C., Aalto, S., Amatucci, E. G., Baryshev, A., **Battersby, Cara**, Belitsky, V., Bergin, E. A., Borgo, B., Carter, R. C., Caux, E., Cooray, A., Corsetti, J. A., De Beck, E., Delorme, Y., Desmaris, V., Dipirro, M. J., Ellison, B., Di Giorgio, A. M., Eggens, M., Gallego, J.-D., Gerin, M., Goldsmith, P. F., Goldstein, C., Helmich, F., Herpin, F., Hills, R. E., Hogerheijde, M. R., Hunt, L. K., Jellema, W., Keizer, G., Krieg, J.-M., Kroes, G., Laporte, P., Laurens, A., Leisawitz, D. T., Lis, D. C., Martins, G. E., Mehdi, I., Meixner, M., Melnick, G., Milam, S. N., Neufeld, D. A., Nguyen Tuong, N., Plume, R., Pontoppidan, K. M., Quartier-Dagorn, B., Risacher, C., Staguhn, J. G., Tong, E., Viti, S., & Wyrowski, F., *Heterodyne Receiver for Origins*, January. 2021, *Journal of Astronomical Telescopes, Instruments, and Systems*, 7, 011007 [ADS]
- [16] Tress, R. G., Sormani, M. C., Glover, S. C. O., Klessen, R. S., **Battersby, Cara D.**, Clark, P. C., Hatchfield, H. P., & Smith, R. J., *Simulations of the Milky Way's central molecular zone - I. Gas dynamics*, December. 2020, *MNRAS*, 499, 4455 [ADS]
- [17] Sormani, M. C., Tress, R. G., Glover, S. C. O., Klessen, R. S., **Battersby, Cara D.**, Clark, P. C., Hatchfield, H. P., & Smith, R. J., *Simulations of the Milky Way's Central Molecular Zone - II. Star formation*, October. 2020, *MNRAS*, 497, 5024 [ADS]
- [18] Wang, Y., Beuther, H., Schneider, N., Meidt, S. E., Linz, H., Ragan, S., Zucker, C., **Battersby, C.**, Soler, J. D., Schinnerer, E., Bigiel, F., Colombo, D., & Henning, T., *Dense gas in a giant molecular filament*, September. 2020, *A&A*, 641, A53 [ADS]
- [19] Henshaw, J. D., Kruijssen, J. M. D., Longmore, S. N., Riener, M., Leroy, A. K., Rosolowsky, E., Ginsburg, A., **Battersby, Cara**, Chevance, M., Meidt, S. E., Glover, S. C. O., Hughes, A., Kainulainen, J., Klessen, R. S., Schinnerer, E., Schrubba, A., Beuther, H., Bigiel, F., Blanc, G. A., Emsellem, E., Henning, T., Herrera, C. N., Koch, E. W., Pety, J., Ragan, S. E., & Sun, J., *Ubiquitous velocity fluctuations throughout the molecular interstellar medium*, July. 2020, *Nature Astronomy*, 4, 1064 [ADS]
- [20] Lu, X., Cheng, Y., Ginsburg, A., Longmore, S. N., Kruijssen, J. M. D., **Battersby, Cara**, Zhang, Q., & Walker, D. L., *ALMA Observations of Massive Clouds in the Central Molecular Zone: Jeans Fragmentation and Cluster Formation*, May. 2020, *ApJ*, 894, L14 [ADS]
- [21] Svoboda, B. E., Shirley, Y. L., Traficante, A., **Battersby, Cara**, Fuller, G. A., Zhang, Q., Beuther, H., Peretto, N., Brogan, C., & Hunter, T., *ALMA Observations of Fragmentation, Substructure, and Protostars in High-mass Starless Clump Candidates*, November. 2019, *ApJ*, 886, 36 [ADS]
- [22] Lu, X., Mills, E. A. C., Ginsburg, A., Walker, D. L., Barnes, A. T., Butterfield, N., Henshaw, J. D., **Battersby, Cara**, Kruijssen, J. M. D., Longmore, S. N., Zhang, Q., Bally, J., Kauffmann, J., Ott, J., Rickert, M., & Wang, K., *A Census of Early-phase High-mass Star Formation in the Central Molecular Zone*, October. 2019, *ApJS*, 244, 35 [ADS]
- [23] Sormani, M. C., Treß, R. G., Glover, S. C. O., Klessen, R. S., Barnes, A. T., **Battersby, Cara D.**, Clark, P. C., Hatchfield, H. P., & Smith, R. J., *The geometry of the gas surrounding the Central Molecular Zone: on the origin of localized molecular clouds with extreme velocity dispersions*, Oct. 2019, *Monthly Notices of the Royal Astronomical Society*, 488, 4663 [ADS]
- [24] Barnes, A. T., Longmore, S. N., Avison, A., Contreras, Y., Ginsburg, A., Henshaw, J. D., Rathborne, J. M., Walker, D. L., Alves, J., Bally, J., **Battersby, C.**, Beltrán, M. T., Beuther, H., Garay, G., Gomez, L., Jackson, J., Kainulainen, J., Kruijssen, J. M. D., Lu, X., Mills, E. A. C., Ott, J., & Peters, T., *Young massive star cluster formation in the Galactic Centre is driven by global gravitational collapse of high-mass molecular clouds*, Jun. 2019, *MNRAS*, 486, 283 [ADS]
- [25] Henshaw, J. D., Ginsburg, A., Haworth, T. J., Longmore, S. N., Kruijssen, J. M. D., Mills, E. A. C., Sokolov, V., Walker, D. L., Barnes, A. T., Contreras, Y., Bally, J., **Battersby, C.**, Beuther, H., Butterfield, N., Dale, J. E., Henning, T., Jackson, J. M., Kauffmann, J., Pillai, T., Ragan, S., Riener, M., & Zhang, Q., *'The Brick' is not a brick: a comprehensive study of the structure and dynamics of the central molecular zone cloud G0.253+0.016*, May. 2019, *MNRAS*, 485, 2457 [ADS]



- [26] Kruijssen, J. M. D., Dale, J. E., Longmore, S. N., Walker, D. L., Henshaw, J. D., Jeffreson, S. M. R., Petkova, M. A., Ginsburg, A., Barnes, A. T., **Battersby, C. D.**, Immer, K., Jackson, J. M., Keto, E. R., Krieger, N., Mills, E. A. C., Sánchez-Monge, Á., Schmiedeke, A., Suri, S. T., & Zhang, Q., *The dynamical evolution of molecular clouds near the Galactic Centre - II. Spatial structure and kinematics of simulated clouds*, Apr. 2019, MNRAS, 484, 5734 [\[ADS\]](#)
- [27] Lu, X., Zhang, Q., Kauffmann, J., Pillai, T., Ginsburg, A., Mills, E. A. C., Kruijssen, J. M. D., Longmore, S. N., **Battersby, C.**, Cara, Liu, H. B., & Gu, Q., *Star Formation Rates of Massive Molecular Clouds in the Central Molecular Zone*, Feb. 2019, ApJ, 872, 171 [\[ADS\]](#)
- [28] Ginsburg, A., Bally, J., Barnes, A., Bastian, N., **Battersby, C.**, Beuther, H., Brogan, C., Contreras, Y., Corby, J., Darling, J., De Pree, C., Galván-Madrid, R., Garay, G., Henshaw, J., Hunter, T., Kruijssen, J. M. D., Longmore, S., Lu, X., Meng, F., Mills, E. A. C., Ott, J., Pineda, J. E., Sánchez-Monge, Á., Schilke, P., Schmiedeke, A., Walker, D., & Wilner, D., *Distributed Star Formation throughout the Galactic Center Cloud Sgr B2*, February. 2018, ApJ, 853, 171 [\[ADS\]](#)
- [29] Walker, D. L., Longmore, S. N., Zhang, Q., **Battersby, C.**, Keto, E., Kruijssen, J. M. D., Ginsburg, A., Lu, X., Henshaw, J. D., Kauffmann, J., Pillai, T., Mills, E. A. C., Walsh, A. J., Bally, J., Ho, L. C., Immer, K., & Johnston, K. G., *Star formation in a high-pressure environment: an SMA view of the Galactic Centre dust ridge*, February. 2018, MNRAS, 474, 2373 [\[ADS\]](#)
- [30] Barnes, A. T., Longmore, S. N., **Battersby, C.**, Bally, J., Kruijssen, J. M. D., Henshaw, J. D., & Walker, D. L., *Star formation rates and efficiencies in the Galactic Centre*, August. 2017, MNRAS, 469, 2263 [\[ADS\]](#)
- [31] Lu, X., Zhang, Q., Kauffmann, J., Pillai, T., Longmore, S. N., Kruijssen, J. M. D., **Battersby, C.**, Liu, H. B., Ginsburg, A., Mills, E. A. C., Zhang, Z.-Y., & Gu, Q., *The Molecular Gas Environment in the 20 km s Cloud in the Central Molecular Zone*, April. 2017, ApJ, 839, 1 [\[ADS\]](#)
- [32] Ginsburg, A., Goss, W. M., Goddi, C., Galván-Madrid, R., Dale, J. E., Bally, J., **Battersby, C. D.**, Youngblood, A., Sankrit, R., Smith, R., Darling, J., Kruijssen, J. M. D., & Liu, H. B., *Toward gas exhaustion in the W51 high-mass protoclusters*, October. 2016, A&A, 595, A27 [\[ADS\]](#)
- [33] Meixner, M., Cooray, A., Carter, R., DiPirro, M., Flores, A., Leisawitz, D., Armus, L., **Battersby, C.**, Bergin, E., Bradford, C. M., Ennico, K., Melnick, G. J., Milam, S., Narayanan, D., Pontoppidan, K., Pope, A., Roellig, T., Sandstrom, K., Su, K. Y. L., Vieira, J., Wright, E., Zmuidzinas, J., Alato, S., Carey, S., Gerin, M., Helmich, F., Menten, K., Scott, D., Sakon, I., & Vavrek, R. 2016, in Space Telescopes and Instrumentation 2016: Optical, Infrared, and Millimeter Wave, Vol. 9904, 99040K [\[ADS\]](#)
- [34] Henshaw, J. D., Longmore, S. N., Kruijssen, J. M. D., Davies, B., Bally, J., Barnes, A., **Battersby, C.**, Burton, M., Cunningham, M. R., Dale, J. E., Ginsburg, A., Immer, K., Jones, P. A., Kendrew, S., Mills, E. A. C., Molinari, S., Moore, T. J. T., Ott, J., Pillai, T., Rathborne, J., Schilke, P., Schmiedeke, A., Testi, L., Walker, D., Walsh, A., & Zhang, Q., *Molecular gas kinematics within the central 250 pc of the Milky Way*, April. 2016, MNRAS, 457, 2675 [\[ADS\]](#)
- [35] Ginsburg, A., Henkel, C., Ao, Y., Riquelme, D., Kauffmann, J., Pillai, T., Mills, E. A. C., Requena-Torres, M. A., Immer, K., Testi, L., Ott, J., Bally, J., Battersby, C., Darling, J., Aalto, S., Stanke, T., Kendrew, S., Kruijssen, J. M. D., Longmore, S., Dale, J., Guesten, R., & Menten, K. M., *Dense gas in the Galactic central molecular zone is warm and heated by turbulence*, Feb. 2016, A&A, 586, A50 [\[ADS\]](#)
- [36] Ginsburg, A., Walsh, A., Henkel, C., Jones, P. A., Cunningham, M., Kauffmann, J., Pillai, T., Mills, E. A. C., Ott, J., Kruijssen, J. M. D., Menten, K. M., **Battersby, C.**, Rathborne, J., Contreras, Y., Longmore, S., Walker, D., Dawson, J., & Lopez, J. A. P., *High-mass star-forming cloud G0.38+0.04 in the Galactic center dust ridge contains H<sub>2</sub>CO and SiO masers*, December. 2015, A&A, 584, L7 [\[ADS\]](#)
- [37] Lu, X., Zhang, Q., Kauffmann, J., Pillai, T., Longmore, S. N., Kruijssen, J. M. D., **Battersby, C.**, & Gu, Q., *Deeply Embedded Protostellar Population in the 20 km s<sup>21</sup> Cloud of the Central Molecular Zone*, December. 2015, ApJ, 814, L18 [\[ADS\]](#)
- [38] Ellsworth-Bowers, T. P., Glenn, J., Riley, A., Rosolowsky, E., Ginsburg, A., Evans, II, N. J., Bally, J., **Battersby, C.**, Shirley, Y. L., & Merello, M., *The Bolocam Galactic Plane Survey. XIII. Physical Properties and Mass Functions of Dense Molecular Cloud Structures*, June. 2015, ApJ, 805, 157 [\[ADS\]](#)



- [39] Merello, M., Evans, II, N. J., Shirley, Y. L., Rosolowsky, E., Ginsburg, A., Bally, J., **Battersby, C.**, & Dunham, M. M., *The Bolocam Galactic Plane Survey. XI. Temperatures and Substructure of Galactic Clumps Based On 350  $\mu$ M Observations*, May. 2015, ApJS, 218, 1 [ADS]
- [40] Ellsworth-Bowers, T. P., Rosolowsky, E., Glenn, J., Ginsburg, A., Evans, II, N. J., **Battersby, C.**, Shirley, Y. L., & Svoboda, B., *The Bolocam Galactic Plane Survey. XII. Distance Catalog Expansion Using Kinematic Isolation of Dense Molecular Cloud Structures with  $^{13}\text{CO}(1-0)$* , January. 2015, ApJ, 799, 29 [ADS]
- [41] Ginsburg, A., Bally, J., **Battersby, C.**, Youngblood, A., Darling, J., Rosolowsky, E., Arce, H., & Lebrón Santos, M. E., *The dense gas mass fraction in the W51 cloud and its protoclusters*, January. 2015, A&A, 573, A106 [ADS]
- [42] Vutisalchavakul, N., Evans, II, N. J., & **Battersby, C.**, *The Star-formation Relation for Regions in the Galactic Plane: The Effect of Spatial Resolution*, December. 2014, ApJ, 797, 77 [ADS]
- [43] Shirley, Y. L., Ellsworth-Bowers, T. P., Svoboda, B., Schlingman, W. M., Ginsburg, A., Rosolowsky, E., Gerner, T., Mairs, S., **Battersby, C.**, Stringfellow, G., Dunham, M. K., Glenn, J., & Bally, J., *The Bolocam Galactic Plane Survey. X. A Complete Spectroscopic Catalog of Dense Molecular Gas Observed toward 1.1 mm Dust Continuum Sources with  $7.^\circ 5 <= l <= 194^\circ$* , November. 2013, ApJS, 209, 2 [ADS]
- [44] Ginsburg, A., Glenn, J., Rosolowsky, E., Ellsworth-Bowers, T. P., **Battersby, C.**, Dunham, M., Merello, M., Shirley, Y., Bally, J., Evans, II, N. J., Stringfellow, G., & Aguirre, J., *The Bolocam Galactic Plane Survey. IX. Data Release 2 and Outer Galaxy Extension*, October. 2013, ApJS, 208, 14 [ADS]
- [45] Kendrew, S., Ginsburg, A., Johnston, K., Beuther, H., Bally, J., Cyganowski, C. J., & **Battersby, C.**, *Early-stage Massive Star Formation near the Galactic Center: Sgr C*, October. 2013, ApJ, 775, L50 [ADS]
- [46] Ellsworth-Bowers, T. P., Glenn, J., Rosolowsky, E., Mairs, S., Evans, II, N. J., **Battersby, C.**, Ginsburg, A., Shirley, Y. L., & Bally, J., *The Bolocam Galactic Plane Survey. VIII. A Mid-infrared Kinematic Distance Discrimination Method*, June. 2013, ApJ, 770, 39 [ADS]
- [47] Longmore, S. N., Kruijssen, J. M. D., Bally, J., Ott, J., Testi, L., Rathborne, J., Bastian, N., Bressert, E., Molinari, S., **Battersby, C.**, & Walsh, A. J., *Candidate super star cluster progenitor gas clouds possibly triggered by close passage to Sgr A\**, June. 2013, MNRAS, 433, L15 [ADS]
- [48] Longmore, S. N., Bally, J., Testi, L., Purcell, C. R., Walsh, A. J., Bressert, E., Pestalozzi, M., Molinari, S., Ott, J., Cortese, L., **Battersby, C.**, Murray, N., Lee, E., Kruijssen, J. M. D., Schisano, E., & Elia, D., *Variations in the Galactic star formation rate and density thresholds for star formation*, February. 2013, MNRAS, 429, 987 [ADS]
- [49] Bressert, E., Ginsburg, A., Bally, J., **Battersby, C.**, Longmore, S., & Testi, L., *How to Find Young Massive Cluster Progenitors*, October. 2012, ApJ, 758, L28 [ADS]
- [50] Ginsburg, A., Bressert, E., Bally, J., & **Battersby, C.**, *There are No Starless Massive Proto-clusters in the First Quadrant of the Galaxy*, October. 2012, ApJ, 758, L29 [ADS]
- [51] Wilcock, L. A., Ward-Thompson, D., Kirk, J. M., Stamatellos, D., Whitworth, A., **Battersby, C.**, Elia, D., Fuller, G. A., DiGiorgio, A., Griffin, M. J., Molinari, S., Martin, P., Mottram, J. C., Peretto, N., Pestalozzi, M., Schisano, E., Smith, H. A., & Thompson, M. A., *Isolated starless cores in infrared dark clouds in the Hi-GAL survey*, July. 2012, MNRAS, 424, 716 [ADS]
- [52] Longmore, S. N., Rathborne, J., Bastian, N., Alves, J., Ascenso, J., Bally, J., Testi, L., Longmore, A., **Battersby, C.**, Bressert, E., Purcell, C., Walsh, A., Jackson, J., Foster, J., Molinari, S., Meingast, S., Amorim, A., Lima, J., Marques, R., Moitinho, A., Pinhao, J., Rebordao, J., & Santos, F. D., *G0.253 + 0.016: A Molecular Cloud Progenitor of an Arches-like Cluster*, February. 2012, ApJ, 746, 117 [ADS]
- [53] Ginsburg, A., Darling, J., **Battersby, C.**, Zeiger, B., & Bally, J., *Galactic  $\text{H}_2\text{CO}$  Densitometry. I. Pilot Survey of Ultracompact H II Regions and Methodology*, August. 2011, ApJ, 736, 149 [ADS]

- [54] Schlingman, W. M., Shirley, Y. L., Schenk, D. E., Rosolowsky, E., Bally, J., **Battersby, C.**, Dunham, M. K., Ellsworth-Bowers, T. P., Evans, II, N. J., Ginsburg, A., & Stringfellow, G., *The Bolocam Galactic Plane Survey. V. HCO<sup>+</sup> and N<sub>2</sub>H<sup>+</sup> Spectroscopy of 1.1 mm Dust Continuum Sources*, August. 2011, ApJS, 195, 14 [\[ADS\]](#)
- [55] Molinari, S., Bally, J., Noriega-Crespo, A., Compiègne, M., Bernard, J. P., Paradis, D., Martin, P., Testi, L., Barlow, M., Moore, T., Plume, R., Swinyard, B., Zavagno, A., Calzoletti, L., Di Giorgio, A. M., Elia, D., Faustini, F., Natoli, P., Pestalozzi, M., Pezzuto, S., Piacentini, F., Polenta, G., Polychroni, D., Schisano, E., Traficante, A., Veneziani, M., **Battersby, C.**, Burton, M., Carey, S., Fukui, Y., Li, J. Z., Lord, S. D., Morgan, L., Motte, F., Schuller, F., Stringfellow, G. S., Tan, J. C., Thompson, M. A., Ward-Thompson, D., White, G., & Umana, G., *A 100 pc Elliptical and Twisted Ring of Cold and Dense Molecular Clouds Revealed by Herschel Around the Galactic Center*, July. 2011, ApJ, 735, L33 [\[ADS\]](#)
- [56] Wilcock, L. A., Kirk, J. M., Stamatellos, D., Ward-Thompson, D., Whitworth, A., **Battersby, C.**, Brunt, C., Fuller, G. A., Griffin, M., Molinari, S., Martin, P., Mottram, J. C., Peretto, N., Plume, R., Smith, H. A., & Thompson, M. A., *The initial conditions of high-mass star formation: radiative transfer models of IRDCs seen in the Herschel Hi-GAL survey*, February. 2011, A&A, 526, A159 [\[ADS\]](#)
- [57] Aguirre, J. E., Ginsburg, A. G., Dunham, M. K., Drosback, M. M., Bally, J., **Battersby, C.**, Bradley, E. T., Cyganowski, C., Dowell, D., Evans, II, N. J., Glenn, J., Harvey, P., Rosolowsky, E., Stringfellow, G. S., Walawender, J., & Williams, J. P., *The Bolocam Galactic Plane Survey: Survey Description and Data Reduction*, January. 2011, ApJS, 192, 4 [\[ADS\]](#)
- [58] Bally, J., Aguirre, J., **Battersby, C.**, Bradley, E. T., Cyganowski, C., Dowell, D., Drosback, M., Dunham, M. K., Evans, II, N. J., Ginsburg, A., Glenn, J., Harvey, P., Mills, E., Merello, M., Rosolowsky, E., Schlingman, W., Shirley, Y. L., Stringfellow, G. S., Walawender, J., & Williams, J., *The Bolocam Galactic Plane Survey:  $\lambda = 1.1$  and  $0.35$  mm Dust Continuum Emission in the Galactic Center Region*, September. 2010, ApJ, 721, 137 [\[ADS\]](#)
- [59] Bally, J., Anderson, L. D., **Battersby, C.**, Calzoletti, L., Digiorio, A. M., Faustini, F., Ginsburg, A., Li, J. Z., Nguyen-Luong, Q., Molinari, S., Motte, F., Pestalozzi, M., Plume, R., Rodon, J., Schilke, P., Schlingman, W., Schneider-Bontemps, N., Shirley, Y., Stringfellow, G. S., Testi, L., Traficante, A., Veneziani, M., & Zavagno, A., *Herschel observations of the W43 “mini-starburst”*, July. 2010, A&A, 518, L90 [\[ADS\]](#)
- [60] Dunham, M. K., Rosolowsky, E., Evans, II, N. J., Cyganowski, C. J., Aguirre, J., Bally, J., **Battersby, C.**, Bradley, E. T., Dowell, D., Drosback, M., Ginsburg, A., Glenn, J., Harvey, P., Merello, M., Schlingman, W., Shirley, Y. L., Stringfellow, G. S., Walawender, J., & Williams, J. P., *The Bolocam Galactic Plane Survey. III. Characterizing Physical Properties of Massive Star-forming Regions in the Gemini OB1 Molecular Cloud*, July. 2010, ApJ, 717, 1157 [\[ADS\]](#)
- [61] Elia, D., Schisano, E., Molinari, S., Robitaille, T., Anglés-Alcázar, D., Bally, J., **Battersby, C.**, Benedettini, M., Billot, N., Calzoletti, L., di Giorgio, A. M., Faustini, F., Li, J. Z., Martin, P., Morgan, L., Motte, F., Mottram, J. C., Natoli, P., Olmi, L., Paladini, R., Piacentini, F., Pestalozzi, M., Pezzuto, S., Polychroni, D., Smith, M. D., Strafella, F., Stringfellow, G. S., Testi, L., Thompson, M. A., Traficante, A., & Veneziani, M., *A Herschel study of YSO evolutionary stages and formation timelines in two fields of the Hi-GAL survey*, July. 2010, A&A, 518, L97 [\[ADS\]](#)
- [62] Molinari, S., Swinyard, B., Bally, J., Barlow, M., Bernard, J.-P., Martin, P., Moore, T., Noriega-Crespo, A., Plume, R., Testi, L., Zavagno, A., Abergel, A., Ali, B., Anderson, L., André, P., Baluteau, J.-P., **Battersby, C.**, Beltrán, M. T., Benedettini, M., Billot, N., Blommaert, J., Bontemps, S., Boulanger, F., Brand, J., Brunt, C., Burton, M., Calzoletti, L., Carey, S., Caselli, P., Cesaroni, R., Cernicharo, J., Chakrabarti, S., Chrysostomou, A., Cohen, M., Compiègne, M., de Bernardis, P., de Gasperis, G., di Giorgio, A. M., Elia, D., Faustini, F., Flagey, N., Fukui, Y., Fuller, G. A., Ganga, K., Garcia-Lario, P., Glenn, J., Goldsmith, P. F., Griffin, M., Hoare, M., Huang, M., Ikhenaoade, D., Joblin, C., Joncas, G., Juvela, M., Kirk, J. M., Lagache, G., Li, J. Z., Lim, T. L., Lord, S. D., Marengo, M., Marshall, D. J., Masi, S., Massi, F., Matsuura, M., Minier, V., Miville-Deschênes, M.-A., Montier, L. A., Morgan, L., Motte, F., Mottram, J. C., Müller, T. G., Natoli, P., Neves, J., Olmi, L., Paladini, R., Paradis, D., Parsons, H., Peretto, N., Pestalozzi, M., Pezzuto, S., Piacentini, F., Piazzi, L., Polychroni, D., Pomarès, M., Popescu, C. C., Reach, W. T., Ristorcelli, I., Robitaille, J.-F., Robitaille, T., Rodón, J. A., Roy,

- A., Royer, P., Russeil, D., Saraceno, P., Sauvage, M., Schilke, P., Schisano, E., Schneider, N., Schuller, F., Schulz, B., Sibthorpe, B., Smith, H. A., Smith, M. D., Spinoglio, L., Stamatellos, D., Strafella, F., Stringfellow, G. S., Sturm, E., Taylor, R., Thompson, M. A., Traficante, A., Tuffs, R. J., Umana, G., Valenziano, L., Vavrek, R., Veneziani, M., Viti, S., Waelkens, C., Ward-Thompson, D., White, G., Wilcock, L. A., Wyrowski, F., Yorke, H. W., & Zhang, Q., *Clouds, filaments, and protostars: The Herschel Hi-GAL Milky Way*, July. 2010, A&A, 518, L100 [\[ADS\]](#)
- [63] Peretto, N., Fuller, G. A., Plume, R., Anderson, L. D., Bally, J., **Battersby, C.**, Beltran, M. T., Bernard, J.-P., Calzoletti, L., Digorgio, A. M., Faustini, F., Kirk, J. M., Lenfestey, C., Marshall, D., Martin, P., Molinari, S., Montier, L., Motte, F., Ristorcelli, I., Rodón, J. A., Smith, H. A., Traficante, A., Veneziani, M., Ward-Thompson, D., & Wilcock, L., *Mapping the column density and dust temperature structure of IRDCs with Herschel*, July. 2010, A&A, 518, L98 [\[ADS\]](#)
- [64] Rosolowsky, E., Dunham, M. K., Ginsburg, A., Bradley, E. T., Aguirre, J., Bally, J., **Battersby, C.**, Cyganowski, C., Dowell, D., Drosback, M., Evans, II, N. J., Glenn, J., Harvey, P., Stringfellow, G. S., Walawender, J., & Williams, J. P., *The Bolocam Galactic Plane Survey. II. Catalog of the Image Data*, May. 2010, ApJS, 188, 123 [\[ADS\]](#)
- [65] Pratap, P., Shute, P. A., Keane, T. C., **Battersby, C.**, & Sterling, S., *Class i Methanol Masers: Signposts of Star Formation?*, May. 2008, AJ, 135, 1718 [\[ADS\]](#)