

Curriculum Vitae  
**Dr. Crystal L. Brogan**

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**Current Professional Positions**

- 2011-present Tenured Astronomer, National Radio Astronomy Observatory (NRAO) /  
North American ALMA Science Center (NAASC)
- 2019-present North American ALMA: Program Scientist, Integrated Science Team  
Representative, & Development Program Coordinator
- 2021-present Subsystem Scientist for the 2nd Generation ALMA Correlator
- 2021-present Subsystem Scientist for the ALMA Band 6 Version 2 Upgrade
- 2006-present Visiting or Adjunct Faculty, University of Virginia Astronomy Department

**Previous Professional Positions**

- 2016-2020 ALMA Interferometric Imaging Pipeline Heuristics Lead
- 2013-2019 Deputy ALMA North American Program Scientist  
Lead of NAASC ALMA Imaging Team 2011-2013  
Group Lead for Scientific Software Support at the NAASC
- 2010-2011 Group Lead for User Support at the NAASC (June 2010 to Feb. 2011)
- 2009-2011 Tenure-track Associate Astronomer NRAO/NAASC
- 2007-2019 ALMA CASA subsystem scientist
- 2006-2008 Tenure-track Assistant Astronomer NRAO/NAASC
- 2003-2006 James Clerk Maxwell Telescope Fellow, Institute for Astronomy, University of Hawaii
- 2000-2003 Jansky Postdoctoral Fellow, National Radio Astronomy Observatory, Socorro
- 1996-2000 Research Assistant, Department of Physics & Astronomy, University of Kentucky  
1999 National Radio Astronomy Observatory Graduate Summer Student (Socorro)
- 1993-1996 Teaching Assistant, Department of Physics & Astronomy, University of Kentucky

**Education**

- 1993-2000 Ph.D., University of Kentucky, Department of Physics and Astronomy (July 2000)  
“[Observational Study of the Role of Magnetic Fields in Star Formation](#)”,  
Supervisor: Dr. Thomas H. Troland
- 1989-1993 B.S., James Madison University, Harrisonburg, VA (Major: Physics)

**Professional Committees and Review Panels**

- 2022 ngEHT Science Requirements Review committee member
- 2021 SOFIA NASA Senior Review Blue Team, Chair
- 2021 JWST Cycle 1 TAC member
- 2018 Origins Space Telescope Milky Way, ISM, and Nearby Galaxies Working Group
- 2018-present M2O - International Maser Monitoring Organization
- 2018 SOFIA Cycle 7 TAC member
- 2017 NASA Astrophysics Probes Mission Concept Studies Panel
- 2016-2018 Member-At-Large AAS Laboratory Astrophysics Division Committee

- 2015 NSF Astronomy and Astrophysics Grant Review Panel
- 2014 SOFIA Cycle 3 TAC member
- 2013 Hubble Fellowship selection committee
- 2013 CONICYT ALMA Fund for Development of Chilean Astronomy selection committee
- 2013 European Research Council Consolidator Grant 2013 reviewer
- 2012 SOFIA Cycle 1 TAC member
- 2011-2014 Virtual Astronomy Observatory Science Council
- 2011 Natural Sciences and Engineering Research Council of Canada Discovery Grant
- 2011 NSF/AST University Radio Observatories Reviewer
- 2010 NASA Origins Grant Proposal Review Committee
- 2009-2010 Astro2010 Program Prioritization Panel for Radio, Millimeter, and Submillimeter
- 2009 NASA post-doctoral selection committee
- 2009 CONICYT ALMA Fund for Development of Chilean Astronomy selection committee
- 2008 University of Virginia Astronomy Department Graduate Student Selection Committee
- 2008 Reviewer for the National Science Foundation - AST Radio Spectrum Management
- 2008 Reviewer for the Natural Sciences and Engineering Research Council of Canada
- 2005-2007 ALMA North American Science Advisory Committee

### **NRAO Committees**

- 2018-present Reber pre-doctoral Fellowship committee
- 2016-2017 Member of NRAO/NAASC Scientist job search committee
- 2016-2017 Member 2016 NAASC scientist search committee
- 2016 Climate for Women at NRAO Committee
- 2016 Member ngVLA Project Scientist search committee
- 2015 Chair, tenure-track NRAO/NAASC job search committee
- 2014-present NRAO Astronomer Performance Review Committee
- 2014-present NRAO/UVa Colloquium Committee
- 2013 Committee to Revise NRAO Scientific Staff Policy Manual
- 2012-2013 NRAO Observatory Science & Technical Council
- 2012 Member search committee for Head of North American ALMA Operations
- 2011 Data Management Review Committee
- 2010 Member NRAO/NAASC Scientific Staff Selection Committee
- 2007-2008 Jansky Prize Lecturer Selection Committee
- 2006-2007 Member NRAO Strategic Planning Committee

### **Telescope Proposal Review Panels**

- 2021 JWST Cycle 1 Proposal Review Committee
- 2019 SOFIA Cycle-7 Proposal Review Committee
- 2014 SOFIA Cycle-3 Proposal Review Committee
- 2012 SOFIA Cycle-1 Proposal Review Committee
- 2008 Spitzer Cycle-5 Proposal Review Committee
- 2006 James Clerk Maxwell Telescope Referee
- 2003-2006 VLA/VLBA Proposal Referee

## Recent Science Organizing Committees

- 2023 "ALMA at 10 years: Past, Present, and Future", Puerto Varas, Chile, December 4 to 8, 2023
- 2023 "Cosmic Masers: Proper Motion toward the Next-Generation Large Projects", Kagoshima-city, Japan, March 20-24, 2023
- 2021 "ALMA-FED 2021: ALMA Front End Development (Virtual) Conference", Sept 27-30, 2021
- 2021 "6th US/China Science and Technology Workshop", June, 4 sessions in June, 2021
- 2020 "The ALMA2030 Vision: Design considerations for Digitizers, Backend and Data Transmission System": Oct 14-16, 2020
- 2020 "The ALMA2030 Vision: Design Considerations for the Next ALMA Correlator" Charlottesville, VA Feb. 11-13, 2020, Chair
- 2019 "ALMA2019: Science Results and Cross-Facility Synergies", Sardinia, Italy, October 14-18, 2019
- 2019 "AAS 234: Laboratory Astrophysics Division Meeting (LAD): Bridging Laboratory & Astrophysics" June 10-13, 2019 in St. Louis, Missouri

## Professional Memberships

- 2004-present International Union of Radio Science
- 1998-present American Astronomical Society (frequent session chair)
- 2015-present American Astronomical Society Laboratory Astrophysics Division

## Mentoring

### *Thesis Advisor*

- 2018-2024 Samer El Abd (University of Virginia)
- 2014-2020 Allison Towner (University of Virginia)
- 2009-2014 Bill Dirienzo, Co-advisor Remy Indebetouw (University of Virginia)
- 2006-2010 Claudia Cyganowski, Co-advisor Ed Churchwell (University of Wisconsin)

### *Thesis Committee member*

- 2018-present Renato Mazzei (University of Virginia)
- 2019-2021 Mengyao Liu (University of Virginia)
- 2015-2018 Lauren Bittle (University of Virginia)
- 2009-2013 Amy Reines (University of Virginia)
- 2001-2004 Ian Hoffman (University of New Mexico)

### *Post-doctoral mentor or supervisor*

- 2018-2020 Ryan Loomis, Jansky Fellow (NRAO)
- 2016-2019 Laura Fissel, Jansky Fellow (NRAO)
- 2009-2012 Rachel Friesen, NAASC Fellow (NRAO)

**Refereed Articles** (number: 137, *h*-index: 50, citations: 8250, acknowledgments: 59)

## Refereed Publications (orcid: 0000-0002-6558-7653)

1. Shope, B.M. et al., "Interstellar Glycolaldehyde, Methyl Formate, and Acetic Acid. II. Chemical Modeling of the Bimodal Abundance Pattern in NGC 6334I", ApJ, in press (2024)
2. Fried, Z. T. P. et al., "Rotational Spectrum and First Interstellar Detection of 2-methoxyethanol Using ALMA Observations of NGC 6334I", ApJL, 965, L23 [arXiv: 2403.17341](https://arxiv.org/abs/2403.17341) (2024)
3. El-Abd, S. et al., "An Automated Chemical Exploration of NGC 6334I at 340 AU Resolution", ApJ, 965, 14 [arXiv: 2402.13913](https://arxiv.org/abs/2402.13913) (2024)

4. Williams, G. et al., "ALMA observations of the Extended Green Object G19.01-0.03: II. A typical high-mass hot core with four low-mass companions", *MNRAS*, 525, 6146, [arXiv: 2309.01743](#) (2023)
5. Chen, Y. et al., "CoCCoA: Complex Chemistry in Hot Cores with ALMA II. Selected oxygen-bearing species", *A&A*, in press, [arXiv: 2308.02688](#) (2023)
6. Hunter, T.R. et al., "The ALMA Interferometric Pipeline Heuristics", *PASP*, 135, 074501, [arXiv: 2306.07420](#) (2023)
7. MacLeod, G. et al., "Identifying Zeeman pairs of hydroxyl masers in NGC6334I-MM3 via velocity drift", *MNRAS*, 520, 5464 (2023)
8. Burns, R. A., et al., "A Keplerian disk with a four-arm spiral birthing an episodically accreting high-mass protostar", *NatAs*, 7, 557 (2023)
9. Hirota, T., Wolak, P., Hunter, T. R., Brogan, C. L., et al. "Millimeter methanol emission in the high-mass young stellar object G24.33+0.14", *PASJ*, 74, 1234 (2022)
10. MacLeod, G. C., Yonekura, Y., Tanabe, Y., et al. "Two periods instead of one in a single 6.7 GHz methanol maser feature in G9.62+0.20E ", *MNRAS*, 516, L96 (2022)
11. Bayandina, O. S., Brogan, C. L., Burns, R. A., and 10 colleagues, "The evolution of the H<sub>2</sub>O maser emission in the accretion burst source G358.93–0.03", *A&A*, 664, A44 (2022)
12. Cyganowski, C. J., Ilee, J. D., Brogan, C. L., and 4 colleagues, "Discovery of a 500 au Protobinary in the Massive Prestellar Core G11.92-0.61 MM2", *ApJ*, 931, L31 (2022)
13. Bayandina, O. S., Brogan, C. L., Burns, R. A., and 8 colleagues, "A Multitransition Methanol Maser Study of the Accretion Burst Source G358.93-0.03-MM1", *AJ*, 163, 83 (2022)
14. Remijan, A., Xue, C., Margulés, L., and 12 colleagues, "Expanding the submillimeter wave spectroscopy and astronomical search for thioacetamide (CH<sub>3</sub>CSNH<sub>2</sub>) in the ISM", *A&A*, 658, A85 (2022)
15. Williams, G. M., Cyganowski, C. J., Brogan, C. L., and 6 colleagues, "ALMA observations of the Extended Green Object G19.01-0.03 - I. A Keplerian disc in a massive protostellar system", *MNRAS*, 509, 748 (2022)
16. Townner, A. P. M., Brogan, C. L., Hunter, T. R., and 1 colleagues, "VLA Observations of Nine Extended Green Objects in the Milky Way: Ubiquitous Weak, Compact Continuum Emission, and Multi-epoch Emission from Methanol, Water, and Ammonia Masers", *ApJ*, 923, 263 (2021)
17. Costa, Allison H., Johnson, Kelsey E., Indebetouw, Remy, and 3 colleagues, "Toward a More Complex Understanding of Natal Super Star Clusters with Multiwavelength Observations", *ApJ*, 918, 76 (2021)
18. Hunter, T. R., Brogan, C. L., De Buizer, J. M., and 7 colleagues, "The Extraordinary Outburst in the Massive Protostellar System NGC 6334 I-MM1: Strong Increase in Mid-Infrared Continuum Emission", *ApJ*, 912, L17 (2021)
19. Chibueze, James O., MacLeod, Gordon C., Vorster, Jakobus M., and 4 colleagues, "The Extraordinary Outburst in the Massive Protostellar System NGC 6334 I-MM1: Spatiokinematics of Water Masers during a Contemporaneous Flare Event", *ApJ*, 908, 175 (2021)
20. Stecklum, B., Wolf, V., Linz, H., and 24 colleagues, "Infrared observations of the flaring maser source G358.93-0.03. SOFIA confirms an accretion burst from a massive young stellar object", *A&A*, 646, A161 (2021)
21. Hull, Charles L. H., Cortes, Paulo C., Gouellec, Valentin J. M. Le, and 9 colleagues, "Characterizing the Accuracy of ALMA Linear-polarization Mosaics", *PASP*, 132, 094501 (2020)
22. Ligterink, Niels F. W., El-Abd, Samer J., Brogan, Crystal L., and 4 colleagues, "The Family of Amide Molecules toward NGC 6334I", *ApJ*, 901, 37 (2020)
23. Ginsburg, Adam, Anderson, L. D., Dicker, Simon, and 19 colleagues, "The MUSTANG Galac-

- tic Plane Survey (MGPS90) Pilot", *ApJS*, 248, 24 (2020)
24. Margulés, L., McGuire, B. A., Motiyenko, R. A., and 4 colleagues, "Millimeter wave spectroscopy of cyanoketene (NC-CH=C=O) and an observational search in the ISM", *A&A*, 638, A3 (2020)
  25. Kepley, Amanda A., Tsutsumi, Takahiro, Brogan, Crystal L., and 4 colleagues, "Auto-multithresh: A General Purpose Automasking Algorithm", *PASP*, 132, 024505 (2020)
  26. Chen, Xi, Sobolev, Andrej M., Breen, Shari L., and 21 colleagues, "<sup>13</sup>CH<sub>3</sub>OH Masers Associated With a Transient Phenomenon in a High-mass Young Stellar Object", *ApJ*, 890, L22 (2020)
  27. Burns, R. A., Sugiyama, K., Hirota, T., and 20 colleagues, "A heatwave of accretion energy traced by masers in the G358-MM1 high-mass protostar", *NatAs*, 4, 506 (2020)
  28. Burns, R. A., Orosz, G., Bayandina, O., and 23 colleagues, "VLBI observations of the G25.65+1.05 water maser superburst", *MNRAS*, 491, 4069 (2020)
  29. Melosso, Mattia, Dore, Luca, Tamassia, Filippo, and 3 colleagues, "The Submillimeter Rotational Spectrum of Ethylene Glycol up to 890 GHz and Application to ALMA Band 10 Spectral Line Data of NGC 6334I", *JPCA*, 124, 240 (2020)
  30. Chen, Xi, Sobolev, Andrej M., Ren, Zhi-Yuan, and 16 colleagues, "New maser species tracing spiral-arm accretion flows in a high-mass young stellar object", *NatAs*, 4, 1170 (2020)
  31. MacLeod, G. C., Sugiyama, K., Hunter, T. R., and 18 colleagues, "Detection of new methanol maser transitions associated with G358.93-0.03", *MNRAS*, 489, 3981 (2019)
  32. Svoboda, Brian E., Shirley, Yancy L., Traficante, Alessio, and 7 colleagues, "ALMA Observations of Fragmentation, Substructure, and Protostars in High-mass Starless Clump Candidates", *ApJ*, 886, 36 (2019)
  33. McGuire, Brett A., Shingledecker, Christopher N., Willis, Eric R., and 14 colleagues, "Searches for Interstellar HCCSH and H<sub>2</sub>CCS", *ApJ*, 883, 201 (2019)
  34. El-Abd, Samer J., Brogan, Crystal L., Hunter, Todd R., and 3 colleagues, "Interstellar Glycolaldehyde, Methyl Formate, and Acetic Acid. I. A Bimodal Abundance Pattern in Star-forming Regions", *ApJ*, 883, 129 (2019)
  35. Alonso, Elena R., McGuire, Brett A., Kolesniková, Lucie, and 6 colleagues, "The Laboratory Millimeter and Submillimeter Rotational Spectrum of Lactaldehyde and an Astronomical Search in Sgr B2(N), Orion-KL, and NGC 6334I", *ApJ*, 883, 18 (2019)
  36. Xue, Ci, Remijan, Anthony J., Brogan, Crystal L., and 3 colleagues, "ALMA Detection of Vibrationally Excited ( $v_t = 1, 2$ ) Acetic Acid toward NGC 6334I", *ApJ*, 882, 118 (2019)
  37. Brogan, C. L., Hunter, T. R., Towner, A. P. M., and 25 colleagues, "Sub-arcsecond (Sub)millimeter Imaging of the Massive Protocluster G358.93-0.03: Discovery of 14 New Methanol Maser Lines Associated with a Hot Core", *ApJ*, 881, L39 (2019)
  38. Towner, A. P. M., Brogan, C. L., Hunter, T. R., and 2 colleagues, "SOFIA FORCAST Photometry of 12 Extended Green Objects in the Milky Way", *ApJ*, 875, 135 (2019)
  39. Hernández-Gómez, Antonio, Loinard, Laurent, Chandler, Claire J., and 10 colleagues, "On the Nature of the Compact Sources in IRAS 16293-2422 Seen at Centimeter to Submillimeter Wavelengths", *ApJ*, 875, 94 (2019)
  40. Finn, Molly K., Johnson, Kelsey E., Brogan, Crystal L., and 5 colleagues, "New Insights into the Physical Conditions and Internal Structure of a Candidate Proto-globular Cluster", *ApJ*, 874, 120 (2019)
  41. Sanna, A., Moscadelli, L., Goddi, C., and 7 colleagues, "Protostellar Outflows at the Earliest Stages (POETS). II. A possible radio synchrotron jet associated with the EGO G035.02+0.35", *A&A*, 623, L3 (2019)
  42. Jankovic, M. R., Haworth, T. J., Ilee, J. D., and 6 colleagues, "Observing substructure in

- circumstellar discs around massive young stellar objects", *MNRAS*, 482, 4673 (2019)
43. Hunter, T. R., Brogan, C. L., Bartkiewicz, A., and 6 colleagues, "Understanding Massive Star Formation through Maser Imaging", *ASPC*, 517, 321 (2018)
  44. Ilee, J. D., Cyganowski, C. J., Brogan, C. L., and 5 colleagues, "G11.92-0.61 MM 1: A Fragmented Keplerian Disk Surrounding a Proto-O Star", *ApJ*, 869, L24 (2018)
  45. Brogan, C. L., Hunter, T. R., Cyganowski, C. J., and 6 colleagues, "The Extraordinary Outburst in the Massive Protostellar System NGC 6334I-MM1: Flaring of the Water Masers in a North-South Bipolar Outflow Driven by MM1B", *ApJ*, 866, 87 (2018)
  46. McGuire, Brett A., Brogan, Crystal L., Hunter, Todd R., and 9 colleagues, "First Results of an ALMA Band 10 Spectral Line Survey of NGC 6334I: Detections of Glycolaldehyde (HC(O)CH<sub>2</sub>OH) and a New Compact Bipolar Outflow in HDO and CS", *ApJ*, 863, L35 (2018)
  47. Matthews, Allison M., Johnson, Kelsey E., Whitmore, Bradley C., and 3 colleagues, "Resolved Star Formation Efficiency in the Antennae Galaxies", *ApJ*, 862, 147 (2018)
  48. MacLeod, G. C., Smits, D. P., Goedhart, S., and 7 colleagues, "A masing event in NGC 6334I: contemporaneous flaring of hydroxyl, methanol, and water masers", *MNRAS*, 478, 1077 (2018)
  49. Bogelund, Eva G., McGuire, Brett A., Ligterink, Niels F. W., and 6 colleagues, "Low levels of methanol deuteration in the high-mass star-forming region NGC 6334I", *A&A*, 615, A88 (2018)
  50. Hunter, T. R., Brogan, C. L., MacLeod, G. C., and 7 colleagues, "The Extraordinary Outburst in the Massive Protostellar System NGC 6334I-MM1: Emergence of Strong 6.7 GHz Methanol Masers", *ApJ*, 854, 170 (2018)
  51. Ginsburg, Adam, Bally, John, Barnes, Ashley, and 24 colleagues, "Distributed Star Formation throughout the Galactic Center Cloud Sgr B2", *ApJ*, 853, 171 (2018)
  52. Johnson, Kelsey E., Brogan, Crystal L., Indebetouw, Remy, and 5 colleagues, "The Association of Molecular Gas and Natal Super Star Clusters in Henize 2-10", *ApJ*, 853, 125 (2018)
  53. McGuire, Brett A., Shingledecker, Christopher N., Willis, Eric R., and 10 colleagues, "ALMA Detection of Interstellar Methoxymethanol (CH<sub>3</sub>OCH<sub>2</sub>OH)", *ApJ*, 851, L46 (2017)
  54. Cyganowski, C. J., Brogan, C. L., Hunter, T. R., and 4 colleagues, "Simultaneous low- and high-mass star formation in a massive protocluster: ALMA observations of G11.92-0.61", *MNRAS*, 468, 3694 (2017)
  55. Towner, A. P. M., Brogan, C. L., Hunter, T. R., and 5 colleagues, "VLA Survey of Dense Gas in Extended Green Objects: Prevalence of 25 GHz Methanol Masers", *ApJS*, 230, 22 (2017)
  56. Hunter, T. R., Brogan, C. L., MacLeod, G., and 7 colleagues, "An Extraordinary Outburst in the Massive Protostellar System NGC6334I-MM1: Quadrupling of the Millimeter Continuum", *ApJ*, 837, L29 (2017)
  57. Brogan, C. L., Hunter, T. R., Cyganowski, C. J., and 3 colleagues, "The Massive Protostellar Cluster NGC 6334I at 220 au Resolution: Discovery of Further Multiplicity, Diversity, and a Hot Multi-core", *ApJ*, 832, 187 (2016)
  58. Forgan, D. H., Ilee, J. D., Cyganowski, C. J., and 2 colleagues, "Self-gravitating disc candidates around massive young stars", *MNRAS*, 463, 957 (2016)
  59. Ilee, J. D., Cyganowski, C. J., Nazari, P., and 4 colleagues, "G11.92-0.61 MM1: a Keplerian disc around a massive young proto-O star", *MNRAS*, 462, 4386 (2016)
  60. Troland, T. H., Goss, W. M., Brogan, C. L., and 2 colleagues, "Orion's Veil: Magnetic Field Strengths and Other Properties of a PDR in Front of the Trapezium Cluster", *ApJ*, 825, 2 (2016)
  61. Planck Collaboration, Arnaud, M., Ashdown, M., and 160 colleagues, "Planck intermediate results. XXXI. Microwave survey of Galactic supernova remnants", *A&A*, 586, A134 (2016)

62. Dirienzo, William J., Brogan, Crystal, Indebetouw, Rémy, and 3 colleagues, "Physical Conditions of the Earliest Phases of Massive Star Formation: Single-dish and Interferometric Observations of Ammonia and CCS in Infrared Dark Clouds", *AJ*, 150, 159 (2015)
63. ALMA Partnership, Vlahakis, C., Hunter, T. R., and 78 colleagues, "The 2014 ALMA Long Baseline Campaign: Observations of the Strongly Lensed Submillimeter Galaxy HATLAS J090311.6+003906 at  $z = 3.042$ ", *ApJ*, 808, L4 (2015)
64. ALMA Partnership, Brogan, C. L., Pérez, L. M., and 82 colleagues, "The 2014 ALMA Long Baseline Campaign: First Results from High Angular Resolution Observations toward the HL Tau Region", *ApJ*, 808, L3 (2015)
65. ALMA Partnership, Hunter, T. R., Kneissl, R., and 67 colleagues, "The 2014 ALMA Long Baseline Campaign: Observations of Asteroid 3 Juno at 60 Kilometer Resolution", *ApJ*, 808, L2 (2015)
66. ALMA Partnership, Fomalont, E. B., Vlahakis, C., and 246 colleagues, "The 2014 ALMA Long Baseline Campaign: An Overview", *ApJ*, 808, L1 (2015)
67. Johnson, K. E., Leroy, A. K., Indebetouw, R., and 5 colleagues, "The Physical Conditions in a Pre-super Star Cluster Molecular Cloud in the Antennae Galaxies", *ApJ*, 806, 35 (2015)
68. Cabrera-Ziri, I., Bastian, N., Longmore, S. N., and 9 colleagues, "Constraining globular cluster formation through studies of young massive clusters - V. ALMA observations of clusters in the Antennae", *MNRAS*, 448, 2224 (2015)
69. Cyganowski, C. J., Brogan, C. L., Hunter, T. R., and 6 colleagues, "G11.92-0.61-MM2: A Bonafide Massive Prestellar Core?", *ApJ*, 796, L2 (2014)
70. Whitmore, Bradley C., Brogan, Crystal, Chandar, Rupali, and 7 colleagues, "ALMA Observations of the Antennae Galaxies. I. A New Window on a Prototypical Merger", *ApJ*, 795, 156 (2014)
71. Dutta, Prasun, Chengalur, Jayaram N., Roy, Nirupam, and 5 colleagues, "The structure function of Galactic H I opacity fluctuations on au scales based on MERLIN, VLA and VLBA data", *MNRAS*, 442, 647 (2014)
72. Hunter, T. R., Brogan, C. L., Cyganowski, C. J., and 1 colleagues, "Subarcsecond Imaging of the NGC 6334 I(N) Protocluster: Two Dozen Compact Sources and a Massive Disk Candidate", *ApJ*, 788, 187 (2014)
73. Anderson, Gemma E., Gaensler, B. M., Kaplan, David L., and 18 colleagues, "Chasing the Identification of ASCA Galactic Objects (ChIcAGO): An X-Ray Survey of Unidentified Sources in the Galactic Plane. I. Source Sample and Initial Results", *ApJS*, 212, 13 (2014)
74. Zhu, Lei, Zhao, Jun-Hui, Wright, M. C. H., and 5 colleagues, "Subarcsecond Observations of NGC 7538 IRS 1: Continuum Distribution and Dynamics of Molecular Gas", *ApJ*, 779, 51 (2013)
75. Yusef-Zadeh, F., Wardle, M., Lis, D., and 5 colleagues, "74 MHz Nonthermal Emission from Molecular Clouds: Evidence for a Cosmic Ray Dominated Region at the Galactic Center", *JPCA*, 117, 9404 (2013)
76. Indebetouw, Rémy, Brogan, Crystal, Chen, C.-H. Rosie, and 15 colleagues, "ALMA Resolves 30 Doradus: Sub-parsec Molecular Cloud Structure near the Closest Super Star Cluster", *ApJ*, 774, 73 (2013)
77. Brogan, C. L., Goss, W. M., Hunter, T. R., and 6 colleagues, "OH (1720 MHz) Masers: A Multiwavelength Study of the Interaction between the W51C Supernova Remnant and the W51B Star Forming Region", *ApJ*, 771, 91 (2013)
78. Sarma, A. P., Brogan, C. L., Bourke, T. L., and 2 colleagues, "Very Large Array OH Zeeman Observations of the Star-forming Region S88B", *ApJ*, 767, 24 (2013)
79. Loinard, Laurent, Zapata, Luis A., Rodríguez, Luis F., and 10 colleagues, "ALMA and VLA

- observations of the outflows in IRAS 16293-2422", *MNRAS*, 430, L10 (2013)
80. Cyganowski, C. J., Brogan, C. L., Hunter, T. R., and 4 colleagues, "The Protocluster G18.67+0.03: A Test Case for Class I CH<sub>3</sub>OH Masers as Evolutionary Indicators for Massive Star Formation", *ApJ*, 760, L20 (2012)
  81. Dirienzo, William J., Indebetouw, Rémy, Brogan, Crystal, and 3 colleagues, "Testing Triggered Star Formation in Six H II Regions", *AJ*, 144, 173 (2012)
  82. Zernickel, A., Schilke, P., Schmiedeke, A., and 7 colleagues, "Molecular line survey of the high-mass star-forming region NGC 6334I with Herschel/HIFI and the Submillimeter Array", *A&A*, 546, A87 (2012)
  83. Anderson, Gemma E., Gaensler, B. M., Slane, Patrick O., and 29 colleagues, "Multi-wavelength Observations of the Radio Magnetar PSR J1622-4950 and Discovery of Its Possibly Associated Supernova Remnant", *ApJ*, 751, 53 (2012)
  84. Roy, Nirupam, Minter, Anthony H., Goss, W. M., and 2 colleagues, "Tiny Scale Opacity Fluctuations from VLBA, MERLIN, and VLA Observations of H I Absorption toward 3C 138", *ApJ*, 749, 144 (2012)
  85. Cyganowski, C. J., Brogan, C. L., Hunter, T. R., and 1 colleagues, "Deep Very Large Array Radio Continuum Surveys of GLIMPSE Extended Green Objects (EGOs)", *ApJ*, 743, 56 (2011)
  86. Reiter, Megan, Shirley, Yancy L., Wu, Jingwen, and 3 colleagues, "Evidence for Inflow in High-mass Star-forming Clumps", *ApJ*, 740, 40 (2011)
  87. Brogan, C. L., Hunter, T. R., Cyganowski, C. J., and 3 colleagues, "First Results from a 1.3 cm Expanded Very Large Array Survey of Massive Protostellar Objects: G35.03+0.35", *ApJ*, 739, L16 (2011)
  88. Reiter, Megan, Shirley, Yancy L., Wu, Jingwen, and 3 colleagues, "The Physical Properties of High-mass Star-forming Clumps: A Systematic Comparison of Molecular Tracers", *ApJS*, 195, 1 (2011)
  89. Devine, K. E., Chandler, C. J., Brogan, C., and 4 colleagues, "Very Large Array Observations of the Infrared Dark Cloud G19.30+0.07", *ApJ*, 733, 44 (2011)
  90. Bietenholz, M. F., Matheson, H., Safi-Harb, S., and 2 colleagues, "The deepest radio study of the pulsar wind nebula G21.5-0.9: still no evidence for the supernova shell", *MNRAS*, 412, 1221 (2011)
  91. Lovchinsky, I., Slane, P., Gaensler, B. M., and 5 colleagues, "A Chandra Observation of Supernova Remnant G350.1-0.3 and Its Central Compact Object", *ApJ*, 731, 70 (2011)
  92. Aversa, Alan G., Johnson, Kelsey E., Brogan, Crystal L., and 2 colleagues, "Very Large Array and ATCA Search for Natal Star Clusters in Nearby Star-forming Galaxies", *AJ*, 141, 125 (2011)
  93. Cyganowski, C. J., Brogan, C. L., Hunter, T. R., and 2 colleagues, "Bipolar Molecular Outflows and Hot Cores in Glimpse Extended Green Objects (EGOs)", *ApJ*, 729, 124 (2011)
  94. Reines, Amy E., Sivakoff, Gregory R., Johnson, Kelsey E., and 1 colleagues, "An actively accreting massive black hole in the dwarf starburst galaxy Henize2-10", *Natur*, 470, 66 (2011)
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## Technical Memos

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