

Dr. Dominique M. Segura-Cox

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EDUCATION

University of Illinois, Champaign-Urbana, Illinois, 2011 – 2017

Illinois Distinguished Fellow

Degree: Ph.D. in Astronomy, supervised by Prof. Leslie Looney

University of Michigan, Ann Arbor, Michigan, 2007 – 2011

Graduated with High Honors, Michigan Tradition Scholar

Degree: B.S. in Astrophysics and Astronomy

RESEARCH POSITIONS

Max Planck Institute for Extraterrestrial Physics, Postdoc with Director Paola Caselli, 2017 – Present

University of Illinois Astronomy Department, Graduate Research Assistant, 2011 – 2017

University of Michigan Department of Astronomy, Undergraduate Research Assistant, 2009 – 2011

Harvard-Smithsonian Center for Astrophysics, NSF REU Summer Intern, 2010

University of Michigan College of Engineering, NSF REU Summer Intern, 2009

ACTIVE RESEARCH AREAS

- Observations of young protostars still embedded in their larger-scale envelopes via infrared to radio wavelengths, interferometry, high spatial resolutions, and polarized emission
- Determining disk kinematic and dust properties in the youngest Class 0 and I protostellar phases
- Examining substructures in embedded disks to search for the earliest footholds of planet formation
- Investigating the influence of accretion from envelopes on the degree of chemical enrichment in disks

ONGOING LARGE SURVEYS WITH MAJOR INVOLVEMENT

MPG-IRAM Observing Program: From Protostars to Planet-Forming Disks, NOEMA, 620 hours, approved 2019. Co-PIs: Paola Caselli & Thomas Henning. Observations Fall 2019 – Present

- Acting as a main Max Planck observing contact for this Class 0, I, and II young stellar object kinematic and chemical study, and contributed heavily to the observing strategy, target selection, and proposal writing. Calibrated all data observed to date and developing data reduction and imaging strategy to be used for all Class 0/I targets to be observed over the remaining 3 years of project

Fifty AU Study of the chemistry in the disk/envelope system of Solar-like protostars (FAUST), ALMA, 152 hours, approved 2018. Co-PIs: Satoshi Yamamoto, Cecilia Ceccarelli, Claire Chandler, Claudio Codella & Nami Sakai. Observations 2018 – Present

- Leading the data reduction and science exploitation for 1 of 13 targets, managing team efforts

Seeds Of Life In Space (SOLIS), NOEMA, 346 hours, approved 2015. Co-PIs: Paola Caselli & Cecilia Ceccarelli. Observations 2015 – 2018

- Leading inspection of cyanopolyne molecular emission from Class 0 protostar IRAS4A

PUBLICATIONS, h-index = 18

- [37] **D. M. Segura-Cox**, L. W. Looney, J. J. Tobin, Z.-Y. Li, R. J. Harris, S. Sadavoy, M. M. Dunham, C. Chandler, K. Kratter, L. Perez, & C. Melis, *The VLA Nascent Disk and Multiplicity Survey of Perseus Protostars (VANDAM). V. 18 Candidate Disks around Class 0 and I Protostars in the Perseus Molecular Cloud*, 2018, ApJ, 866, 161
- [36] **D. M. Segura-Cox**, R. J. Harris, J. J. Tobin, L. W. Looney, Z.-Y. Li, C. Chandler, K. Kratter, M. M. Dunham, S. Sadavoy, L. Perez, & C. Melis, *The VLA Nascent Disk and Multiplicity Survey: First Look at Resolved Candidate Disks around Class 0 and I Protostars in the Perseus Molecular Cloud*, 2016, ApJ, 817, 14
- [35] **D. M. Segura-Cox**, L. W. Looney, I. W. Stephens, M. Fernández-López, W. Kwon, J. J. Tobin, Z.-Y. Li, & R. Crutcher, *The Magnetic Field in the Class 0 Protostellar Disk of L1527*, 2015, ApJ, 798, 2
- D. M. Segura-Cox**, A. Schmiedeke, J. E. Pineda, I. W. Stephens, M. Fernández-López, L. W. Looney, P. Caselli, Z.-Y. Li, L. G. Mundy, W. Kwon, & R. J. Harris, *Four annular structures in a protostellar disk with an age <500,000 years*, 2020, submitted to Nature
- [34] E. Bianchi, C. J. Chandler, C. Ceccarelli, C. Codella, N. Sakai, A. López-Sepulcre, L. T. Maud, G. Moellenbrock, B. Svoboda, Y. Watanabe (+56 co-authors and **D. M. Segura-Cox**), *FAUST I. The hot corino at the heart of the prototypical Class I protostar L1551 IRS5*, 2020, accepted to MNRAS, arXiv:2007.10275
- [33] J. E. Pineda, **D. M. Segura-Cox**, P. Caselli, N. Cunningham, B. Zhao, A. Schmiedeke, M. J. Maureira, & R. Neri, *A protostellar system fed by a streamer of 10,500 au length*, 2020, accepted to Nature Astronomy, arXiv:2007.13430
- [32] L. Tychoniec, C. F. Manara, G. P. Rosotti, E. F. van Dishoeck, A. J. Cridland, T.-H. Hsieh, N. M. Murillo, **D. M. Segura-Cox**, S. E. van Terwisga, & J. J. Tobin, *Dust masses of young disks: constraining the initial solid reservoir for planet formation*, 2020, accepted to A&A, arXiv:2006.02812
- [31] M. J. Maureira, J. E. Pineda, **D. M. Segura-Cox**, P. Caselli, L. Testi, G. Lodato, L. Loinard, & A. Hernandez-Gomez, *Orbital and mass constraints of the young binary system IRAS 16293-2422 A*, 2020, ApJ, 897, 59
- [30] V. Taquet, C. Codella, M. De Simone, A. López-Sepulcre, J. E. Pineda, **D. M. Segura-Cox**, C. Ceccarelli, P. Caselli, A. Gusdorf, M. V. Persson (+36 co-authors), *Seeds of Life in Space (SOLIS). VI. Chemical evolution of sulfuretted species along the outflows driven by the low-mass protostellar binary NGC 1333-IRAS4A*, 2020, A&A, 637, 63
- [29] C. Favre, C. Vastel, I. Jimenez-Serra, D. Quénard, P. Caselli, C. Ceccarelli, A. Chacón-Tanarro, F. Fontani, J. Holdship, Y. Oya (+33 co-authors and **D. M. Segura-Cox**), *Seeds of Life in Space (SOLIS). VII. Discovery of a cold dense methanol blob toward the L1521F VeLLO system*, 2020, A&A, 635, 189
- [28] J. J. Tobin, P. D. Sheehan, S. T. Megeath, A. K. Díaz-Rodríguez, S. S. R. Offner, N. M. Murillo, M. L. R. van 't Hoff, E. F. van Dishoeck, M. Osorio, G. Anglada (+26 co-authors and **D. M. Segura-Cox**), *The VLA/ALMA Nascent Disk and Multiplicity (VANDAM) Survey of Orion Protostars. II. A Statistical Characterization of Class 0 and Class I Protostellar Disks*, 2020, ApJ, 890, 130
- [27] K. Perraut, L. Labadie, B. Lazareff, L. Klarmann, **D. M. Segura-Cox**, M. Benisty, J. Bouvier, W. Brandner, A. Caratti o Garatti, P. Caselli (+70 co-authors), *The GRAVITY Young Stellar Object survey I. Probing the disks of Herbig Ae/Be stars at terrestrial orbits*, 2019, A&A, in press
- [26] J. J. Tobin, T. S. Megeath, M. van 't Hoff, A. K. Diaz-Rodriguez, N. Reynolds, M. Osorio, G. Anglada, E. Furlan, N. Karnath, S. Offner (+23 co-authors and **D. M. Segura-Cox**), *The VLA/ALMA*

Nascent Disk and Multiplicity (VANDAM) Survey of Orion Protostars I. Identifying and Characterizing the Protostellar Content of the OMC2-FIR4 and OMC2-FIR3 Regions, 2019, ApJ, in press

[25] S. I. Sadavoy, I. W. Stephens, P. C. Myers, L. W. Looney, J. J. Tobin, W. Kwon, B. Commercon, **D. M. Segura-Cox**, T. Henning, & P. Hennebelle, *Dust Polarization Toward Embedded Protostars in Ophiuchus with ALMA. III. Survey Overview*, 2019, ApJS, 245, 2

[24] F. O. Alves, P. Caselli, J. M. Girart, **D. M. Segura-Cox**, G. A. P. Franco, A. Schmiedeke, & B. Zhao, *Gas flow and accretion via spiral streamers and circumstellar disks in a young binary protostar*, 2019, Science, 366, 6461

[23] J. E. Pineda, B. Zhao, A. Schmiedeke, **D. M. Segura-Cox**, P. Caselli, P. C. Myers, J. Tobin, & M. Dunham, *The specific angular momentum radial profile in dense cores: improved initial conditions for disk formation*, 2019, ApJ, 822, 103

[22] B. C. Andersen, I. W. Stephens, M. M. Dunham, R. Pokhrel, J. K. Jorgensen, S. Frimann, **D. M. Segura-Cox**, P. C. Myers, T. L. Bourke, J. J. Tobin, & L. Tychoniec, *The Mass Evolution of Protostellar Disks and Envelopes in the Perseus Molecular Cloud*, 2019, ApJ, 873, 54

[21] S. I. Sadavoy, P. C. Myers, I. W. Stephens, J. Tobin, W. Kwon, **D. M. Segura-Cox**, T. Henning, B. Comercon, & L. Looney, *Dust Polarization toward Embedded Protostars in Ophiuchus with ALMA. II. IRAS 16293-2422*, 2018, ApJ, 869, 115

[20] J. J. Tobin, L. W. Looney, Z.-Y. Li, S. I. Sadavoy, M. M. Dunham, **D. M. Segura-Cox**, K. Kratter, C. J. Chandler, C. Melis, R. J. Harris, & L. Perez, *The VLA/ALMA Nascent Disk and Multiplicity (VANDAM) Survey of Perseus Protostars. VI. Characterizing the Formation Mechanism for Close Multiple Systems*, 2018, ApJ, 867, 43

[19] L. Tychoniec, J. J. Tobin, A. Karska, C. Chandler, M. M. Dunham, R. J. Harris, K. M. Kratter, Z.-Y. Li, L. W. Looney, C. Melis (+4 co-authors and **D. M. Segura-Cox**), *The VLA Nascent Disk and Multiplicity Survey of Perseus Protostars (VANDAM). IV. Free-Free Emission from Protostars: Links to Infrared Properties, Outflow Tracers, and Protostellar Disk Masses*, 2018, ApJS, 238, 19

[18] R. J. Harris, E. G. Cox, L. W. Looney, Z.-Y. Li, H. Yang, M. Fernández-López, W. Kwon, S. Sadavoy, **D. M. Segura-Cox**, I. Stephens, & J. Tobin, *ALMA Observations of Polarized 872 μ m Dust Emission from the Protostellar Systems VLA 1623 and L1527*, 2018, ApJ, 861, 91

[17] S. I. Sadavoy, P. C. Myers, I. W. Stephens, J. Tobin, B. Commercon, T. Henning, L. Looney, W. Kwon, **D. M. Segura-Cox**, & R. Harris, *Dust Polarization toward Embedded Protostars in Ophiuchus with ALMA. I. VLA 1623*, 2018, ApJ, 859, 165

[16] L. Tychoniec, J. J. Tobin, A. Karska, C. Chandler, M. M. Dunham, Z.-Y. Li, L. W. Looney, **D. M. Segura-Cox**, R. J. Harris, C. Melis, & S. I. Sadavoy, *The VLA Nascent Disk And Multiplicity Survey of Perseus Protostars (VANDAM). III. Extended Radio Emission from Protostars in Perseus*, 2018, ApJ, 852, 18

[15] I. W. Stephens, H. Yang, Z.-Y. Li, L. W. Looney, A. Kataoka, W. Kwon, M. Fernández-López, C. L. H. Hull, M. Hughes, **D. M. Segura-Cox** (+3 co-authors), *ALMA Reveals Transition of Polarization Pattern with Wavelength in HL Tau's Disk*, 2017, ApJ, 851, 55

[14] M. Fernández-López, I. W. Stephens, J. M. Girart, L. W. Looney, S. Curiel, **D. M. Segura-Cox**, C. Eswaraiah, & S.-P. Lai, *1.3mm Polarized Emission in the Circumstellar Disk of a Massive Protostar*, 2016, ApJ, 832, 200

[13] J. J. Tobin, K. M. Kratter, M. V. Persson, L. W. Looney, M. M. Dunham, **D. M. Segura-Cox**, Z.-Y. Li, C. J. Chandler, S. I. Sadavoy, R. J. Harris, C. Melis, & L. Perez, *A Triple Protostar System formed via Fragmentation of a Gravitationally Unstable Disk*, 2016, Nature, 538, 483

- [12] S. Storm, L. G. Mundy, K. I. Lee, M. Fernández-López, L. W. Looney, P. Teuben, H. G. Arce, E. W. Rosolowsky, A. M. Meisner, A. Isella (+10 co-authors and **D. M. Segura-Cox**), *CARMA Large Area Star Formation Survey: Dense Gas in the Young L1451 Region of Perseus*, 2016, ApJ, 830, 2
- [11] H. Yang, Z.-Y. Li, L. W. Looney, E. G. Cox, J. J. Tobin, I. W. Stephens, **D. M. Segura-Cox**, & R. J. Harris, *Disc Polarization from Both Emission and Scattering of Magnetically Aligned Grains: the Case of NGC 1333 IRAS 4A1*, 2016, MNRAS, 460, 4109
- [10] J. J. Tobin, L. W. Looney, Z.-Y. Li, C. J. Chandler, M. M. Dunham, **D. M. Segura-Cox**, S. I. Sadavoy, C. Melis, R. J. Harris, K. Kratter, & L. Perez, *The VLA Nascent Disk and Multiplicity Survey of Perseus Protostars (VANDAM). II. Multiplicity of Protostars in the Perseus Molecular Cloud*, 2016, ApJ, 818, 73
- [9] J. B. Lamb, M. S. Oey, **D. M. Segura-Cox**, A. S. Graus, D. C. Kiminki, J. B. Golden-Marx, & J. Wm. Parker, *The Runaways and Isolated O-Type Star Spectroscopic Survey of the SMC (RIOTS4)*, 2016, ApJ, 817, 113
- [8] E. G. Cox, R. J. Harris, L. W. Looney, **D. M. Segura-Cox**, J. J. Tobin, Z.-Y. Li, L. Tychoniec, C. J. Chandler, M. M. Dunham, K. Kratter (+3 co-authors), *High-resolution 8 mm and 1 cm Polarization of IRAS 4A from the VLA Nascent Disk and Multiplicity (VANDAM) Survey*, 2015, ApJ, 814, 28
- [7] K. I. Lee, M. M. Dunham, P. C. Myers, J. J. Tobin, L. E. Kristensen, J. E. Pineda, E. I. Vorobyov, S. S. R. Offner, H. G. Arce, Z.-Y. Li (+10 co-authors and **D. M. Segura-Cox**), *Mass Assembly of Stellar Systems and Their Evolution with the SMA (MASSES). Multiplicity and the Physical Environment in L1448N*, 2015, ApJ, 814, 114
- [6] J. J. Tobin, M. M. Dunham, L. W. Looney, Z.-Y. Li, C. J. Chandler, **D. M. Segura-Cox**, S. I. Sadavoy, C. Melis, R. J. Harris, L. M. Perez (+4 co-authors), *The VLA Nascent Disk and Multiplicity (VANDAM) Survey of Perseus Protostars. Resolving the Sub-arcsecond Binary System in NGC 1333 IRAS2A*, 2015, 798, 61
- [5] K. I. Lee, M. Fernández-López, S. Storm, L. W. Looney, L. G. Mundy, **D. M. Segura-Cox**, P. J. Teuben, E. Rosolowsky, H. G. Arce, E. C. Ostriker (+14 co-authors), *CARMA Large Area Star Formation Survey: Structure and Kinematics of Dense Gas in Serpens Main*, 2014, ApJ, 797, 76
- [4] S. Storm, L. G. Mundy, M. Fernández-López, K. I. Lee, L. W. Looney, P. J. Teuben, E. Rosolowsky, H. G. Arce, E. C. Ostriker, **D. M. Segura-Cox** (+15 co-authors), *CARMA Large Area Star Formation Survey: Project Overview with Analysis of Dense Gas Structure and Kinematics in Barnard 1*, 2014, ApJ, 794, 165
- [3] M. Fernández-López, H. G. Arce, L. W. Looney, L. G. Mundy, S. Storm, P. J. Teuben, K. Lee, **D. M. Segura-Cox**, A. Isella, J. J. Tobin (+8 co-authors), *CARMA Large Area Star Formation Survey: Observational Analysis of Filaments in the Serpens South Molecular Cloud*, 2014, ApJ, 790, 19
- [2] I. W. Stephens, J. M. Evans, R. Xue, Y.-H. Chu, R. A. Gruendl, & **D. M. Segura-Cox**, *Spitzer Observations of Dust Emission from H II Regions in the Large Magellanic Cloud*, 2014, ApJ, 784, 147
- [1] J. B. Lamb, M. S. Oey, A. A. Graus, F. C. Adams, & **D. M. Segura-Cox**, *The Initial Mass Function of Field OB Stars in the Small Magellanic Cloud*, 2013, ApJ, 763, 101

EXTERNAL TALKS

- Europlanet Science Congress 2020, September 2020, scheduled
- European Astronomical Society Annual Meeting 2020, June 2020
- Building Blocks of Planets 2020 Workshop, April 2020, **invited**

- ALMA2019: Science Results and Cross-Facility Synergies, October 2019
- European Week of Astronomy and Space Science, June 2019, **invited**
- National Radio Astronomical Observatory Lunch Seminar, January 2019
- Embedded Disk and Planet Formation Workshop: Leiden, July 2017, **invited**
- 229th Meeting of the American Astronomical Society (AAS), January 2017
- Harvard-Smithsonian Center for Astrophysics, December 2016, **invited**
- Half a Decade of ALMA: Cosmic Dawns Transformed Meeting, September 2016
- National Radio Astronomical Observatory Lunch Seminar, February 2016
- Midwest Magnetic Fields Workshop, May 2015
- AAS Workshop on Dense Cores: Origin, Evolution, and Collapse, July 2014
- 69th International Symposium on Molecular Spectroscopy, June 2014

ACCEPTED OBSERVING PROPOSALS AS PRINCIPAL INVESTIGATOR, 128.2 hours total

- *Envelope to Disk: The Composition of Accretion*, 2019, Project W19AG, **NOEMA**
- *The Origins of Complex Organic Molecule Emission in Protostars*, 2018, Project W18AS, **NOEMA**
- *Linking the Stages of Star Formation: Kinematics and Chemistry of the Class I Protostar TMC1A*, 2018, Project W18AN, **NOEMA**
- *Chemistry Associated with the Protostellar Disk with the Youngest-Known Ringed Dust Structure*, 2018, Project 2018.1.01634.S, **ALMA**
- *Doubling the Number of Class 0 and I Disks Through ALMA Line Observations of Perseus Disk Candidates*, 2017, Project 2018.1.01348.S, **ALMA**
- *First Detection of Disks around Class 0/I Protostars in Cepheus*, 2017, Project 2017A-S044, **SMA**
- *Has Planet Formation Already Begun in the Class I Protostellar Phase?*, 2015, Project 2015.1.01512.S, **ALMA**
- *Confirming the First Class 0 Circumbinary Disk*, 2015, Project 2015.1.01053.S, **ALMA**
- *Far-Infrared Polarization of Large-Scale Emission around Young Protostars: The TADPOL+E Survey*, 2015, Project #04_0170, **SOFIA**
- *Probing Magnetic Braking with the Disk of Class 0 Source L1527*, 2013, Project c1188, **CARMA**
- *The Inner Envelope Kinematics of the Class 0 Source L1527*, 2013, Project c1122, **CARMA**

ON SITE OBSERVING EXPERIENCE

CARMA Observing Shifts, 2013 – 2014, 30+ days

- Completed five week-long, 24 hours-a-day shifts which included controlling the telescope array, checking weather conditions, cooperatively taking data for other scientists, and assessing data quality

CARMA Summer School, 2012

- Learned to operate the CARMA telescope array, designed and carried out first millimeter-wave observing project, received training in interferometric data reduction and analysis techniques

TECHNICAL SKILLS

Facilities: Extensive experience with ALMA, NOEMA, VLA, SMA, CARMA, SOFIA, *Spitzer*

Observational techniques: Skilled with advanced interferometric calibration and analysis including self-calibration of long-baseline data, reducing polarized observations, and studies in the *uv*-plane

Astronomical software: Proficient with CASA, GILDAS, MIRIAD, SAOImage DS9, IRAF, SMART

Programming languages: Familiar with Python, C, IDL, shell-scripting, R, HTML

AWARDS & GRANTS

Mr. and Mrs. Hsiang-Pai and Wen-Hua Chu Department of Astronomy Excellence in Research Graduate Student Award, 2017, University of Illinois Astronomy Department, Award

Excellence Award in Recognition of Academic Excellence & Good Citizenship, 2016 & 2017, University of Illinois at Urbana-Champaign, Award

SOFIA Cycle 4 GO Grant, 2015, SOFIA Science Mission Operations. \$55,000 to support work connected to Project #04_0170, Grant

ALMA NRAO Student Observing Support, 2015, National Radio Astronomical Observatory. One year of graduate funding, Grant

VLA NRAO Student Observing Support, 2013, National Radio Astronomical Observatory. One year of graduate funding, Grant

Illinois Distinguished Fellowship, 2011, University of Illinois at Urbana-Champaign. Three years of graduate funding, Award

PROFESSIONAL SERVICE

MPE-ESO-LMU Star and Planet Formation Seminar Co-organizer, Max Planck Institute for Extraterrestrial Physics, 2018 – Present

Peer Reviewer, *The Astrophysical Journal*, 2016 – Present

Graduate Student Representative to the Faculty, University of Illinois Astronomy Department, elected by peers, 2016 – 2017

Treasurer, Women in Astronomy at the University of Illinois, 2014 – 2017

University of Illinois Fellowship Board Executive Committee, 2014

- Served as a student panelist to select campus-wide graduate fellowship recipients

TEACHING EXPERIENCE

Mentor to Graduate Students, Max Planck Institute for Extraterrestrial Physics

- Serving on Thesis Advisory Committee: Joaquin Zamponi (2019 – Present)
- Research Mentor: Carolina Agurto Gangas (2018 – Present)

Mentor to Undergraduate Students, University of Illinois

- Research Mentor: John DeVries (2017), Jiayin Dong (2015 – 2016), Andrew Nadolski (2014), Zhuchang Zhan (2013)
- Women in Astronomy Graduate Mentor: Sushma Adari (2014 – 2017)

Teaching Assistant, University of Illinois

- Graduate Course: *Theoretical Stellar Physics* (Spring 2015)
- Upper-Division Undergraduate Courses: *Astronomical Techniques* (Spring 2012, Fall 2014), *Solar System & Interstellar Medium* (Spring 2013), *Stellar Astrophysics* (Fall 2011, Fall 2012)

SELECTED OUTREACH ACTIVITIES

Astronomy on Tap Speaker, Max Planck Institute for Extraterrestrial Physics, 2020

- Presented “Baby photos: Star Formation Caught in the Act,” aimed at an audience of the general public. Gave engaging lecture and answered layman level questions

Public Total Eclipse Viewing, University of Illinois, 2017

- Aided with advanced planning logistics for off-campus event, lead hands-on demonstrations

Correctional Facility Eclipse Outreach, Harrisburg Juvenile Correctional Facility and the adult Vienna Correctional Facility, 2017

- Engaged with incarcerated individuals in the path of totality about the upcoming eclipse

Girls Explore Astronomy Summer Camp, University of Illinois, 2016

- Assisted with organization and presented portions of a week-long astronomy summer science camp for 10-12-year-old girls, coordinated with the Champaign Park District

The American Astronomical Society Astronomy Ambassadors Program Workshop, 227th Meeting of the American Astronomical Society, 2016

- Participated in formal outreach training aimed at early career astronomers

National Radio Astronomical Observatory (NRAO) Outreach Video Interview, 2016,

<https://public.nrao.edu/explore/role-models/dominique-segura-cox/>

- Discussed career path and past challenges faced for NRAO website aimed at the public

I-RISE Summer Teacher Workshops, University of Illinois, 2012 & 2013

- Lead, organized, and lectured at two-day workshops aimed at middle and high school math and science teachers to incorporate astronomy throughout their curricula