Daniel Carrera

Curriculum Vitae

Education

02/2017 **PhD in Astrophysics**, *Lund University*, Sweden.
Thesis: Formation and early evolution of planetary systems

06/2012 **Masters in Astrophysics**, *Lund University*, Sweden.
Thesis: Effects of WIMP dark matter on binary stars

06/2001 **Bachelor in Math and Physics**, *University of Toronto*, Canada.
Graduated with distinction

Selected Publications (from 15 refereed, 11 as first author)

2022 *The Streaming Instability Cannot Form Planetesimals from Millimeter-size Grains in Pressure Bumps*
Carrera, D., Simon, J. B., 2022, ApJL, 933, 10

2022 *Resilience of Planetesimal Formation in Weakly-Reinforced Pressure Bumps*
Carrera, D., Thomas, A. J., Simon, J. B., Small, M. A., Kretke, K. A., Klahr, H., 2022, ApJ, 927, 52

2021 *Protoplanetary Disk Rings as Sites for Planetesimal Formation*
Carrera, D., Simon, J. B., Li, R., Kretke, K. A., Klahr, H., 2021, AJ, 161, 96

2019 *Formation of short-period planets by disc migration*
Carrera, D., Ford, E. B., & Izidoro, A., 2019, MNRAS, 486, 3874

2018 *Identifying inflated super-Earths and photo-evaporated cores*
Carrera, D., Ford, E. B., Izidoro, A., Jontof-Hutter, D., Raymond, S. N., & Wolfgang, A., 2018, ApJ, 866, 2

2017 *Planetesimal Formation by the Streaming Instability in a Photoevaporating Disk*
Carrera, D., Gorti, U., Johansen, A., & Davies, M. B., 2017, ApJ, 839, 16

2017 *Concentrating small particles in protoplanetary disks through the streaming instability*
Yang, C.-C., Johansen, A., & **Carrera, D.** 2017, A&A, 606, A80

2015 *How to form planetesimals from mm-sized chondrules and chondrule aggregates*
Carrera, D., Johansen, A., & Davies, M. B., 2015, A&A, 579, A43

Relevant Positions

2023-present **Research Scientist**.
Department of Physics and Astronomy. Iowa State University.
Research focus: evolution of Class 0/I disks.

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2019-2023 **Postdoctoral Research Associate**.
Department of Physics and Astronomy. Iowa State University.
Research focus: formation of planetesimals by the streaming instability.

2019 **Assistant Research Professor**.
Department of Astronomy & Astrophysics. Pennsylvania State University.
Research focus: formation of super-Earths.

2017-2019 **NASA Postdoctoral Fellow**.
Department of Astronomy & Astrophysics. Pennsylvania State University.
Research focus: formation of super-Earths.

Selected Invited talks

2021 *Planetesimal Formation in Pressure Bumps*
Lund-Copenhagen Astronomy Meeting (virtual seminar).

2020 *Protoplanetary Disk Rings as Sites for Planetesimal Formation*
Planetesimal Formation Meeting (virtual conference).

2018 *Origin of volatiles on super-Earths*
American Museum of Natural History, New York, New York.

2017 *Formation of planetesimals through the streaming instability*
Accretion: Building New Worlds, Houston, Texas.

2016 *Survival of habitable planets in unstable planetary systems*
California State University Northridge, Northridge, California.

2016 *Planetesimal formation by the streaming instability in a photoevaporating disk*
University of Bern, Bern, Switzerland.

Selected contributed talks

2022 *Challenge of forming planetesimals from mm grains in dust rings*
Annual DPS Meeting, AAS, London, Ontario.

2022 *Planetesimal formation in dust rings*
ngVLA Conference, CCA, Flatiron Institute, New York.

2022 *The SI cannot form planetesimals from mm grains in pressure bumps*
Exoplanets IV, Las Vegas, Nevada.

2021 *Protoplanetary Disk Rings as Sites for Planetesimal Formation*
Origins Seminar at the University of Arizona (virtual seminar).

2020 *Protoplanetary Disk Rings as Sites for Planetesimal Formation*
Five Years After HL Tau (virtual conference).

2019 *Formation of short period planets by disk migration of resonant chains*
Planetary Dynamics Conference, MPIA, Heidelberg, Germany

2018 *Identifying inflated super-Earths and photo-evaporated cores*
Emerging Researchers In Exoplanet Science Symposium IV, State College, PA

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2017 *Origin of super-Earth atmospheres*
Habitable Worlds, Laramie, Wyoming

2017 *Planetesimal formation by the streaming instability in a photo-evaporating disk*
Formation and Dynamical Evolution of Exoplanets, Aspen, Colorado.

2016 *How to form asteroids from mm-sized grains*
Bay Area Exoplanets Meeting, NASA Ames, Mountain View, California.

2016 *Survival of habitable planets in unstable planetary systems*
The Astrophysics of Planetary Habitability, Vienna, Austria.

Selected Teaching and Mentorship

June 2022 - present ***Research advisor for a graduate student at Iowa State University.***.
I am the student's primary advisor. The student is conducting a study with me on the evolution of Class 0/I disks and its implications for planet formation.

2018-2022 ***Research advisor for a graduate student at the Pennsylvania State University***.
I was the student's primary advisor. I guided the student through two research projects that led to first-author peer-reviewed publications in 2021 (MNRAS) and 2022 (ApJ).

2019-2021 ***Research advisor for an undergraduate student at Iowa State University***.
I was the student's primary advisor. I guided the student through a research project that resulted in a peer-reviewed publication ApJ in 2022.

2021 ***Postdoctoral Scholar Excellence Award for Teaching and Mentoring***.
This award honors postdoctoral scholars who have made innovative and significant contributions to training future scientists at Iowa State.

2012–2016 ***MATLAB for Astronomers***.
I designed a 3-day MATLAB course for astronomers that quickly became part of Lund University's astronomy curriculum as a mandatory component of three graduate and undergraduate level courses.

2015 **Exoplanets lab**.
I designed and taught the exoplanets lab for the bachelor course *Introduction to Astronomy*, at Lund University. Students learn to use Kepler archival data to characterize Kepler-22b.

2015 **Pedagogy course**.
Three-week course on pedagogy, *Teaching and Learning in Higher Education*, at Lund University.

2013 **Instructor for *Statistical Tools in Astrophysics***.
This course is part of the Masters program in astronomy at Lund University. In 2013 I was the sole course instructor. I prepared all the lectures, and I designed and graded the final exam.

Computing

Hydro I have extensive experience with two state-of-the art hydrodynamic codes — the Pencil Code and Athena. I am a Pencil Code contributor and I have added new capabilities (such as pressure bumps) to Athena.

N-Body I have extensive experience with two state-of-the art N-body codes — MERCURY6 and REBOUND. I have written significant extensions to both for use in research.

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HPC I routinely use national-level (e.g., XSEDE) supercomputers to conduct highly parallel simulations (with up to 6,000 cpu cores).

Compilers I am a contributor to the GNU Fortran Compiler. I contributed to the MPI-based implementation of Coarrays, which are part of the Fortran 2008 standard. I have experience working with a large codebase.

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