LIZXANDRA FLORES RIVERA

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EDUCATION

Postdoctoral researcher Present
Center for Star and Planet formation, Globe institute, University of Copenhagen, Denmark
PIs: Dr. Michiel T. A. Lambrechts and Anders Johansen

Doctorate of Philosophy in Astronomy 30 November 2022
Connection simulations of protoplanetary disks with forbidden emission lines observations.
Max Planck Institute for Astronomy (MPIA) at Heidelberg, Germany
PI: Dr. Mario Flock

Master of Science in Physics June 2018
Thesis Title: *Chemistry of the Envelope and Disk in the Protostar L1527.*
California State University Los Angeles (CSULA)
PI: Dr. Susan Terebey

Bachelor of Science in Theoretical Physics/minor in Atmospheric Sciences May 2015
University of Puerto Rico at Mayaguez (UPRM)

QUALIFICATION STRENGTHS AND INTERESTS

Research Interest Areas	Global hydrodynamical simulations on protoplanetary disks using PLUTO code. Analyzing optical data from MUSE/VLT. Post-processing with radiative transfer and chemical models.
Programing languages experience	Python, IDL, Fortran and C
Softwares	PLUTO 4.4, RADMC3D

CURRENT RESEARCH

Pebble concentration in vortices
Globe institute *Postdoctoral research*

· We performed 3D HD simulations including Lagrangian dust particles using PLUTO 4.4 to understand where dust particles of different sizes concentrate in disks. We find that the particles concentrate in stable and long-lived vortices. We post-process the simulations with RADMC3D to obtain the synthetic dust continuum emission at different wavelength bands that is directly comparable to ALMA and ngVLA. Our findings suggest that particle concentrations within vortices formed in VSI-driven turbulent disks can account for the observed dust asymmetries in protoplanetary disks, which are often attributed to the presence of giant planets.

Ice particles processing in VSI-active disk
Globe institute *Postdoctoral research*

· We performed HD simulations, including Lagrangian dust particles, using PLUTO 4.4 to understand how dust particles of different sizes are UV-processed in the disk and influenced by VSI-driven turbulence. We found that a fraction of 100 micrometer particles are UV-processed by photodissociation at the UV layer (Z/R=0.2), given that their residence time is comparable to their icy destruction timescale. The 1 mm particles remain UV-shielded for the entire dynamical evolution of the disk.

Forbidden emission lines in protostellar outflows and jets with MUSE/VLT.
MPIA *PhD Project II*

· We analyze spatially resolved seven forbidden emission lines, that are originating from the outflow/jet in five T Tauri sources. We aim to derive the position angle of the outflow/jet, that is connected with the inner disk, and compare it with the position angle of the dust constrained from the outer disk by previous work. The idea is to determine whether or not there is a potential missalignment between the inner disk and outer disk. We also attempted to analyze the velocity component of the lines.

Hydrodynamical simulations of protoplanetary disks including irradiation of stellar photons. Part I. Resolution study of Vertical Shear Instability (VSI).
MPIA *PhD Project I*

· We perform HD simulations using PLUTO 4.3 and implemented our accretion disk setup in 2.5D (2 Dimensions, 3 Components) that covers approximately a full meridional domain. We selected an isothermal configuration to assess the vertical momentum and energy that the vertical shear can produced and influence the launch of winds at the surface of the disk.

Physical and Chemical Structure of the Disk and Envelope of protostar L1527 June 2016 - June 2018
Jet Propulsion Laboratory (NASA JPL) *Master Thesis Project*

· We apply our modeling code, RadChemT, which combines collapse dynamics of the molecular cloud, radiative transfer (HOCHUNK3D), and gas-grain chemistry to ultimately reproduce ALMA $C^{18}O$ (2-1) and CARMA ^{12}CO (1-0), and N_2H^+(1-0) observations of L1527, which appear to trace the disk-envelope boundary, infall, and outflow of L1527 Class 0/I protostar.

OPTICAL OBSERVING EXPERIENCE

1.23 Telescope, Calar Alto Observatory (CAHA) 24 nights

· Operated the 1.23m telescope to take optical photometric observations of M-dwarfs as part of the EDEN project, searching for planetary transits in the northern-hemisphere. The telescope and instruments were operated in remote-mode. The observations included full telescope, dome and instrument control. Observer was in charge of calibration frames acquisition, and observation of the science targets.

PAST RESEARCH OPPORTUNITIES

Identifying Extreme UltraViolet (EUV) plasma jets in Coronal Holes June - August 2015
Marshall Space Flight Research Center (NASA MSFC) *NASA Academy*

Atmospheric data and the prediction of flight path from scientific balloons June - August 2014
Armstrong Flight Research Center (NASA AFRC)

Diagnosing meteorological conditions associated with sprites and lightning with large Charge Moment Changes (CMC) over Oklahoma June - August 2013
Marshall Space Flight Research Center (NASA MSFC)

Improving weather forecasts on the western side of PR using weather sounding August 2012 - May 2013
UPRM

Evaluation of hail size using Dual-Polarization radar products June - July 2012
National Weather Service, Memphis, TN

Evaluation of dust events reaching P.R. during summer of 2011 June - July 2011
Bio-Optics Oceanography Laboratory (UPRM)

RESEARCH PUBLICATIONS

Nakatani, R., Terebey, S., Turner, N., and **L. Flores-Rivera**, *Radiation Hydrodynamics Simulations of Envelope Accretion in L1527, in prep.*

L. Flores-Rivera, Manger, N., et al. *Gas dynamics around dust asymmetries in turbulent disks, under revision.*

Terebey, S., Sandoval L., and **L. Flores-Rivera**, and Turner, N., and Barajas, A., *The dynamics of infall and accretion shocks in the outer disk*, ApJ, 2025, 990, 53.

L. Flores-Rivera, M. Lambrechts, S. Gavino, S. Lorek, and collaborators *UV-processing of icy pebbles in the outer parts of VSI-turbulent disks*, AAS, 2025, 693, 17pp.

Birney, M., Whelan E., et al.+incl.(**L. Flores-Rivera**), *Spectro-imaging of the RU Lupi Wind and Jet*, A&A, 2024, 692, 13pp.

Dietrich, J., et al.+incl.(**L. Flores-Rivera**), *EDEN Survey: Small Transiting Planet Detection Limits and Constraints on the Occurrence Rates for Late M Dwarfs within 15 pc*, ApJ, 2023, 165, 149.

L. Flores-Rivera, M. Flock, et al., *Forbidden emission lines in protostellar outflows and jets with MUSE*, AAS, 670, A126.

L. Flores-Rivera, S. Terebey, K. Willacy, A. Isella, N. Turner, and M. Flock, *Physical and Chemical Structure of the Disk and Envelope of the Class 0/I protostar L1527*, ApJ, 2021, 908, 108F.

L. Flores-Rivera, M. Flock, and R. Nakatani, *Hydrodynamical simulations of protoplanetary disks including irradiation of stellar photons. I. Resolution study for vertical shear instability*, 2020, AAS, 644, A50.
DOI: `https://doi.org/10.1051/0004-6361/202039294`

T. Lang, S. Cummer, D. Petersen, **L. Flores-Rivera**, W. Lyons, D. MacGorman and W. Beasley, *Large Charge Moment Change Lightning in the El Reno Tornadic Storm System*, Journal of Geophysical Research: Atmospheres.,120, March 2015.

COLLEGE JOURNAL PUBLICATION

L. Flores-Rivera, G. Rivera-Santiago, A. N. Ramos-Valle, and C.U. Pabon-Ortiz, *Juracan*, Revista Informativa Sociedad Meteorologica de Puerto Rico, Capitulo Estudiantil-UPR Recinto Universitario de Mayaguez, Vol.6, January 2013.

HONORS AND AWARDS

- **NASA Emerging Worlds 2023 external reviewer honorarium**
  An honorarium award of $100 was given after my participation as an external reviewer in a NASA Emerging Worlds 2023 proposal. 2024
- **Seal of Excellence recognition by the European Commission**
  for the DiskIce project (high scored but not funded) proposal under the Horizon Europe Marie Sklodowska-Curie. 2023
  HORIZON-MSCA-2023-PF-01-01 - MSCA postdoctoral fellowships.
- **MBRS-RISE MS-to-PhD** fellowship under the M.S. in CSULA September 2017 - June 2018
  Grant: R25 GM061331
- **JPL Master Thesis Fellowship Program (MSTP)** under the M.S. in CSULA May 2017 - September 2017
- **NASA DIRECT-STEM** scholarship under the M.S. in CSULA. September 2015 - May 2017
  Grant: NNX15AQo6A.
- University of Puerto Rico at Mayaguez , Arts and Sciences **Honor Roll** 2009-2014

TECHNICAL PRESENTATIONS

Gas and dust dynamics in VSI-active disks
Flatiron workshop on Hydrodynamics and Dusty Turbulence in Protoplanetary disks, New York, USA (invited talk) 23-25 February 2026
Department of Astronomy, Ludwig-Maximilians-Universität (LMU) Münich, Germany 7 March 2025
Department of Physics and Astronomy, University of Bologna, Italy 27 February 2025
New Heights for Planet Formation workshop, ESO Garching, Germany 15-19 July 2024
Lunch seminar, Center for Simulational Physics, Univ. of Georgia, U.S.A. 13 February 2024

PFM, Globe institute, Univ. of Copenhagen, Denmark 30 November 2023
Gas dynamics of infall in L1527
Globe institute, Univ. of Copenhagen, Denmark 31 May 2023
Gas dynamics and photoevaporative-driven winds
National Astronomical Observatory Japan (NAOJ), Tokyo, Japan 17 April 2023
Globe institute retreat, Valadalen, Sweden 3 March 2023
PFM, Globe institute, Univ. of Copenhagen, Denmark 14 December 2022
VSI conference 2022 via Zoom 8-11 November 2022
PSF coffee at MPIA, Germany 8 June 2022
Forbidden emission lines in protostellar outflows and jets with MUSE/VLT
Core2disk conference, Paris, France 9-13 October 2023
Jets and Winds from Young Stars workshop, Maynooth, Ireland 14 June 2023
Protostar and Planets VII conference in Kyoto, Japan (Poster: SF-06-0006) 10-15 April 2023
INSIDE conference 2022 in Ringberg castle, Kreuth, Germany (Poster) 18-21 September 2022
PSF coffee at MPIA, Germany 8 June 2022
Disk evolution and planet formation.
Speaker: **L. Flores-Rivera**.
International Day of Women and Girls in Science, Univ. of Copenhagen, Denmark 9 February 2024
Univ. of Puerto Rico, Rio Piedras, Puerto Rico, via Zoom. 1 December 2023
Univ. of Puerto Rico, Mayaguez, Puerto Rico, via Zoom. 21 April 2022
California State University, Los Angeles, California, via Zoom. 19 September 2022
Optical and NIR magnitude measurements of low Earth orbit satellites, from a global observing network (registered for presentation).
PI: Jeremy Tregloan-Reed (Univ. Atacama, Chile) and Co-authors (incl.): **L. Flores-Rivera**.
IAU General Assembly 2022, Busa, Republic of Korea, via Zoom. 2-11 August 2022
Disk dynamics and forbidden emission lines in protostellar outflows and jets with MUSE/VLT
University of Wisconsin in Madison, Wisconsin, U.S.A. 12-17 November 2021
University of Illinois in Urbana-Champaign, Illinois, U.S.A. 10-12 November 2021
University of Michigan in Ann Arbor, Michigan, U.S.A. 6-10 November 2021
Texas State University in San Marcos, Texas, U.S.A. 4-6 November 2021
University of Arizona in Tucson, Arizona, U.S.A. 1-4 November 2021
NASA Ames Research Center in California, U.S.A. 27-31 October 2021
Overview PSF link: Protoplanetary disks
MPIA PSF retreat, in Weilburg, Germany. 20-22 October 2021
Hydrodynamical simulations of protoplanetary disks including irradiation of stellar photons. Part I. Resolution study of VSI.
Authors: **L.Flores-Rivera** and M. Flock.
PLUTO symposium, via Zoom. 28-29 June 2021
Circumplanetary Disks and Satellite Formation II conference, ETH Zrich, Switzerland. 15-17 March 2021
Department of Applied Mathematics and Theoretical Physics (DAMTP), U. of Cambridge, U.K. 15 February 2021
Grenoble workshop (via Zoom). 14 December 2020
Five years after HL Tau (Recorded Poster via Zoom). 7-11 December 2020
MPIA PSF coffee (via Zoom). 7 October 2020
Exoplanets III. Host: Kees Dullemond (Poster via Zoom). July 2020
Building Blocks of Planets 2020 meeting. Host: Mario Flock (via Zoom). April 2020
Disc2Planet meeting by Bertram Bitsch in Ringberg castle, Kreuth, Germany. September 2019
Accretion 2019 meeting by Hubert Klahr in Ringberg castle, Kreuth, Germany. July 2019

Physical and Chemical Structure of Disk and Envelope of Protostar L1527.
Authors: **L.Flores-Rivera** and S. Terebey.
Heidelberg & Harvard workshop (via Zoom) 1 December 2020
Star Planet Formation Journal club seminar in Department of Astronomy, U. Michigan U.S.A. 18 August 2020
Harvard & Heidelberg workshop in Cambridge, Boston, U.S.A November 2019
Planet Formation and Evolution meeting: P512, Rostock, Germany. February-March 2019

232nd AAS Annual meeting, Denver CO. Molecular clouds, star formation and YSOs: 222.01. June 2018
Annual DIRECT-STEM Research Symposium, CSULA. April 2017
25th Annual Student Symposium on Research, Scholarship and Creative Activity, CSULA. February 2017
229th AAS Annual meeting, Grapevine TX. Circumstellar and Debris disk session: 345.19. January 2017
Jet Propulsion Laboratory, Pasadena CA. August 2016

Observational signature of protostellar disk accretion at 4.5 microns.
Authors: **L. Flores-Rivera** and S. Terebey.
Annual DIRECT-STEM research Symposium, CSULA. April 2016

Identifying Extreme UltraViolet (EUV) plasma jets in Coronal Holes.
Authors: **L. Flores-Rivera** and M. Adams.
2015 AGU Virtual Poster Showcase, San Francisco, CA. December 2015
NASA Marshall Space Flight Center, Hunstville, AL. August 2015

Vertical Profile of the atmosphere for K-12 teachers.
Authors: **L. Flores-Rivera** and J. Algarin.
Eugene Francis Room, UPRM. April 2015

Atmospheric data and the prediction of launch points for large scientific balloons.
Authors: **L. Flores-Rivera** and E. Teets.
95th AMS Annual meeting, Phoenix, AZ. Amer.Meteor.Soc.,S15. January 2015
NASA Armstrong Flight Research Center. Edwards Air Force Base, CA. August 2014

Diagnosing meteorological conditions associated with lightning with Large Charge Moment Changes (CMC) over Oklahoma.
Authors: **L. Flores-Rivera** and T. Lang.
94th AMS Annual meeting, Atlanta, GA. Amer.Meteor.Soc.,S52. January 2014
NASA Marshall Space Flight Center, Huntsville, AL. August 2013

Evaluation of Hail Size using dual polarimetric radar data.
Authors: **L. Flores-Rivera** and T. Salem.
93rd AMS Annual Meeting, Austin, TX. Amer.Meteor.Soc.,S21. January 2013

African dust intrusions to the Eastern Caribbean during summer 2011.
Authors: **L. Flores-Rivera**, Y. Detres, and R. Armstrong.
First International Workshop on the Long-Range Transport and Impacts of African Dust in the Americas. San Juan, P.R. September 2012
Sixth NOAA Education and Science Forum, Tallahassee, FL. March 2012
UPRM, Department of Physics, Summer Internship Symposium. August 2011

LEADERSHIP AND OUTREACH EXPERIENCE

Dust-to-DNA summer school in Copenhagen, Denmark 18-22 August 2025
This one-week PhD course explores the journey from interstellar dust to habitable planets through interdisciplinary lectures and hands-on sessions led by international experts. I served on the organizing committee of the school, welcoming students, assisting them with questions during the hands-on sessions, and providing meals. For more information: `http://www.dust2dna.dk/`

Outreach day to Gefion Gymnasium high school in Copenhagen, Denmark 12 May 2025
The outreach consisted of a lecture about the formation of solar-like systems and life on Earth followed by an activity where students will characterize different meteorites that we will bring from the institute. Duration: 1 hour 30 minutes.

Referee duties on scientific journal 2024
Invited to served as a referee for the Astrophysical Journal (ApJ).

External reviewer for a NASA Emerging Worlds proposal 2024
Invited to served as an external reviewer for a NASA Emerging Worlds proposal.

StarPlan seminar coordinator 2022-2023
Served as the coordinator of our weekly group meetings.

Teaching assistant at the University of Heidelberg, Germany 2021
Instructed bachelors and masters student the course about statistical methods for experimental physics for a total of 12 sessions.

MPIA PhD student representative 2020-2021
Together with two other PhD student representatives we worked to collect and to communicate students technical and finance needs to the administration during the COVID-19 pandemic.

Public outreach at MPIA and Haus die Astronomie (HdA) 2019-2020
I held the position as one of the Guide Tour persons to demonstrate the 70cm King Telescope at MPIA and a showcase in the Planetarium at HdA.

One-day lecture experience at CSULA Spring 2018
Served as a substitute lecturer for my master's supervisor, Dr. Terebey, delivering a session on "Radiation fundamentals: brightness and flux density" as part of the Introduction to Astrophysics course.

NASA Leadership Academy Summer 2015
Enrolled in groups and teamwork activities, seminars, informal discussions, evening lectures, supervised research, tours, assessment, outreach to Kindergarten students, and voluntary work at a museum.

UPRM Meteorological Laboratory 2014-2015
Leader and Forecaster.

American Meteorological Society (AMS) UPRM Student Chapter
Editor-in-chief of the AMS UPRM Student Chapter Journal "Juracan" 2013-2012
Chair of the committee of Science Outreach and Interactive Science Demonstrations 2012

REFERENCES

Susan Terebey: sterebe@exchange.calstatela.edu

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Anders Johansen: anders.johansen@sund.ku.dk