Darius Modirrousta-Galian, Curriculum Vitae

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Current Professional Appointments

- **Tsung-Dao Lee Fellow,** Tsung-Dao Lee Institute, Shanghai, China, 2025–Present.
- **Associate Professor,** Shanghai Jiao Tong University, Shanghai, China, 2025–Present.
- **Research Affiliate,** Yale University, New Haven, Connecticut, United States, 2025–Present.

Past Professional Appointments

- **Postdoctoral Associate,** Yale University, New Haven, Connecticut, United States, 2021–2025.
  RESEARCH: Loss of volatiles from the Hadean Earth and the subsequent redox evolution of the atmosphere.
  SUPERVISOR: Prof. Jun Korenaga.

Education

- **Ph.D., Physics,** University of Palermo (UniPa), National Institute for Astrophysics (INAF), Palermo, Italy, 2022.
  DISSERTATION: A Theoretical Analysis of Super-Earths and Sub-Neptunes.
  ADVISOR: Prof. Giuseppina Micela.
- **Visiting Graduate Researcher,** California Institute of Technology (CalTech), Pasadena, United States, 2020.
  ADVISOR: Prof. David J. Stevenson.
- **M.Sc., Planetary Science,** University College London (UCL), London, United Kingdom, 2018.
  DISSERTATION: The Interior Structure of Hot Super-Earths: Transmission Spectroscopy of Silicate Species.
  ADVISOR: Prof. Giovanna Tinetti.
- **B.Sc., Astrophysics,** University College London (UCL), London, United Kingdom, 2017.

First Author Publications

12. **Modirrousta-Galian, D.** & Korenaga, J., (2026). Retention of primordial atmospheres through giant impacts. Nature Astronomy, doi:10.1038/s41550-026-03006-1.
11. **Modirrousta-Galian, D.** & Korenaga, J., (2026). On the dual nature of atmospheric escape. The Astrophysical Journal, 1000, 11.
10. **Modirrousta-Galian, D.** & Korenaga, J., (2026). Revising core powered mass loss: A critical assessment of the "energy limited" argument. Icarus, 444, 116827.
9. **Modirrousta-Galian, D.** & Korenaga, J., (2025). On the efficacy of ocean formation with a primordial hydrogen atmosphere. Journal of Geophysical Research: Planets, 130, e2024JE008786.
8. **Modirrousta-Galian, D.**, Spinelli, R. and Jimenez-Escobar, A., (2024). Windows Into Other Worlds: Pitfalls in the physical interpretation of exoplanet atmospheric spectroscopy. Memorie della Societa Astronomica Italiana, 95, 93.
7. **Modirrousta-Galian, D.** & Korenaga, J., (2024). The diffusion limit of photoevaporation in primordial planetary atmospheres. The Astrophysical Journal, 965, 97.
6. **Modirrousta-Galian, D.** & Korenaga, J., (2023). The three regimes of atmospheric evaporation for super-Earths and sub-Neptunes. The Astrophysical Journal, 943, 11.
5. **Modirrousta-Galian, D.** & Maddalena, G., (2021). Of aliens and exoplanets: Why the search for life, probably, requires the search for water. Journal of the British Interplanetary Society 74, 238–242.
4. **Modirrousta-Galian, D.**, Ito, Y. and Micela, G., (2021). Exploring super-Earth surfaces: Albedo of near-airless magma ocean planets and topography. Icarus, 358, 114175.
3. **Modirrousta-Galian, D.**, Stelzer, B., Magaudda, E., Maldonado, J., Güdel, M., Sanz Forcada, J., Edwards, B. and Micela, G., (2020). GJ 357 b. A super-Earth orbiting an extremely inactive host star. Astronomy & Astrophysics, 641, A113.
2. **Modirrousta-Galian, D.**, Locci, D. and Micela, G. (2020). The bimodal distribution in exoplanet radii: Considering varying core compositions and H_2 envelope's sizes. The Astrophysical Journal, 891, 158.
1. **Modirrousta-Galian, D.**, Locci, D., Tinetti, G. and Micela, G. (2020). Hot super-Earths with hydrogen atmospheres: A model explaining their paradoxical existence. The Astrophysical Journal, 888, 87.

Other Publications

7. Mugnai, L. & **Modirrousta-Galian, D.** (2022). RAPOC: The Rosseland and Planck opacity converter: A user-friendly and fast opacity program for Python. Experimental Astronomy, doi:10.1007/s10686-022-09869-2.
6. Mugnai, L., **Modirrousta-Galian, D.**, et al. (2021). ARES. V. No evidence for molecular absorption in the HST WFC3 spectrum of GJ 1132 b. The Astronomical Journal, 161, 284.
5. Benatti, S., **Modirrousta-Galian, D.**, et al. (2021). Constraints on the mass and on the atmospheric composition and evolution of the low-density young planet DS Tucanae A b. Astronomy & Astrophysics, 650, A66.
4. Guilluy, G., **Modirrousta-Galian, D.**, et al. (2020). ARES IV: Probing the atmospheres of the two warm small planets HD 106315c and HD 3167c with the HST/WFC3 camera. The Astronomical Journal, 161, 19.
3. Pluriel, W., **Modirrousta-Galian, D.**, et al. (2020). ARES. III. Unveiling the two faces of KELT-7 b with HST WFC3. The Astronomical Journal, 160, 112.
2. Skaf, N., **Modirrousta-Galian, D.**, et al. (2020). ARES. II. Characterizing the hot Jupiters WASP-127 b, WASP-79 b, and WASP-62b with the Hubble Space Telescope. The Astronomical Journal, 160, 109.
1. Edwards, B.,**Modirrousta-Galian,D.**, et al. (2020). ARES I: WASP-76 b, a tale of two HST spectra. The Astronomical Journal, 160, 8.

Experience & Teaching

- **Graduate Advisees**
  Ph.D. students
    - Ren Wang, Tsung-Dao Lee Institute, Shanghai Jiao Tong University, 2025–present.
- **Graduate Mentees**
  Ph.D. students
    - Xiumin Huang, Tsung-Dao Lee Institute, Shanghai Jiao Tong University, 2025–present.
    - Emma Esparza Borges, The Europlanet Early Career (EPEC) network, 2021.
    - Gianluca Cracchiolo, National Institute for Astrophysics (INAF) & University of Palermo (UniPa), 2021.

  Master's students
    - Edoardo Alaimo, University of Palermo (UniPa), 2020.
- **Member,** Ariel Consortium, 2018–Present.
  Working groups
    - Atmospheric chemistry, phase curves, planet formation, interiors, prebiotic chemistry and astrobiology, stellar activity, upper atmosphere.

  Roles and achievements
    - Proposing a novel strategy for observing and interpreting the Bond albedos of terrestrial exoplanets within the Ariel phase curves working group. This has led to one publication, one invited talk, and two seminars.
    - Coordinating with astronomers and data scientists to provide a theoretical foundation for interpreting Ariel data. This has yielded one first author and seven coauthor publications.
    - Contributing to three Ariel data science projects: The ARES school, the RAPOC code development, and the resolution of discrepancies between the Iraclis, CASCADe, and EXCALIBUR codes.
- **Lecturing**
    - Atmospheric physics and modeling, Chengdu University of Technology, Sichuan, China, 2024.
    - Advanced Topics in Geodynamics, EPS 540 01, Yale University, New Haven, Connecticut, USA, 2023.
    - Exoplanet module, Stellar evolution course, AA2021, University of Palermo (UniPa), Palermo, Italy, 2020.
    - Advanced Spanish language, University College London Union (UCLU), London, UK, 2015–2016.
- **Observational Astronomer**, Galileo National Telescope, La Palma, Spain, 2019.
- **Tour Guide**, University College London Observatory (UCLO), London, United Kingdom, 2016–2018.

Invited Talks

- "Giant Impacts Sustain Rather Than Remove Hydrogen-Rich Planetary Atmospheres," The First Gan De Symposium of the Chinese Astronomical Society and the First Exoplanet Conference, Hubei, China, October 2026.
- "Giant Impacts Sustain Rather Than Remove Hydrogen-Rich Planetary Atmospheres," The 2nd AI-Empowered Astronomy for Open Science, Qinghai, China, August 2026.
- "On the connection between observed atmospheric abundances and planetary interiors and evolutions," Mini Symposium on the Evolution of Rocky Planets and Icy Bodies, Taipei, China, April 2026.
- "On the connection between observed atmospheric abundances and planetary interiors and evolutions," Ariel Open Conference 2026, ESA Magali Vaissiere Conference Centre, Harwell Campus, UK, March 2026.
- "Understanding rocky planet interiors," Workshop on Stellar and Planetary Physics, Shanghai, China, March 2026.
- "On the formation of water oceans in rocky exoplanets with hydrogen atmospheres," International Conference on Exoplanets and Planet Formation, Shanghai, China, December 2025.
- "On the dual nature of atmospheric escape," Pujiang Innovation Forum - Subforum on Physics and Astronomy, Shanghai Jiao Tong University, Shanghai, China, November 2025.
- "The diffusion limit of X-ray and ultraviolet photoevaporation in primordial planetary atmospheres," AGU Annual Meeting, California, USA, December 2023.
- "Windows into other worlds: A review of exoplanet atmospheres," National Congress of Protoplanetary Astrochemistry, Trieste, Italy, September 2023.
- "Role of planetary winds in planet evolution and population," International Astronomical Union General Assembly, Busan, South Korea, August 2022.
- "Atmospheric evaporation, geological outgassing, and the bimodal distribution of exoplanet radii," Ariel Consortium Meeting, September 2021.
- "Understanding the XUV-induced atmospheric erosion of young planets and their evolution with time," Ariel Consortium, May 2020.
- "Understanding the XUV-induced atmospheric erosion of young planets and their evolution with time," 16th GAPS meeting, Osservatorio Astronomico di Padova, Padova, Italy, May 2020.
- "Exploring super-Earth surfaces: Albedo of near-airless magma ocean planets and topography," Ariel: Science, Mission & Community 2020 conference, ESA/ESTEC, Noordwijk, The Netherlands, January 2020.
- "Very hot super-Earths with hydrogen atmospheres: A model explaining their paradoxical existence," Ariel Consortium Meeting, Palermo, Italy, March 2019.

Seminars

- "On the connection between observed atmospheric abundances and planetary interiors and evolutions," Peking University Kavli Institute , Beijing, China, June 2026.
- "On the connection between observed atmospheric abundances and planetary interiors and evolutions," Academia Sinica, Taipei, China, April 2026.
- "On the formation of water oceans in rocky exoplanets with hydrogen atmospheres," Shanghai Jiao Tong University, Shanghai, China, November 2025.
- "On the formation of water oceans in rocky exoplanets with hydrogen atmospheres," Shanghai Astronomical Observatory, Shanghai, China, October 2025.
- "Unveiling the Chemistry of Alien Worlds: Population-Level Metallicity Trends and Planetary Evolution," Sun Yat Sen University, Zhuhai, China, February 2025.
- "Unveiling the Chemistry of Alien Worlds: Population-Level Metallicity Trends and Planetary Evolution," Shanghai Jiao Tong University, Shanghai, China, December 2024.
- "The three regimes of atmospheric evaporation," National Astronomical Observatory of Japan, Tokyo, Japan, July 2024.
- "Water on Distant Worlds: Do H_2-rich atmospheres form oceans in small exoplanets?," Chengdu University of Technology, Sichuan, China, June 2024.
- "Water on Distant Worlds: Do H_2-rich atmospheres form oceans in small exoplanets?," Shanghai Jiao Tong University, Shanghai, China, June 2024.
- "The three regimes of atmospheric evaporation," Chengdu University of Technology, Sichuan, China, January 2024.
- "The three regimes of atmospheric evaporation," Shanghai Jiao Tong University, Shanghai, China, January 2024.
- "The three regimes of atmospheric evaporation," Sichuan University, Sichuan, China, January 2024.
- "The three regimes of atmospheric evaporation," Tsinghua University, Beijing, China, December 2023.

- "The three regimes of atmospheric evaporation," Peking University, Beijing, China, December 2023.
- "The three regimes of atmospheric evaporation," Sun Yat Sen University, Zhuhai, China, December 2023.
- "The three regimes of atmospheric evaporation," NASA Jet Propulsion Laboratory, California, USA, March 2023.
- "The three regimes of atmospheric evaporation," Department of Earth & Planetary Sciences, Yale University, Connecticut, USA, February 2023.
- "The three regimes of atmospheric evaporation," California Institute of Technology, California, USA, January 2023.
- "The three regimes of atmospheric evaporation," Osservatorio Astronomico di Palermo, Palermo, Italy, January 2023.
- "Super-Earths, sub-Neptunes, and their extreme loss of volatiles," Department of Astronomy, Yale University, Connecticut, USA, April 2022.
- "Super-Earths, sub-Neptunes, and their extreme loss of volatiles," Department of Earth & Planetary Sciences, Yale University, Connecticut, USA, March 2022.
- "Dynamical systems and machine learning approaches to Sun-Earth relations," Osservatorio Astronomico di Palermo, Palermo, Italy, March 2021.
- "Exploring Super-Earth Interiors: Core erosion and envelope metallicity," Osservatorio Astronomico di Palermo, Palermo, Italy, October 2020.
- "ARES: Ariel Retrieval of Exoplanets School," Osservatorio Astronomico di Palermo, Palermo, Italy, June 2020.
- "Core erosion of super-Earths and sub-Neptunes," California Institute of Technology, California, USA, June 2020.
- "Understanding the XUV-induced atmospheric erosion of young planets and their evolution with time," NASA Jet Propulsion Laboratory, California, USA, June 2020.
- "Exploring super-Earth surfaces: Albedo of near-airless magma ocean planets and topography," California Institute of Technology, California, USA, April 2020.
- "Exploring super-Earth surfaces: Albedo of near-airless magma ocean planets and topography," Osservatorio Astronomico di Palermo, Palermo, Italy, February 2020.
- "The importance of theoretical exoplanetology," University of Palermo, Palermo, Italy, November 2019.
- "The importance of theoretical exoplanetology," Osservatorio Astronomico di Palermo, Palermo, Italy, October 2019.
- "Very hot super-Earths with hydrogen atmospheres: A model explaining their paradoxical existence," Telescopio Nazionale Galileo, La Palma, Spain, May 2019.
- "Very hot super-Earths with hydrogen atmospheres: A model explaining their paradoxical existence," Osservatorio Astronomico di Palermo, Palermo, Italy, January 2019.

Awards & Grants

- National Science Foundation, GLOW: Loss of volatiles from the Hadean Earth and the redox evolution of the early atmosphere, research grant, Lead PI: Jun Korenaga, Role: Cowriter and principal participant. $298,718, 07/2023–06/2025.
- International Astronomical Union, invited review grant, €175, 08/2022.
- Heising-Simons Foundation, invited review grant, $2500, 08/2022.
- National Institute for Astrophysics (INAF) & University of Palermo (UniPa), "Scienze Fisiche e Chimiche" - Internazionale - A.A. 2018/2019 (XXXIV ciclo), €46,029.84, 11/2018–03/2022.

Outreach & Volunteering

- Member of the British Interplanetary Society, 2021–Present.
  My contributions include:
  - Participating in and leading discussions to promote the involvement of underrepresented groups in STEM.
  - Answering questions and promoting space advocacy in a digestible format to an audience of 82 attendees for three hours when I was on the experts panel for the BIS 2021 Christmas Get-Together.
  - Collaborating with the executive committee to improve the JBIS journal and promotional materials, resulting in one publication cited in the book "Back to the Moon: The Next Giant Leap for Humankind" authored by Prof. Joseph Silk.
- President of UCL Spanish & Latin American Society, 2016–2017.
  My contributions include:
  - Managing a team of five committee members, six teachers, 40 students, over 100 active members, and over 1000 passive members.
  - Coordinating biweekly cultural events, including the 2016 Spanish-Italian-Portuguese Christmas gathering with over 100 attendees.
  - Forming partnerships with local businesses such as Oblique Life LTD and The Cuban restaurant for our weekly "La Fiesta" event.
- Member of Circle Of Friends, 2007–2011.
  My contributions include:

  - Assisting students on the autism spectrum through weekly one hour sessions to support their social and educational development.
  - Mentoring students with learning difficulties in math and science, through weekly one hour meetings.
  - Representing my school at the Jack Petchy ceremonies, securing £400 for improving our astronomical resources.
- Invited interviews:
  - "Did this scorching-hot planet lose—and regain—an atmosphere?" WIRED magazine, April 2021.
- Public talks:
  - "Human extinction—what can we learn from exoplanets about climate change on Earth," PalermoScienza (INAF, OAPa), Palermo, Italy, February 2020.
  - "From the position of the stars to life in the universe" and "Astronomy storytelling and new ways to conceptualise the universe," Esperienza InSegna (INAF, OAPa), Palermo, Italy, February 2019.

Other

- Proficient in Python 3/2.7, understands Fortran.
- Codeveloper of the publicly available Python 3 code RAPOC: Rosseland And Planck Opacity Converter.
- Native speaker of English and Spanish, fluent in Italian.