

CURRICULUM VITÆ

DARIUS (DARIO) MODIRROUSTA-GALIAN

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EDUCATION

- **Ph.D., Physics**, National Institute for Astrophysics (INAF), Palermo Astronomical Observatory, 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.

PROFESSIONAL APPOINTMENTS

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

FIRST AUTHOR PUBLICATIONS

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 H₂ 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.**, Edwards, B., Changeat, Q., Bouwman, J., Morello, G., Al-Refaie, A., Baeyens, R., Bieger, M., Blain, D., Gressier, A., Guilluy, G., Jaziri, Y., Kiefer, F., Morvan, M., Pluriel, W., Poveda, M., Skaf, N., Whiteford, N., Wright, S., Yip, K., Zingales, T., Charnay, B., Drossart, P., Leconte, J., Venot, O., Waldmann, I. and Beaulieu, J., (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., Damasso, M., Borsa, F., Locci, D., Pillitteri, I., Desidera, S., Maggio, A., Micela, G., Wolk, S., Claudi, R., Malavolta, L. and **Modirrousta-Galian, D.**, (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., Gressier, A., Wright, S., Santerne, A., Jaziri, A.Y., Edwards, B., Changeat, Q., **Modirrousta-Galian, D.**, Skaf, N., Al-Refaie, A., Baeyens, R., Bieger, M.F., Blain, D., Kiefer, F., Morvan, M., Mugnai, L.V., Pluriel, W., Poveda, M., Zingales, T., Whiteford, N., Yip, K.H., Charnay, B., Leconte, J., Drossart, P., Sozzetti, A., Marq, E., Tsiraras, A., Venot, O., Waldmann, I. and Beaulieu, J.-P. (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., Whiteford, N., Edwards, B., Changeat, Q., Yip, K.H., Baeyens, R., Al-Refaie, A., Fabienne Bieger, M., Blain, D., Gressier, A., Guilluy, G., Yassin Jaziri, A., Kiefer, F., **Modirrousta-Galian, D.**, Morvan, M., Mugnai, L.V., Poveda, M., Skaf, N., Zingales, T., Wright, S., Charnay, B., Drossart, P., Leconte, J., Tsiaras, A., Venot, O., Waldmann, I. and Beaulieu, J.-P. (2020). ARES. III. Unveiling the two faces of KELT-7 b with HST WFC3. *The Astronomical Journal*, 160, 112.
2. Skaf, N., Bieger, M.F., Edwards, B., Changeat, Q., Morvan, M., Kiefer, F., Blain, D., Zingales, T., Poveda, M., Al-Refaie, A., Baeyens, R., Gressier, A., Guilluy, G., Jaziri, A.Y., **Modirrousta-Galian, D.**, Mugnai, L.V., Pluriel, W., Whiteford, N., Wright, S., Yip, K.H., Charnay, B., Leconte, J., Drossart, P., Tsiaras, A., Venot, O., Waldmann, I. and Beaulieu, J.-P. (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., Changeat, Q., Baeyens, R., Tsiaras, A., Al-Refaie, A., Taylor, J., Yip, K.H., Bieger, M.F., Blain, D., Gressier, A., Guilluy, G., Jaziri, A.Y., Kiefer, F., **Modirrousta-Galian, D.**, Morvan, M., Mugnai, L.V., Pluriel, W., Poveda, M., Skaf, N., Whiteford, N., Wright, S., Zingales, T., Charnay, B., Drossart, P., Leconte, J., Venot, O., Waldmann, I. and Beaulieu, J.-P. (2020). ARES I: WASP-76 b, a tale of two HST spectra. *The Astronomical Journal*, 160, 8.

EXPERIENCE & TEACHING

- **Mentor**

- Ph.D. students

1. Emma Esparza Borges, The Europlanet Early Career (EPEC) network, 2021–Present.
2. Gianluca Cracchiolo, National Institute for Astrophysics (INAF)/University of Palermo (UniPa), 2021.

- Master's students

1. 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

- The first member of the Ariel phase curves working group to promote a strategy for observing and interpreting the Bond albedos of terrestrial exoplanets.
- Coordinate regularly with observational astronomers and data scientists to provide a theoretical foundation for interpreting Ariel data.
- Involved in various Ariel data science projects for processing astronomical data effectively. Some examples include performing atmospheric spectroscopy in the ARES school, codeveloping the RAPOC code, and investigating the discrepancies between the Iraclis, CASCADE, and EXCALIBUR codes.
- **Lecturing**, Exoplanet module, *Stellar evolution course, AA2021*, University of Palermo (UniPa), Palermo, Italy, 2020.
- **Observational Astronomer**, Galileo National Telescope, La Palma, Spain, 2019.
- **Tour Guide**, University College London Observatory (UCLO), London, United Kingdom, 2016–2018.

INVITED TALKS

- “*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

- “*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 JPL, 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

2022 International Astronomical Union, invited review grant, \$175.

2022 Heising-Simons Foundation, invited review grant, \$2500.

2018 “Scienze Fisiche e Chimiche” – Internazionale – A.A. 2018/2019 (XXXIV ciclo), National Institute for Astrophysics (INAF)/University of Palermo (UniPa), Ph.D. award, \$45,000.

OUTREACH

- Member of the British Interplanetary Society, 2021–Present.
My contributions include:
 - Participating in and leading discussions on how to encourage underrepresented groups to get involved in STEM.
 - Answering questions and promoting space advocacy in a digestible format to the general public when I was on the experts panel for the *BIS 2021 Christmas Get-Together*.
 - Exploring avenues for improving the journal and promotional materials with members of the executive committee.
- INVITED INTERVIEW: “*Did this scorching-hot planet lose—and regain—an atmosphere?*” WIRED magazine, April 2021.
- PUBLIC TALK: “*Human extinction—what can we learn from exoplanets about climate change on Earth*,” PalermoScienza (INAF, OAPa), Palermo, Italy, February 2020.
- PUBLIC TALK: “*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.

PROGRAMMING

- Proficient in *Python 3/2.7*, understands *Fortran*.
- Codeveloper of the publicly available *Python 3* code RAPOC: Rosseland And Planck Opacity Converter.

EXTRA SKILLS

- Native speaker of English and Spanish, fluent in Italian.
- Trained on the safe use of lasers, University College London (UCL), London, United Kingdom, 2017.