

Alexandre M. B. Branco

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Education

Ph.D. in Astronomy

Jan 2025 - ongoing

University of Porto & Institute of Astrophysics and Space Sciences (IA), Portugal

- Thesis: *Towards a Comprehensive Understanding of the Atmospheric Composition of Small Exoplanets*. Advisors: Dr. Clara Sousa-Silva (Bard College and IA), Dr. Olivier Demangeon (IA) & Dr. Pedro Machado (University of Lisbon and IA).

M.Sc. in Physics – Specialization in Astrophysics and Cosmology

Sep 2022 - Jan 2025

University of Lisbon, Portugal

Final Grade: 19/20 (A¹)

- Thesis: *From Venus to Ultra-Hot Jupiters: Characterizing Planetary Atmospheres with High-Resolution Transmission Spectroscopy*. Advisors: Dr. Pedro Machado, Dr. Olivier Demangeon & Dr. Tomás Azevedo Silva. Grade: 19/20.

B.Sc. in Physics – Specialization in Astronomy and Astrophysics

Sep 2019 - Jul 2022

University of Lisbon, Portugal

Final Grade: 16/20 (B¹)

- Research Project²: *High-Resolution Transmission Spectroscopy of WASP-76 b*. Advisor: Dr. Pedro Machado. Grade: 18/20.

¹Grade according to the ECTS grading scale: A - Excellent, B - Very Good, C - Good, D - Satisfactory, E - Sufficient;

²At the University of Lisbon there is no bachelor's thesis in physics, but a semester project (6 ECTS).

Research Experience

M.Sc. Student

Sep 2023 - Sep 2024

University of Lisbon, Portugal

- Analysed DST/FIRS observations of the Venus solar transit of 2012 to detect key chemical species in its transmission spectrum. Used spectroscopic databases and the petitRADTRANS code to highlight potential spectral observables for Venus-like exoplanet atmospheres. Also analysed VLT/ESPRESSO transit observations of the ultra-hot Jupiter WASP-76 b. Identified and characterized atomic absorption features, revealing the planet's atmospheric dynamics.

Visiting Scholar

Oct 2023 - Sep 2024

Blue Marble Space Institute of Science (remote)

- Used computational chemistry to model complex chemical reaction networks, involving thousands of molecules. I aimed to simulate the reaction of glucose with hydrogen sulfide to study the synthesis of complex sulfur-bearing compounds from relatively simple organic molecules, helping to predict key processes in the origin of life. Advisor: Dr. Jim Cleaves (Carnegie Institution for Science and Howard University).

Research Associate

Jun - Sep 2022

Blue Marble Space Institute of Science (remote)

- Completed the Young Scientist Program, including science communication and ethics modules. Conducted a scientific literature analysis on surface reflectance biosignatures linked to the pigmentation of extremophiles. Advisor: Dr. Rafael Loureiro (Winston-Salem State University).

Research Intern

Jul - Oct 2021

Laboratory of Instrumentation and Experimental Particle Physics, Lisbon, Portugal

- Worked with Galactic Cosmic Ray models and Monte Carlo simulations to study the interactions between highly energetic particles and semiconductor materials. I aimed to address the feasibility of SRAM-based devices as radiation monitors at the orbit and surface of Mars. Advisors: Dr. Marco Pinto (ESA) and Dr. Luísa Arruda (LIP).

Research Publications

- Branco, A.; Machado, P.; Demangeon, O.; et al., "Transmission Spectroscopy Along the Transit of Venus: A Proxy for Exoplanets Atmospheric Characterization", *Atmosphere MDPI*, vol. 15, 2024. DOI: 10.3390/atmos15121431.

Talks & Conference Contributions

- EANA 2025 Conference, Lisbon, Portugal, Oct 21-24, 2025 (contributed talk)
Branco, A., Sousa-Silva, C., Broussard, W., et al., "Exploring the Impact of HSO and HNO Cross-Section Variability on Photochemical Modelling and its Implications for the Spectral Characterization of Terrestrial Exoplanets".
- EPSC-DPS Joint Meeting 2025, Helsinki, Finland, Sep 07-12, 2025 (contributed talk)
Branco, A., Machado, P., Demangeon, O., et al., "High-Resolution Transmission Spectroscopy of Venus: A Proxy for Atmospheric Characterization of Earth-Sized Exoplanets".
- EPSC-DPS Joint Meeting 2025, Helsinki, Finland, Sep 07-12, 2025 (poster)
Branco, A., Sousa-Silva, C., Broussard, W., et al., "Assessing the Impact of Varying HSO and HNO Cross-Sections on Photochemical Models: Implications for the Spectral Characterization of Terrestrial Exoplanets".
- Europlanet Webinar: Transit of Venus 2012 – Past and Present, online, Dec 11, 2024
Branco, A., Machado, P., Demangeon, O., et al., "Transmission Spectroscopy Along the Transit of Venus: A Proxy for Exoplanets Atmospheric Characterization".

Other Experience

- Member of ESA's Ariel Working Groups on Spectroscopic Data & Chemistry 2025 - ongoing
- Member of NASA's Habitable Worlds Observatory Living Worlds Working Group 2025 - ongoing
- Member of the ExCITE-PM project 2025 - ongoing
 - Experimental Constraints for Improving Terrestrial Exoplanet Photochemical Models
 - NASA Exoplanets Research Program - PI: S. Ranjan/E. Schwieterman (awarded September 2021)
- Local Organising Committee of Exoplanets 6 Conference, Porto, Portugal Jun 29 - Jul 03, 2026
- Local Organising Committee of EANA 2025 Conference, Lisbon, Portugal Oct 21-24, 2025
- Local Organising Committee of Ariel Consortium Fall 2024 Meeting, Lisbon, Portugal Oct 28-30, 2024
- Invited scientist at the Hackathon "Exoplanetas em Bytes", Lisbon, Portugal Oct 4, 2024
- Assisted in supervising B.Sc. Research Project in Physics, University of Lisbon, Portugal Dec 2023 - Jun 2024
 - Title: WASP-76 b Atmosphere's Characterization Using Transmission Spectroscopy

Computer Skills

- Python
- C++
- L^AT_EX
- Linux

Languages

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|------------|----------------|
| Portuguese | Native Speaker |
| English | C1 |

Schools & Certificates

- XXI International School of Astrobiology "Josep Comas I Solá" - ESA Academy Scholarship Jul 2025
Universidad Internacional Menéndez Pelayo, Santander, Spain
- III Course of Environmental Sampling, Instituto Superior Técnico, Portugal Sep 2023
- Cambridge English: Advanced (CAE), CEFR Level C1 Mar 2019
- Cambridge English: First (FCE), CEFR Level B2 Apr 2017