Curriculum Vitæ et Studiorum of

Andrea Bocchieri

andrea.bocchieri@uniroma1.it | andreabocchieri.com | GitHub | ORCID | Google Scholar | NASA/ADS

Telescope Scientist for ESA's *Ariel* mission specialising in exoplanet characterisation through spectroscopic observations, data analysis, optimisation of space instrumentation, especially optical aspects, and control of experimental systematics.

Positions held

- **Postdoctoral Fellow**, Sapienza University of Rome — 2023 – Present
- **Ph.D. in Astronomy, Astrophysics and Space Science**, Sapienza University of Rome — 2020 – 2023

Professional activities

- **Research Associate**, CNR-IFN - Padova — 2025 – Present
- **Telescope Scientist**, ESA's *Ariel* Space Mission — 2024 – Present
- **Research Associate**, INAF - Arcetri Astrophysical Observatory — 2024 – Present

Education

- **Ph.D. in Astronomy, Astrophysics and Space Science**, Sapienza University of Rome — 2020 – 2023
  Summa cum Laude – *Characterisation of the Atmospheres of Extrasolar Planets with the Ariel Space Mission*
- **M.Sc. in Astronomy and Astrophysics**, Sapienza University of Rome — 2018 – 2020
  Summa cum Laude – *Learning from Exoplanetary populations: Data Analysis for the Ariel Space Mission*
- **B.Sc. in Physics**, Sapienza University of Rome — 2015 – 2018

Leadership and Service

- **Member** – GAPS Collaboration — 2025 – Present
- **Founder, coordinator** – *Ariel* Stellar Obliquity WG — 2025 – Present
- **Chair** – *Ariel* Telescope Assembly Mounting-Correlation Working Group — 2025 – Present
- **Member** – *Ariel* Instrument Scientist Team as the Telescope Scientist — 2024 – Present
- **Member** – *Ariel* Telescope Assembly Project Office — 2024 – Present
- **Chair** – *Ariel* Telescope Assembly Tiger Team — 2024 – Present
- **Member** – *Ariel* Data Challenge organising team — 2024 – Present
- **Coordinator** – *Ariel*-IT Dry Run simulations and retrievals — 2023 – Present
- **National contact** – Exoclock Collaboration — 2023 – Present
- **Member** – *Ariel* Instrument Operations & Science Data Centre Working Group — 2022 – Present
- **Chair** – *Ariel* Simulators Software, Management and Documentation Working Group — 2022 – Present
- **Member** – *EXCITE* Team and Data Analysis Working Group — 2021 – Present
- **Chair** – *Ariel* Science Brainstorms Working Group — 2021 – 2024
- 14 peer-reviewed journal articles as author or co-author; 4 submitted
- 41 conference proceedings, 10+ technical notes, 4 invited talks, 13 observing proposals
- 4 observing nights at TNG with HARPS-N and GIANO-B

Languages

Italian (Native) English (C2) French (C1) German (C1) Spanish (B1)

Grants and Awards

- **Organiser** – *Ariel* Data Challenge - NeurIPS, Kaggle [$100,000] — 2024, 2025
- **Co-PI** – INAF USC VIII - Ariel-IT Dry Run: simulation and retrieval [3 M CPUh] — 2023

- **PI** – Avvio alla Ricerca - Sapienza University of Rome [$4,000] 2022, 2024
- **Collaborator** – Progetti di Ricerca - Sapienza University of Rome [$50,000] 2021, 2022, 2023, 2024
- Winner of the *Excellence track* during M.Sc. - Sapienza University of Rome 2020

Selected Publications and Projects

- **Bocchieri** et al. (2025). *ExoNAMD: Leveraging the spin-orbit angle to gauge multi-planet systems.* Submitted to A&A
- **Bocchieri** et al. (2025). *Exploring Synergies between Twinkle and Ariel: A Pilot Study.* Accepted by Exp. Astr.
- **Bocchieri** et al. (2025). *De-jittering Ariel: an optimised algorithm.* Exp. Astr.
- Mugnai+**Bocchieri** et al. (2025). *ExoSim 2.0: the new Exoplanet Observation Simulator [...].* Exp. Astr.
- Changeat et al. (2025). *On the synergetic use of Ariel and JWST for exoplanet atmospheric science.* arXiv
- **Bocchieri** et al. (2024). *PAOS: a fast, modern, and reliable Python package for Physical Optics studies.* SPIE
- Zak+**Bocchieri** et al. (2024). *Stellar obliquity measurements of six gas giants.* A&A
- Mugnai+**Bocchieri** et al. (2024). *ExoRad 2.0: The generic point source radiometric model.* JOSS
- **Bocchieri** et al. (2023). *Detecting molecules in Ariel low resolution transmission spectra.* Exp. Astr.

- **Creator, maintainer** – `PAOS`: Generic physical optics model of wavefront propagation through complex space telescopes.
- **Creator, maintainer** – `ExoNAMD`: Codebase to compute the Normalised Angular Momentum Deficit of planetary systems.
- **Creator, maintainer** – `STOP-utils`: Utilities for wavefront error analysis using externally simulated errormaps.
- **Creator, maintainer** – `TIGRO`: Tool analysing interferometric surface error measurements with nanometer precision.
- **Creator, maintainer** – `taurex-emcee`: A plugin for TauREx 3.1 that provides the Emcee sampler for the retrieval.
- **Co-creator** – `ExoRad2.0`: Generic radiometric point source simulator of exoplanet observations.
- **Co-creator** – `ExoSim2.0`: Generic time-domain point source simulator of exoplanet observations.

- Interferometric testing of Ariel M1 structural model of the 1.1 m aluminium primary mirror (May – August 2024).

Conferences and Workshops

Invited Talks

1. Notti d'Estate (Arcetri, ITA) 22 Jul 2025
   Characterisation of exoplanet atmospheres with Ariel: scientific and technological challenges
2. First PLATOSpec science workshop (Ondřejov, CZ) 22 May 2025
   Know Thy Star, Know Thy Planet: PLATOSpec's Crucial Context for the Ariel Survey
3. ESO: Stellar Coffee (Garching, GER) 10 Jun 2024
   Summoning the Science Simulators Applied to the Ariel Space Mission
4. MIAPbP: Habitability: the astrophysical, atmospheric, and geophysical implications (Garching, GER) 4 Jun 2024
   An overview of the Ariel simulators framework and the Ariel Data Challenge 2024

Organisation

1. Convener and Chair at Europlanet Science Congress (Helsinki, FIN) 7–12 Sep 2025
   Future and current instruments to detect and characterise extrasolar planets and their environment
2. Convener and Chair at Europlanet Science Congress (Berlin, GER) 8–13 Sep 2024
   Future and current instruments to detect and characterise extrasolar planets and their environment
3. SOC member at Ariel-IT Science (Palermo, ITA) 20–22 May 2024
   4th Meeting of the Italian community dedicated to Ariel's scientific preparation
4. Convener at NeurIPS – Ariel Data Challenge (San Diego, USA) 2–7 Dec 2025
   Extracting exoplanetary signals from the Ariel Space Telescope
5. Convener at NeurIPS – Ariel Data Challenge (Vancouver, CAN) 10–15 Dec 2024
   Extracting exoplanetary signals from the Ariel Space Telescope

Selected Talks

1. Ariel Consortium Meeting (Madrid, SP) 29 Sep–3 Oct 2025
   - *Ariel S2MD: working group update (plenary)*
   - *ExoNAMD: Leveraging the spin-orbit angle to constrain the dynamics of multiplanetary systems*

2. Congresso Nazionale di Fisica (Palermo, ITA) 22–26 Sep 2025
   Ariel-IT end-to-end exercise from the astrophysical scene to planetary spectra: simulations and retrieval
3. Europlanet Science Congress (FIN) 7–12 Sep 2025
   - *The Atmospheric Remote-sensing Infrared Exoplanet Large-survey (Ariel) sensitivity and performance*
   - *ExoNAMD: a community tool to gauge multi-planetary systems*
4. Detection and Dynamics of Exoplanets (Coimbra, PO) 7–11 Jul 2025
   ExoNAMD: a community tool to gauge multi-planetary systems
5. Chianti Topics (Florence, ITA) 3–6 Jun 2025
   - *Ariel-IT end-to-end exercise from the astrophysical scene to planetary spectra: simulations and retrieval*
   - *ExoNAMD: a community tool to gauge multi-planetary systems*
6. Ariel Consortium Meeting (Leiden, NL) 8–11 Apr 2025
   - *Ariel S2MD: working group update (plenary)*
   - *An end-to end experiment on a small sample of targets: simulations and retrieval*
7. Ariel Consortium Meeting (Lisbon, PO) 28–30 Oct 2024
   Ariel S2MD: working group update (plenary)
8. Europlanet Science Congress (Berlin, GER) 8–13 Sep 2024
   The Atmospheric Remote-sensing Infrared Exoplanet Large-survey sensitivity and performance
9. SPIE Astronomical Telescopes & Instrumentation (Yokohama, JP) 16–21 Jun 2024
   The atmospheric remote-sensing infrared exoplanet large-survey (Ariel) sensitivity and performance
10. Ariel-IT Science (Palermo, ITA) 22 May 2024
    Updates on Ariel simulations and detrending
11. Ariel Consortium Meeting (Tartu, EST) 23–26 Apr 2024
    - *Ariel S2MD: working group update (plenary)*
    - *Updates on Ariel performance analyses*
    - *Ariel long-term detrending*
12. Ariel Consortium Meeting (Budapest, HUN) 24–27 Oct 2023
    Breakthrough in Ariel jitter detrending
13. ExoClock Annual Meeting (Thessaloniki, GR) 21–22 Oct 2023
    - *The Ariel mission and population studies*
    - *A vanilla introduction to jitter detrending for Ariel*
14. Ariel Science Ground Segment Workshop at ESAC (Madrid, ES) 12–14 Sep 2023
    Ariel Exposure Time Calculator (ETC) Status and Plans
15. Ariel Consortium Meeting (Tenerife, ES) 6–9 Jun 2023
    Ariel Reconnaissance Survey Targets: Detection of Molecules and Promotion to Higher Tiers
16. Ariel-IT Meeting (Palermo, ITA) 16–18 May 2023
    - *Ariel Reconnaissance Survey Targets: Detection of Molecules and Promotion to Higher Tiers*
    - *The ExoClock Project: an open platform for maintaining the Ariel target ephemerides*
17. Disks and Planets across ESO Facilities (Garching, GER) 28 Nov–2 Dec 2022
    Detecting molecules in Ariel low resolution transmission spectra
18. Ariel Consortium Meeting (Bologna, ITA) 10–12 Oct 2022
    Ariel PSF sampling analysis with PAOS
19. Ariel Consortium Meeting (Paris, FR) 14–17 Jun 2022
    Ariel Tier 1 population analysis

Teaching Experience

1. **Co-Advisor** – Syty, A. (Paris-Saclay University) 2024
   Research project: *Detrending techniques for the Ariel space mission*
2. **Co-Advisor** – Polci, A. (Sapienza University of Rome) 2023–2024
   M.Sc. thesis: *Exoplanet observations through the lens of the Fisher information formalism*
3. **Co-Advisor** – Syty, A. (Paris-Saclay University) 2023
   Research project: *Line of sight jitter detrending techniques for the Ariel space mission*
4. **Co-Advisor** – Carrarini, T. (Sapienza University of Rome) 2023
   M.Sc. thesis: *Transit spectroscopy with the James Webb Space Telescope: the impact of noise and saturation*
5. **Tutor** – Hall, H. (ESA Mission Performance Engineering YGT) 2022–2023

Research project: *Linear drift creation and detrending in presence of pointing jitter*

6. **Co-Advisor** – Altamura, L. (Sapienza University of Rome) 2022
   M.Sc. thesis: *Pointing jitter noise reduction in HD209458 out-of-transit observation*
7. **Co-Advisor** – D'Alessandro, A. (Sapienza University of Rome) 2021
   M.Sc. thesis: *Phase-resolved spectroscopy with EXCITE for exoplanet atmospheric characterization*
8. **Co-Advisor** – Masciulli, C. (Sapienza University of Rome) 2021
   M.Sc. thesis: *Synergies and complementarities between JWST and EXCITE*

Observing Proposals

1. **LBT** (PI) 2025
   The evolutionary history of the ∼60 Myr multiplanetary system TIC 434398831
   Instrument: PEPSI, Telescope time: **6.1h**
2. **ESO/VLT** (Cycle P116, dPI) 2025
   Cliff Hanger system TOI-942: aligned or misaligned orbit? Escaping or stable atmosphere?
   Instrument: ESPRESSO, Telescope time: **6h 42m**
3. **TNG** (PI) 2025
   GIARPS characterization of the super-puff transiting planet TOI-1420 b
   Instrument: HARPS-N/GIANO-B, Telescope time: **12.1h**
4. **ESO/VLT** (Cycle P115, dPI) 2024
   Breaking the chains of near-resonant systems
   Instrument: ESPRESSO, Telescope time: **6h 18m**
5. **HST** (Cycle 32 & 33, CoI) 2024
   FUV flux of nearby exoplanet host stars in the Ariel target list
   Instrument: COS/G140L, 137 Snapshot Targets
6. **ESO/VLT** (Cycle P114, PI) 2024
   Unruly mini-Neptunes: constraining the evolution of the very young transiting system TOI-1097
   Instrument: ESPRESSO, Telescope time: **4h 38m**
7. **ESO/VLT** (Cycle P114, CoI) 2024
   Planet evolution in- and around the desert: measuring masses of the young Neptunes orbiting TOI-942
   Instrument: ESPRESSO, Telescope time: **28h 23m**
8. **ESO/VLT** (Cycle P114, dPI) 2024
   Vanishing Worlds: Comparative Study of Atmospheric Mass Loss of Two Very Young Neptunes
   Instrument: CRIRES, Telescope time: **6h 50m**
9. **Gemini-North** (Semester 2024A, CoI) 2024
   How do resonant planetary chains form and survive?
   Instrument: MAROON-X, Telescope time: **7h 30m**
10. **JWST** (Cycle 3, CoI) 2024
    Contextualising our solar-system: Atmospheric characterization of the Jupiter-analogue Kepler-167e
    Instrument: NIRISS, Telescope time: **39h 16m** [ADS]
11. **ESO/VLT** (DDT P112, dPI) 2024
    How do resonant planetary chains form and survive?
    Instrument: ESPRESSO, Telescope time: **5h 12m**
12. **ESO/VLT** (Cycle P112, PI) 2023
    Unruly Neptunes: constraining the evolution of the very young transiting system TOI-942
    Instrument: ESPRESSO, Telescope time: **7h 15m**
13. **ESO/VLT** (Cycle P112, dPI) 2023
    Vanishing Worlds: Comparative Study of Atmospheric Mass Loss of Two Very Young Neptunes
    Instrument: CRIRES, Telescope time: **12h 45m**

Technical Skills

- **Programming:** Python, C, Git, Bash, LaTeX
- **Software:** Office Suite, Adobe Suite
- **Optical design**: Zemax OpticStudio; PAOS
- **Codes**: ExoRad2.0; ExoSim2.x; Alfnoor; TauREx3.x
- **OS:** Linux (Ubuntu, Debian), Windows, macOS
- **Linux server administration:** *melodie* and *flounder*