

CV Quentin Changeat

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RESEARCH SUMMARY

Since 2019, I have co-authored 58 research articles in the field of exoplanets, including 11 first author (h-index: 23).

My research focuses on the analysis of current and future spectroscopic observations of exoplanets, planets outside our solar system, to understand the physics and the chemistry of their atmospheres. Using data-oriented techniques and models, I am interested in the properties of all planets, ranging from the temperate super-Earth LHS-1140b to the extremely-hot Jupiter KELT-9b, that I observed with the James Webb, Hubble and Spitzer Space Telescopes. Studying the properties of exo-atmospheres provides a unique window into their nature, but also how they formed and interact with their host star. In this context, I have pioneered in the development of tools (*TauREx3* and *Alfnoor*) adapted to analyze large populations of atmospheres and the extraction of 3D information from challenging phase-curve observations. I have also used those tools to support upcoming exoplanet missions such as the ESA-Ariel telescope and evaluate how they can help us answer some of the major questions of the field.

CURRENT POSITIONS

2022 Sep – Current: **European Space Agency (ESA) Research Fellow**
Space Telescope Science Institute (STScI), Baltimore (USA)

2022 Sep – Current: **Honorary Research Fellow**
Department of Physics and Astronomy, University College London (UK)

PAST PROFESSIONAL EXPERIENCES

2022 May – 2023 Jun: **Guest Researcher**
Centre for Computing Astrophysics (CCA), Flatiron Institute, Simons Foundation (USA)

2021 Jan – 2022 Sep: **Postdoctoral Research Fellow**
Department of Physics and Astronomy, University College London (UK)

2016 Oct – 2017 Sep: **Consultant at Wavestone**
Cybersecurity division, Wavestone SA Paris (FR). Cybersecurity consultancy services for large companies.

2015 Nov - 2016 Feb: **Freelance Consultant**
OutSmart Insights Ltd, London (UK). Technology scanning for Aerospace & Defence companies.

EDUCATION

2018 – 2021: **PhD in Astrophysics** - *University College London* (UK)

- Title: Next generation techniques to characterise exoplanetary atmospheres – Supervisor: Prof. Giovanna Tinetti.
- Program completed in 2.5 years (1 year ahead of schedule).
- Jon Darius Memorial Prize for best thesis in Astrophysics 2021.

2017 – 2018: **Master (Part III) in Applied Mathematics** - *University of Cambridge* (UK)

- E.M. Burnett prize for excellent results.

2015 – 2016: **Master (MSc) in Environmental Technology** - *Imperial College London* (UK) – Grade: Merit

2013 – 2016: **Master (MEng) in General Engineering** - *Ecole des Mines Douai* (FRA) – Grade: 15.1/20, Ranked top 1%.

2010 – 2013: **CPGE: Equiv. Bachelor Degree in Mathematics/Physics** - *Lycée Daudet* (FRA) – Grade: A

SUCCESSFUL PROPOSALS AND GRANTS

Obtained as PI or Science PI

Funding Proposals:

- 2023 – 2027: **ESA Science Faculty Research Funds**, “Exoplanet atmospheres in a new era”, funding to support a 3-year PhD student – 110,000 EUR.
- 2023: **NAOJ Research Unit Visiting Grant**, “Towards a unified understanding of the formation of exoplanets and their atmospheres”, funding for short-term visits – ¥310,000 JPY.
- 2023 – 2026: **STScI Discretionary Research Grant**, “Studying the atmospheres of transiting and directly imaged exoplanets via JWST spectroscopy”, funding to support visits from a joint CEA/STScI PhD student – \$32,000.
- 2022 – 2025: **ESA Research Fellowship**, “Deciphering exoplanetary atmospheres in the era of ESA Ariel and NASA-ESA-CSA JWST”, independent research grant – \$300,000.
- 2021: **JSPS Short-Term Research Fellowship** at NAOJ Japan, “From exoplanetary formation to atmospheric properties: A unified journey”, funds for short-term project and visit – ¥800,000 JPY.
- 2021 – 2023: **UKSA Postdoctoral Research Fellowship** at University College London, “ESA M4 Mission Ariel Implementation Phase”, recipient of the external award (PI G. Tinetti) – £200,000.

Observing Proposals:

- 2022: **CHEOPS AO3**, “Atmospheric characterization of the hot-Jupiter WASP-79 b with CHEOPS” – 28 orbits.

Computing Proposals:

- 2023 – 2026: **STFC DiRAC HPC RAC 15th**, “Characterization of exoplanet atmospheres with JWST”, computing – 9.5M CPUh (equiv. £25,000).

Obtained as co-I

Observing Proposals:

- 2023: **JWST Cycle 2**, “The First Atmospheric Study of a Bona Fide Water World” – 23 hours.
- 2023: **CRILES+**, “Vanishing Worlds: Comparative Study of Atmospheric Mass Loss of Two Very Young Neptunes” – 13 hours.
- 2023: **CRILES+**, “A holistic view of atmospheric chemistry: the synergies between JWST and ground-based spectrographs” – 10 hours.
- 2022: **CHEOPS AO3**, “Cloudiness of three warm Sub-Neptunes” – 21 orbits.
- 2022: **CHEOPS AO3**, “Ephemeris Refinement of Key Targets for the ESA-Ariel Mission” – 132 orbits.
- 2022: **CHEOPS AO3**, “Constraining Refractory Species and Characterizing the Stellar Environment of the Inflated hot-Jupiter WASP-17 b” – 20 orbits.
- 2022: **CHEOPS AO3**, “Rescuing Longer Period TESS Planet Candidates for Future Atmospheric Characterizations” – 130 orbits.
- 2021: **HST Cycle 28**, “Atmospheric Characterization of A Disintegrating Planet in the Hot Neptune Desert” – 8 orbits.
- 2019: **Las Cumbres Observatory**, “Refining Exoplanet Ephemerides” – 100 hours.

Computing Proposals:

- 2023 – 2026: **STFC DiRAC HPC RAC 15th**, “In Search of an Interdisciplinary Solution for Scalable Planetary Characterization”, computing time – 5M CPUh (equiv. £50,000) + 35k GPUh (equiv. £20,000).

SELECTION OF TALKS

- 2024 Jan: **University of Vienna** (AUT) - “Modern analysis techniques for exoplanet data” (Seminar).
- 2023 Nov: **University of Maryland** (USA) – “Towards panchromatic light-curve retrievals” (Seminar)
- 2023 Apr: **NAOJ** (JP) – “Exo-atmospheres in the era of JWST and Ariel” (Seminar).
- 2023 Mar: **ESLAB 2023 Symposium** (Netherlands) – “Modern analysis techniques for exoplanet data” (Keynote Speaker).
- 2023 Mar: **SRON** (Netherlands) – “Towards population studies of exoplanet atmospheres” (Seminar).
- 2022 Dec: **ESA SCI Science Workshops** (Netherlands) – “Towards population studies of exo-atmospheres” (Contributed).
- 2022 Sep: **NASA Jet Propulsion Lab** (USA) – “Towards population studies of exoplanets” (Seminar).
- 2022 Aug: **CCA Exoplanet Symposium** in NY (USA) – “Atmospheric Retrievals and more” (Contributed).
- 2022 Feb: **Tokyo University** (JP) – “Challenges in analyses of exo-atmospheres in the era of JWST and Ariel” (Seminar).
- 2021 Dec: **NASA Goddard** (Virtual) – “Atmospheric studies in the era of next generation telescopes” (Seminar).
- 2021 Dec: **Exosystèmes II** in Toulouse (France) – “Phase-curve retrievals of exo-atmospheres: WASP-43b” (Contributed).
- 2020 Dec: **Ariel ARES days** (Virtual)- “Phase-curve retrieval studies of exo-atmospheres” (Contributed).
- 2020 Mar: **Tokyo University** (JP) – “Seminar on atmospheric retrievals” (Seminar).
- 2020 Jan: **Rocky Exo-worlds Conference** in Cambridge (UK) – “Presentation of ESA-Ariel” (Contributed).
- 2019 Oct: **Tokyo University** (JP) – “Degeneracies in atmospheric retrievals for future space telescopes” (Seminar).
- 2019 Sep: **EPSC-DPS 2019** in Lyon (FR) – “Data analysis techniques in the era of next generation telescopes” (Contributed).
- 2019 Jul: **University of California Berkeley** (USA) – “Towards more complex chemical parametrisation for atmospheric retrievals of exoplanets” (Seminar).

- 2019 Jul: **NASA Jet Propulsion Lab** (USA) – “Towards more complex chemical parametrisation for atmospheric retrievals of exoplanets” (Seminar).
- 2019 Jul: **California Institute of Technology** (USA) – “Towards more complex chemical parametrisation for atmospheric retrievals of exoplanets” (Seminar).
- Other contributed talks at **more than 20 events**, including ESA Ariel Consortium meetings (EU locations) – 2018 to Present.

ACADEMIC SERVICES

- 2023: Reviewer for the ESA Research Fellowships and for the ESA Science Faculty Research proposals.
- 2023: Organizing Committee for the 2023 ESA Pilot Workshop “Brainstorming on Astrobiology”.
- 2023: Reviewer of the 2023 STFC Small Award grants.
- 2023: Organizing Committee for the 2023 Ariel Data Challenge in ECML.
- 2022: Organizing Committee for the 2022 Ariel Data Challenge in NeurIPS.
- 2022 – Now: Member of the JWST ERS Transiting Exoplanet team.
- 2021: Organizing Committee for the ARES II Summer School, Biarritz FR.
- 2020 - Now: Leader of the Spectral Retrieval working group for the ESA Ariel Mission.
- 2020 – Now: Reviewer for AAS journals, A&A, MNRAS, JOSS, Exp. Ast., Astrophys. Space Sci.

STUDENT SUPERVISION

- 2024 Jan – 2027 Jan: Unnamed PhD student, PhD ESA/UCL – co-supervision with T. Lueftinger and G. Tinetti.
- 2023 Oct – 2026 Sep: Maël Voyer, PhD University Paris-Saclay / CEA – co-supervision with P.O. Lagage.
- 2022 Oct – Now: Simon Schleich, PhD University of Vienna – mentoring.
- 2021 Oct – Now: Sushuang Ma, PhD Astrophysics UCL – mentoring.
- 2021 Oct – 2022 Sep: Fang Wang, PhD Chinese Academy of Science – external supervisor.
- 2021 Oct – 2022 Sep: Zofia Hermaszewska, MSc Planetary Science UCL – thesis primary supervisor.
- 2021 Oct – 2022 Sep: Christos Xenofontos, MSc Planetary Science UCL – thesis primary supervisor.
- 2021 Oct – 2022 Sep: Connor Ballard, MSc Planetary Science UCL – thesis second supervisor
- 2021 Oct – 2022 Mar: Estelle Janin, MSc Astrophysics UCL – thesis primary supervisor.
- 2021 Jun – 2021 Sep: Lorenzo Pica Ciamarra, Summer Intern UCL – summer intern supervisor.
- 2020 Oct – 2022 Sep: Alexandra Thompson, MSc Astrophysics UCL – thesis primary supervisor.
- 2019 Oct – 2020 Sep: Luke Keyte, MSc Astrophysics UCL – thesis primary supervisor

TEACHING EXPERIENCES

- 2022 Mar: Rencontre Exobiologique pour Doctorants (RED 22) school, Le Teich FR – invited lecturer.
- 2021 Dec: Exosystèmes II Conference, atmospheric retrievals with TauREx, Toulouse FR – hands-on lead.
- 2021 Sep: ARES II Summer School, Biarritz FR – school organiser and lecturer.
- 2019 Sep: ARES I Summer School, Biarritz FR – invited lecturer.
- 2019 Feb: Digital Exoplanet Conference, Prague CZ – hands-on lead.
- 2018 – 2019: Marker and tutor for the MSc course PHAS0068, “Physics of the Exoplanets” – course marker.

OUTREACH

- 2022 May: **Pint of Science**, Paris FR – public talk.
- 2020 Dec: **Astronomines Conference**, Ecole des Mines Saint-Etienne FR (Online) – public talk.
- 2019 Nov: **Conférence Astronomie**, Lycée Jacque Prévert and Saint-Christol-les-Ales FR – public talk.
- 2019 Oct: **Space Café**, Tokyo JP – public talk.
- 2018 – 2020: **ORBYTS program**, BSSL, bimonthly courses on exoplanets to high-school students with planification of LCO and TelescopeLive observations, led to two publications – teacher.
- 2019 – Now: Promotion of science via press and online articles:
- ESA/UCL/NVIDIA/CNRS PR: “Hubble observations used to answer key exoplanet questions”
 - ExoClock Ariel article: “The prospects of phase curve studies in the Ariel era”.
 - The Conversation: “AI can reliably spot molecules on exoplanets...”.
 - The Conversation: “How can some planets be hotter than stars?”.

- Science & Vie: “Le mystère des planètes vaporeuses”.
- All About Space Magazine: “What are hot-Jupiters?”.

ACADEMIC REFERENCES

- Prof. Giovanna Tinetti (g.tinetti@ucl.ac.uk): Head of the Astrophysics Group at UCL (UK), Director of the UCL Centre for Space Exochemistry Data, PI of the ESA-Ariel space mission, co-founder and co-director of Blue Skies Space Ltd. Former PhD advisor.
- Prof. James Y-K. Cho (jamescho@brandeis.edu): Professor of Physics at Brandeis University (USA).
- Dr. Theresa Lueftinger (theresa.rank-lueftinger@esa.int): Project Scientist of Ariel at the European Space Agency ESTEC (EU).
- Prof. Pierre-Olivier Lagage (pierre-olivier.lagage@cea.fr): Director of the Département d'Astrophysique at CEA-Saclay (France), co-PI of the JWST-MIRI instrument, co-PI France of ESA-Ariel.
- Dr. Ingo P. Waldmann (ingo.waldmann@ucl.ac.uk): Associate Professor at UCL (UK), PI of the ExoAI project, co-founder of Spaceflux Ltd.