Annika Salmi

PhD student at ETH Zurich in two departments, Physics and Earth & Planetary Sciences. Currently modeling carbon and sulfur cycles on temperate super-Earths and sub-Neptunes.

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Education

ETH Zurich *Oct 2025 - present*
PhD student
- Supervised by Professor Paul Tackley and Professor Caroline Dorn

Trinity Hall, University of Cambridge *Oct 2024 - July 2025*
MPhil in Planetary Science and Life in the Universe
- Mark: Distinction (highest mark possible); therefore elected a Bateman Scholar
- Thesis: Simulating LIFE and HWO's future detections. Supervised by Dr. Bonsor and Professor Shorttle
- Received an overall award for Excellence for the thesis.
- Modules including Planetary System Dynamics (part of Math Part III)

Yale University *Aug 2017 - Dec 2021*
Bachelor of Arts double major in Physics and Astronomy
- GPA: 3.6/4.0 (UK 2:1 equivalent); final two years 3.8/4.0
- Undergraduate Thesis Title: Correlating mapped nuclear dust with AGN obscuration. With Professor Urry
- Research semester in Fall 2020 with Professor Meg Urry, studying dust around supermassive black holes

Princeton University *June 2020*
Physics of Life Summer Program

Work & Research Experience

Simulation Engineer *Seattle, Washington*
Starfish Space *Aug 2022 – June 2024*
- Architected and wrote a pipeline to process and clean on-orbit data for ground analysis. Used this tool to determine physics simulation accuracy; found the simulation was already 95% accurate.
- Upgraded and enhanced simulated images to more effectively train the navigation convolutional neural network (CNN). Designed and led hardware camera testing to add noise to synthetic Blender images.
- Modeled low Earth orbit physics in a Basilisk physics simulation to solve for drag. Improved dynamics simulation model performance by 30%, by rewriting slow algorithms, by tailoring cloud tools, and changing build processes. Dynamics simulation is Python wrapping C++ code; contributed in both languages. Also improved simulation UI.

Research Assistant *Yale University*
Urry Lab *Sep 2020 – Dec 2021*
- Mapped galaxy dust distributions of 109 galaxies with active galactic nuclei (AGN) to resolve whether galactic dust obscured AGN X-ray radiation. Wrote an algorithm that combined infrared and optical Hubble images to illuminate the galactic dust; now a GitHub package.
- Presented at a senior thesis Mellon Forum; funded by the Richter Memorial Fund.

Research Assistant *Yale University*
Newburgh Lab *Aug 2019 – Aug 2020*
- Generated channel telescope frequency versus intensity graphs of well-known bright stars on the Canadian Hydrogen Intensity Mapping Experiment (CHIME) to find telescope accuracy. Found 5 frequency channels that were over- and under-measuring intensity; results calibrated telescope.
- Research done with Cedar supercomputer; funded by the Richter Memorial Fund.

Museum Assistant in Paleobotany *Yale University*
Peabody Museum *Aug 2018 – Dec 2018*

Papers & Posters

Revisiting TOI-4438 and TOI-442 planetary systems with new observations from SPIRou and TESS, in prep.
J. Bell, G. Hébrard, E. Martioli, R. Díaz, L. de Almeida, R. Doyon, D. de Oliveira, A. L'Heureux, É. Artigau, L. Arnold, I. Boisse, X. Bonfils, A. Carmona, N. J. Cook, X. Delfosse, J.-F. Donati, **A. Salmi**, M. Valatsou

Conference poster: *Assessing the habitability and potential detectability of life on planets around M dwarfs*, Cambridge Life in the Universe Science Day (2025)
V. Ellmies, I. Kisvárdai, M. Kreuziger, A. Kumar, **A. Salmi** (equal contributions)

Honors & Awards

Planetary Sciences "Thesis Excellence Award" at Cambridge (2025)

Bateman Scholarship Fund (2024-2025)

Mellon Forum fund (2021)

Paul K. Richter and Evalyn E. Cook Richter Memorial Fund (2020, 2021)

National Science Foundation funding to go to Antarctica (2016)

Technical Skills

Skills: Cleaning and analyzing astronomical images, generating synthetic images, scientific and big data cloud computing, MCMC simulations, satellite orbit determination filtering algorithms, scientific writing

Languages: Python (6 years), Bash/Unix scripting (4 years), C++ (3 years), MATLAB (2 years), R (2 years), YAML (2 years)

Software tools: *Astronomy*: DS9, FITS, *Synthetic images*: Blender, cuda, *Aerospace*: Freeflyer, *Developer*: Linux, Git, Jira, VSCode, Cursor, *Cloud*: Google Cloud, Kubernetes, Docker

Repos

mdwarf-habitability *2025*

- Predicted the number of habitable zone planets HWO and LIFE will detect using an MCMC simulated planetary population. LIFE found more planets than HWO, but HWO was more successful for G-type stars.

exo-venus-evolution *2024, in progress*

- Model the evolution of "exo-Venuses" over their geological history, using Venus and exo-Venus data.

alignpy *2020*

- Built a tool that locally downloads FITS files of astronomical objects, specified by filter and catalog. Once they are downloaded, the image files can be aligned and plotted via addition, subtraction, or division

Science Communication

Teaching & mentoring

TA, AI-Assisted Coding — *ETH, spring 2026*
Institute of Astronomy science night volunteer — *Cambridge, 2024-25*
President (2018–2021), *Starlab Planetarium Shows* — *Yale, 2017–21*

Science writing

Women in Natural Sciences blog — *ETH, present*
SciTech Desk Writer, *Yale Daily News* — *Yale, 2020-21*
Popular astronomy writing has also appeared in Matador Network and Study Breaks.

Activities

Yale Free & Alpine Ski Team *Yale, 2017-21*
Captain 2019-2020

Languages: English (native), Spanish (advanced), French (intermediate)

Dual citizen of USA and Finland; Swiss resident.