

Research Interests

- Sub-Neptune atmospheres, planetary composition, and demographics
- Connection between atmospheric abundances and planet formation
- Time-series spectroscopy with space-based telescopes, such as HST and JWST
- Atmospheric retrievals and spectroscopic analysis

Academic Career

- Sep 2023 – present **PhD candidate in Astronomy & Astrophysics**, *Max Planck Institute for Astronomy / Heidelberg University*, Heidelberg, Germany
Supervisor: Prof. Dr. Laura Kreidberg
Expected completion: 2027
- Dec 2020 – May 2023 **Scientific Assistant**, *Max Planck Institute for Radio Astronomy*, Bonn, Germany
Research on chemical inventories of star-forming regions
- Oct 2020 – Dec 2022 **MSc in Astrophysics**, *University of Bonn*, Bonn, Germany
Supervisor: Prof. Dr. Karl M. Menten
Co-Supervisor: Dr. Friedrich Wyrowski
Final grade: 1.1 (very good)
- Sep 2019 – Oct 2019 **Student Assistant**, *University of Bonn*, Bonn, Germany
Public outreach at the “Highlights der Physik” science festival
- Sep 2017 – Sep 2020 **BSc in Physics**, *University of Bonn*, Bonn, Germany
Final grade: 1.5 (very good)

Research Experience

- Mar 2026 – present **Constraining sub-Neptune atmospheric demographics with HST and JWST**
What is the nature of sub-Neptune exoplanets, and can we identify demographic trends based on their atmospheric observations? Developed a homogeneous framework that enables a comparative retrieval of sub-Neptune atmospheres, based on HST and JWST transmission spectra. The analysis of demographic trends is ongoing.
- Jun 2024 – present **The refractory-rich formation of the ultra-hot Jupiter WASP-121 b**
Where and under which conditions do hot gas giants form? Extracted a new JWST MIRI/LRS dayside spectrum of WASP-121 b and combined it with NIRISS and NIRSpec data for a joint retrieval analysis. The measured abundances suggest a refractory-rich formation of the planet. Manuscript under review with A&A and published on ArXiv.
- Sep 2023 – Jul 2025 **The hot sub-Neptune HD 86226 c challenges sub-Neptune atmosphere trends**
What are the atmospheric conditions on hot sub-Neptunes? Combined nine HST WFC3/G141 transits of HD 86226 c to extract the first spectrum of a sub-Neptune with an equilibrium temperature above 1000 K, and conducted a retrieval analysis. The atmosphere is either metal-rich or enshrouded in high-temperature condensates that can not form on other sub-Neptunes. Paper published in A&A.

First-author Publications and Manuscripts

- In preparation K. A. Kahle, L. Kreidberg, the SPACE team, *Constraining sub-Neptune atmospheric demographics with HST and JWST*, in preparation.
- Jun 2026 K. A. Kahle, P. Mollière, L. Kreidberg, et al., *The panchromatic JWST dayside spectrum of WASP-121 b reveals a refractory-rich formation*, A&A, under review; [arXiv:2606.21855](https://arxiv.org/abs/2606.21855).
- Sep 2025 K. A. Kahle, J. Blečić, R. Ashtari, et al., *The SPACE Program I. The featureless spectrum of HD 86226 c challenges sub-Neptune atmosphere trends*, A&A, 701, A184, Sep 2025.
- Jul 2024 K. A. Kahle, F. Wyrowski, C. König, et al., *The effects of stellar feedback on molecular clumps in the Lagoon Nebula (M8)*, A&A, 687, A162, July 2024.
- May 2023 K. A. Kahle, A. Hernández-Gómez, F. Wyrowski, K. M. Menten, *The molecular environment of the solar-type protostar IRAS 16293-2422*, A&A, 673, A143, May 2023.

Co-author Publications and Manuscripts

- In preparation A. Triantafyllides, T. Beatty, P. Jason, et al., *The transmission spectrum of TOI-6478 b using HST/WFC3*, in preparation.
- In preparation S. Vaughan, K. A. Kahle, L. Kreidberg, et al., *Constraining the reflective properties of WASP-121 b using high spectral resolution retrievals*, in preparation.
- In preparation J. Blečić, I. Dobbs-Dixon, P. Cubillos, K. A. Kahle, et al., *Dynamic and Adaptable Open-Source Mie-Scattering Thermal Stability Cloud Model for Forward and Retrieval Modeling of Exoplanet Atmospheres - II: Applications to HD 86226c and WASP-17b*, in preparation.
- Aug 2026 C. Gapp, L. Acuña-Aguirre, Reza Ashtari, et al., *The SPACE Program II. No discernible spectral features in the transmission spectrum of the sub-Neptune HD 191939 b observed with HST/WFC3*, accepted to AJ in Aug 2026.
- Apr 2026 I. Barlach Christensen, C. Gieser, F. Wyrowski, et al., *Formaldehyde as a densitometer and thermometer in Cygnus-X, the GLOSTAR pilot region, and M8: Utilizing the H₂CO ground-state transition*, A&A, 708, A201, Apr 2026.
- Mar 2026 R. Ashtari, S. Collins, J. Splinter, et al., *Heat Reveals What Clouds Conceal: Global Carbon & Longitudinally Asymmetric Chemistry on LTT 9779 b*, AJ, 171, 215, Mar 2026.
- Jan 2026 J. Brande, M. Weiner Mansfield, I. Crossfield, et al., *Carbon dioxide and evidence for water in a stripped Hot Jupiter*, AAS Journals, under review.
- Dec 2025 C. Bruce Rosete, M. Leon Dasi, M. R. Boyd, K. A. Kahle, et al., *Exodus: A mission proposal to explore exoplanet evolution through understanding atmospheric escape*, Advances in Space Research, 77, 5, Dec 2025.
- Sep 2024 M. Fouesneau, I. G. Momcheva, U. Chadayammuri, et al., *What is the Role of Large Language Models in the Evolution of Astronomy Research?*, [arXiv:2409.20252](https://arxiv.org/abs/2409.20252).

Observing Experience and Proposals

Observing proposals

- 2024 – 2025 **JWST**, cycles 4 and 5 – **PI on 4 proposals** targeting sub-Neptunes and a phase-curve of an ultra-hot Jupiter. Co-I on 9 additional proposals.
- 2023 **APEX** (Atacama Pathfinder Experiment) / **LAsMA** – Co-I: Developed science case to investigate the gas structure surrounding the Lagoon Nebula (M8) by performing a large-scale molecular mapping. **Awarded 8 h**.
- 2021 **IRAM 30-m telescope** / **EMIR90** – Co-I: Refining physical properties and chemical inventories of molecular clumps in M8 by observing ground-state transitions. **Awarded 19 h**.

Observing runs

- Feb 2024 – Mar 2024 New Technology Telescope (NTT): Observer (7 nights).
Mar 2022 – Jun 2022 IRAM 30-m telescope: Individual and pool observer (10 nights).
2021 APEX: Pool observer (4 nights).

Computational Expertise

- Data reduction Eureka!, PACMAN, Tiberius, GILDAS, CASA
Spectroscopic analysis petitRADTRANS, easyCHEM, RADEX, CASSIS
Programming Python, C, Fortran (basic)
HPC Slurm, MPCDF clusters (Vera, Viper, Astronodes)
Other astro. software paKo, MESA, DS9

Selected Talks and Conferences

- Jun 2026 Contributed talk, *Exoplanets 6*, Porto, PT.
Mar 2026 Invited speaker, *Monday Lunch Seminar*, Kapteyn Astronomical Institute, Groningen, NL.
What HST and JWST teach us about sub-Neptunes and ultra-hot Jupiters
Feb 2026 Contributed talk, *From Galaxies to Planets: an elemental journey*, Schloss Ringberg, DE.
Nov 2025 Breakout-session organizer, *Signal in the Noise: The Ringberg Workshop on JWST Exoplanet Observations*, Schloss Ringberg, DE.
A Gaussian process user manual for exoplanets
Jul 2025 Contributed poster, *Exoclimates VII*, Montreal, CA.
Sep 2024 Contributed two posters, *Europlanet Science congress (EPSC)*, Berlin, DE.
Jul 2024 Contributed talk, *Challenge accepted: linking planet formation with present-day atmospheres*, Heidelberg, DE.
Jun 2024 Contributed poster, *Exoplanets 5*, Leiden, NL.
Jan 2023 Contributed two posters, *Science with the Atacama Pathfinder Experiment (APEX)*, Schloss Ringberg, DE.

Schools and Workshops

- Jul 2025 *ExoSLAM VII* summer school, analysis methods for exoplanet observations.
Nov 2023 *Post-Alpbach Summer School Event*, concurrent engineering of the Exodus mission.
Jul 2023 *Sagan Exoplanet Summer Hybrid Workshop, Characterizing Exoplanet Atmospheres: The Next Twenty Years*, analysis methods for JWST data.
Jul 2023 *Summer School Alpbach 2023, Exoplanets: Understanding alien worlds in diverse environments*, development of the Exodus mission concept.

Teaching and Mentoring

- July 2025 **Graduate tutor at the *A New Era in Exoplanet Atmosphere Observation and Characterisation* summer school in Bad Honnef** – Prepared and instructed computational hands-on exercises on atmospheric retrievals for international participants.
Mar 2025 – Aug 2025 **Laboratory tutor** at Heidelberg university – Supervised the undergraduate wavefront-sensing physics lab and graded group-reports.
Jun 2022 **Research project supervisor** (2 weeks) – Conceptualized a research project and mentored a high-school student based on it. Taught data analysis with GILDAS and organized an observing night at the 50cm telescope of the Argelander-Institute for Astronomy.

Academic Service

- Apr 2026 **Peer review** for Nature Communications
- Dec 2025 – present **Student representative** of the 19th generation at the International Max Planck Research School for Astronomy & Cosmic Physics at the University of Heidelberg
- Nov 2023 – Jan 2026 **Organizer and chair** of the *Exocoffee* literature seminar at the Max Planck Institute for Astronomy

Public Outreach and Science Communication

- Apr 2025 **Teacher education workshop**
Designed and delivered a training session on exoplanet characterization for international secondary school teachers, bringing planet science into the classrooms. A second session is planned as part of the *Bundesweite Wilhelm und Else Heraeus-Lehrerfortbildung zur Astronomie*.
- Feb 2025 – Jun 2026 **Invited public lectures and planetarium talks**
Delivered two public presentations at the planetarium of the *Haus der Astronomie* in Heidelberg and co-designed a supporting planetarium show. Invited speaker for the popular YouTube science channel *Astro&Co*, sharing exoplanet research with a broad audience. Two upcoming invited talks at the *Trebur astronomy foundation* and the *Starkenburger-Sternwarte*.

Languages

- German Native Speaker
- English Fluent
- French Basic
- Spanish Basic