Korash Assani

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Quick Profile

PhD Candidate with 9+ years of experience in astrophysics research, specializing in protoplanetary disks, protostellar outflows, and large-scale data analysis. Expertise includes spectroscopy, radiative transfer, 3D simulations, and spectral synthesis. Skilled in Python, Fortran, C++, and HPC systems with extensive experience analyzing JWST and ALMA datasets. Strong record of publications, collaboration, mentoring, teaching, outreach, and presentations.

Education

Ph.D. Candidate in Astronomy — **University of Virginia**
2022–Present — *Charlottesville, VA*

M.S. in Astronomy — **University of Virginia**
2020–2022 — *Charlottesville, VA*
GPA: 3.98/4.0

B.S. in Astrophysics, Physics; B.A. in Mathematics — **University of Cincinnati**
2016–2020 — *Cincinnati, OH*
GPA: 3.77/4.0

Research Experience

Graduate Research Assistant (Advisor: Zhi-Yun Li) — **University of Virginia**
2020–Present — *Charlottesville, VA*

- Developed custom analysis frameworks for JWST/MIRI and NIRSpec IFU and ALMA data cubes, including calibration, spatial alignment, moment map generation, and spectral diagnostics.
- Performed LTE analysis of H_2 emission lines to build excitation diagrams and apply extinction corrections, constraining physical conditions in protostellar outflows.
- Applied spectral synthesis codes to model forbidden [Fe II] fine-structure emission, linking observed line ratios to density, temperature, and extinction.
- Conducted global 3D hydrodynamic + dust simulations of planetary growth via pebble accretion using DISPATCH, and Athena++.
- Coordinated multi-institution observing proposals (JWST Cycles 2 & 4; ALMA Cycle 10) and awarded highly competitive telescope time.
- Delivered invited talks at STScI (2025), UC (2025), Virginia Tech (2025) and presented at several international conferences and workshops.

Undergraduate Research Assistant (Advisor: Mike Sitko) — **University of Cincinnati**
2016–2020 — *Cincinnati, OH*

- Investigated protoplanetary disk structure and variability using SpeX spectroscopy, photometry, and radiative transfer models (HOCHUNK3D) of young stellar systems.
- Extended studies to photometric "dippers," hydrogen recombination calibration in Herbig Ae/Be and T Tauri stars, and variability in accretion processes.
- Presented research at the American Astronomical Society and departmental symposia winning best undergraduate presentation two years in a row.

Computational Experience

- Extensive experience in **Python**, **Fortran**, and **Mathematica**, with proficiency in **IDL**, **C++**, **MATLAB**, **HTML**, and **Java**. Comfortable adapting quickly to new programming languages as needed.
- Experienced in computationally intensive **physics simulations**, including *3D hydrodynamic + dust simulations* of planet formation (**DISPATCH**, **Athena++**); *atomic spectral synthesis modeling* of forbidden [Fe II] emission (**CLOUDY**); and *3D Monte Carlo radiative transfer modeling* of spectral energy distributions (**HOCHUNK3D**).
- Proficient in **Python**-based data analysis and visualization of large datasets, including **N-dimensional datacubes** from **JWST** and **ALMA** observations; built custom pipelines for spectral line diagnostics, extinction corrections, and Boltzmann/LTE analyses.
- Significant experience with **high-performance computing** environments, including NASA supercomputing clusters and institutional HPC systems at the University of Cincinnati and University of Virginia.
- Participant, **NASA GPU Hackathon** — Sep 12–28, 2022
  Remote workshop focused on GPU-based acceleration of astrophysical simulations and data analysis.
- Experienced in **Git** version control using GitHub and Bitbucket: `https://github.com/KorashAssani`

Observing Proposals

- **The Dark Side of the Force: Unraveling Protostellar Jet Asymmetry by Probing TMC1A's Fainter Red-shifted Outflow with JWST**. Assani, K. D. (Co-I). JWST Cycle 4, Proposal ID 8872, 7.5 hrs (Accepted, 11% rate).
- **Imaging Planet Formation at Its Earliest Stages: Measuring the Extinction Level of an Enshrouded Protoplanet**. Wagner, K., Assani, K. D. (Co-I). JWST Cycle 2, Proposal ID 4010 (Accepted).
- **ALMA Meets JWST: Is There Warm Molecular Gas Near the [Fe] Jet?**. Harsono, D., Assani, K. D. (Co-I). ALMA Cycle 11, Project 2024.1.00046.S (Accepted).

Selected Publications

- **Mid-infrared extinction curve for protostellar envelopes from JWST-detected embedded jet emission: the case of TMC1A.** Assani, K. D. et al. (2025). *A&A*, 701, A175.
- **The asymmetric bipolar [Fe II] jet and H_2 outflow of TMC1A resolved with the JWST NIRSpec IFU.** Assani, K. D. et al. (2024). *A&A*, 688, A26.
- **Direct images and spectroscopy of a giant protoplanet driving spiral arms in MWC 758.** Wagner, K., . . . , Assani, K. D. et al. (2023). *Nat. Astron.*, 7, 1208–1217.
- **Wavelength-dependent extinction and grain sizes in "Dippers.** Sitko, M. L., . . . , Assani, K. D. et al. (2023). *AJ*, 166, 24.
- **Dracula's Chivito: Discovery of a large edge-on protoplanetary disk with Pan-STARRS.** Berghea, C. T., . . . , Assani, K. D. et al. (2024). *ApJL*, 967, L3.
- **Variability of disk emission . . . HD 163296.** Pikhartova, M., . . . , Assani, K. D. et al. (2021).*ApJ*, 919, 64.
- **Differences in the gas and dust distribution in the transitional disk of PDS 70**. Long, Z. C., . . . , Assani, K. D. et al. (2018). *ApJ*, 858, 112.

Invited Talks

- **Stellar Fountains: Probing Star Formation and Dust with JWST Observations of Protostellar Outflows** Sep 2025
  University of Cincinnati Astronomy Seminar Series Cincinnati, OH
- **Protostellar Outflows with JWST: From Line Diagnostics to Dust Attenuation** Sep 2025
  Space Telescope Science Institute – Dust/ISM Group Baltimore, MD
- **The Birth of Stars: JWST Insights into Protostellar Outflows and Dust in Star-Forming Regions** Mar 2025
  Virginia Tech Astronomy Series Blacksburg, VA

Presentations

- **[Fe II] & H_2 Excitation Conditions of the TMC1A Protostellar Outflow** – Specola Vaticana, Castel Gandolfo, Italy (Sep 2024)
- **Global Simulations of Planetary Growth via Pebble Accretion** – Gordon Research Conference, Mount Holyoke, MA (Jun 2023); Bob Rood Symposium, Charlottesville, VA (Apr 2023); VICO–CICO Workshop, Charlottesville, VA (Nov 2021); Sagan Exoplanet Summer Workshop, Poster #54 (Jun 2021)
- **Variability in the Gas and Dust Emission of the UX Orionis Star CQ Tau** – 235th AAS Meeting, Honolulu, HI, Poster #451.01 (Jan 2020)
- **Modeling the Circumstellar Disk of HD 166191** – 233rd AAS Meeting, Seattle, WA, Poster #163.19 (Jan 2019); UC MUSE Fellowship Presentation, Cincinnati, OH (Nov 2018)

Teaching & Mentorship

- Graduate Teaching Assistant, Univ. of Virginia Astronomy Dept. (2020, 2022).
- Undergraduate Mentor, UVA Astronomy Mentoring Program (2021–2022).
- Peer Tutor/Leader & Supplemental Instructor, Univ. of Cincinnati Learning Commons (2017–2019).

Service & Outreach

- Judge, Virginia Piedmont Regional Science Fair (2023, 2025)
- Coordinator, UVA Astro Grad Lunch (2023–2024); Journal Club (2021–2023)
- Telescope Operator, McCormick Observatory (2021–Present)
- Public outreach: Astronomy on Tap (Speaker, 2022), Dark Sky Bright Kids (2021–22), Cincinnati Observatory (2016–17)