Prakruti Sudarshan | Ph.D. student

CONTACT INFORMATION

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EDUCATION

Max Planck Institute for Astronomy &
Ruprecht-Karls-Universität Heidelberg, Germany
Ph.D. in Astronomy, IMPRS Fellow — October 2022 — Present

- Advisor: Dr. Mario Flock
- Working thesis title: *Dust dynamics in radiative protoplanetary disks*

Eberhard Karls Universität Tübingen, Germany
M.Sc. in Astro and Particle Physics, Overall Grade: 1.1 — September 2022

- Advisors: Late Prof. Dr. Wilhelm Kley, Dr. Christoph Schäfer
- Thesis: *Spirals and gravitoturbulence in 2D disks*, Thesis grade: 1.0

Christ University, Bangalore, India
B.Sc. *triple major* in Physics, Mathematics and Chemistry, GPA: 3.93/4.00 — June 2020

- Research Education and Advancement Program (REAP) student in Astrophysics, Jawaharlal Nehru Planetarium, Bangalore.

RESEARCH INTERESTS

I work on **planet formation theory**, studying **dust–gas dynamics of starlight heated protoplanetary disks**—- specifically, testing the effects of stellar irradiation on disk geometry using global radiation hydrodynamical simulations with the PLUTO code. I am involved in **ongoing collaborations** modeling **circumbinary disks**, **pressureless dust fluids**, **gravitational instability**, and the **streaming instability**. I also recently joined the Indian science team of the **SKAO consortium**.

TECHNICAL SKILLS

- **Programming languages**: C, Python (*Advanced*); Rust, CUDA, C++ (*Basic*)
- **Astrophysical Codes**: PLUTO with radiation multifluid hydrodynamics (*Advanced*); RADMC3D, Rebound, IDEFIX (*Intermediate*)
- **Data visualization & other tools**: LaTeX, Origin Pro (*Advanced*); Matlab, JavaScript, Hugo *(Intermediate)*;
- **High Performance Computing** with MPI/GPUs (*Advanced*)

RESEARCH EXPERIENCE

Computational Physics Group (CPT), Universität Tübingen, Germany — July 2021 – March 2022
Research assistant (HiWi)

Worked on a project of how cooling influences circumbinary disks with the GPU–PLUTO code with Dr. Anna Penzlin, Dr. Alex Ziampras, Prof. Dr. Wilhelm Kley and Prof. Dr. Richard Nelson.

- related paper published in A&A (664, A157)

PUBLICATIONS

Sudarshan, P., Flock, M., to be subm., A&A, "Shadows and staircases in starlight heated protoplanetary disks: Limits to the irradiation instability with FLD"

Baronett, S., et al. (incl. **Sudarshan, P.**), in prep, "Streaming instability code comparison: the unstratified BA problem" [Results online]

GRAVITY Collaboration. Sanchez-Bermudez, J., **Sudarshan, P.**, et al., in prep,"HD45677: the inner cavity of a possible close binary disk"

Ziampras, A., **Sudarshan, P.**, et al., 2025, MNRAS, 536, 4, pp.3322-3337 "Dusty substructures induced by planets in ALMA disks: how dust growth and dynamics changes the picture" [ADS]

Ueda, T., et al. 2024 (incl. **Sudarshan, P.**), Nature Astronomy 8, 1148-1158 (2024) "Support for fragile porous dust in a gravitationally self-regulated disk around IMLup" [ADS]

Sudarshan, P., Penzlin, A. B. T., Ziampras, A., Kley, W., & Nelson, R. P., 2022, A&A, 664, A157 "How cooling influences circumbinary disks" [ADS]

Teaching and Supervision

Summer project supervision of *incoming student Niranjan A.* — June 2025
Topic: Temperature and radiation fields at gap edges in protoplanetary disks

Master thesis co-supervision of *Pundari Kavipurapu*, Heidelberg University — 2023 – 2025
Topic: Dust dynamics in VSI active disks with parameterized cooling laws

Advanced Astronomy Lab Tutor, Heidelberg University — Summer 2023
F36 Adaptive optics: Wavefront analysis using the Shack Hartmann Sensor

Talks and Posters

Planet & Star Formation Coffee, MPIA	March 2025
Astronomical Society of India Meeting, Rourkela, India (***Contributed Talk***)	February 2025
IMPRS retreat, Mosbach, Germany	September 2024
PLUTO symposium, Torino, Italy (***Contributed Talk***)	September 2024
Gravity+ conference, Grenoble, France (***Poster***)	June 2024
Theory Group seminar, IPAG Grenoble, France	June 2024
DisktoPlanet Group meeting, MPIA, Germany	May 2024
Astronomy Unit Group meeting, Queen Mary University London	April 2024
Group seminar, Imperial College London	April 2024
MHD flows in young circumstellar disks, Ringberg, Germany (***Poster***)	September 2023
Theory group meeting, Charles University, Prague	May 2023
Protostars and Planets VII, Kyoto, Japan (***Poster***)	April 2023
DisktoPlanet Group meeting, MPIA, Germany	October 2022
The inner regions of protoplanetary disks, Ringberg, Germany (***Poster***)	September 2022
Formation and Evolution of Planetary systems conference, Tübingen (***Contributed Talk***)	August 2022
European Astronomical Society Annual Meeting (S22 session), Valencia, Spain (***Contributed Talk***)	July 2022

Honors and Awards

International Max Planck Research School (IMPRS-HD) Fellowship	2022 – 2026
SN Bhatt Memorial ICTS Fellowship, 1/10 selected All India *(cancelled due to Covid-19)*	2020
Christ University Physics and Electronics Club Quiz Champion	2019
Research Education and Advancement Program (REAP) scholarship	2018 – 2019
Secondary School Certificate (SSLC Board), 99.04%, Rank 5 in Karnataka State	2015

Professional Service / Outreach

Co-chair & SOC, "Early career astronomers and their supporters" session, European Astronomical Society Annual Meeting (EAS) Cork, Ireland — July 2025

Co-chair & SOC, "Early career astronomers and their supporters" session,

	European Astronomical Society Annual Meeting (EAS) Padova, Italy	July 2024
	Disk2Planet Group mailing list organizer	2024 – 2025
	LOC, Ringberg meeting on "MHD flows in young circumstellar disks"	October 2023
	Volunteer, MPIA Tag der offenen Tür (Open day)	October 2023
	LOC, Formation and Evolution of Planetary systems conference, Tübingen	August 2022
	Mentoring on STEM Careers for students with economically weak backgrounds, Viveka Scholar Program, SVYM, Sargur Village, India	December 2023
	Mediator, Virtual PSYCHE exhibition season, Science Gallery Bengaluru	April -– May 2022

OBSERVING TIME

30-inch telescope, Vainu Bappu Observatory, Kavalur, India
Time series spectra of the Sun — 2 nights, 2019

INDUSTRY EXPERIENCE

Bosch Sensortec GmBH, Reutlingen, Germany — April 2022 – July 2022
Working Student Intern

Worked on the analysis of MEMS-based Bosch sensor data and in-house code documentation using Python and Matlab.