

Sushant S. Mahajan

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PROFESSIONAL PREPARATION

- Research Scientist, W. W. Hansen Experimental Physics Laboratory, Stanford University 2024–present
- Postdoctoral Fellow, W. W. Hansen Experimental Physics Laboratory, Stanford University 2022–2024
- Solar Physics Postdoctoral Fellow, Institute for Astronomy, University of Hawai'i 2019–2022
- Ph.D.* in Astronomy, Georgia State University, USA 2019
Thesis: *Observational Constraints on the Solar Dynamo and the Hunt for Precursors to Solar Flares*
Advisor: Petrus C. Martens
- Master of Science*, Physics, Georgia State University, USA 2014–2017
- Master of Technology*, Engineering Physics, Indian Institute of Technology (BHU), India 2014
Thesis: *The Effect of Torsional Oscillations on the Solar Cycle*
Advisors: Dibyendu Nandi and B. N. Dwivedi

RESEARCH PROFILE

Solar physicist and computational researcher working on solar dynamo diagnostics, global-scale flows, helioseismology, time-series analysis, rare-event prediction, data assimilation, and scientific software for large observational archives.

AWARDS & HONORS

- Stanford University Libraries Data Sharing Prize, Stanford Solar Observatories Group 2026
- Recipient, NASA Silver Group Achievement Award, JSOC Flood Recovery Team 2025
- Editor's Choice, *Solar Physics* for "The Sun's Large-Scale Flows I: Measurements of Differential Rotation & Torsional Oscillation" 2024
- Best Young Presenter Award, IAU Symposium 340, Jaipur, India 2018
- Best Young Scientist Poster Award, IAU Symposium 335, University of Exeter, UK 2017
- Honorary Mention, Best Student Poster, Solar Physics Division meeting, Boulder 2016

SELECTED INVITED TALKS & ORAL PRESENTATIONS

- "Beyond 60 Degrees: High-Quality HMI Polar Magnetograms for the Solar Community," COFFIES annual meeting, Stanford University, CA 2026
- "How much magnetic flux and energy do active regions carry away from the solar interior?" Flux Emergence Workshop, San Diego, CA 2025
- "Unveiling the Solar Poles: Addressing Projection Artifacts and Revealing Circumpolar Features in HMI Magnetograms," AAS/SPD 246, Anchorage, AK 2025
- "Explaining Empirical Relationships in Sunspot Number & Area Time Series Using Poynting Theorem," TESS meeting, Dallas, TX 2024

“Unveiling the Sun: Exploring the Wonders of Solar Astrophysics,” KIPAC public lecture, Stanford University 2023

“The Influence of Active Regions on Plasma Flows Inside the Sun,” UCAR/HAO colloquium 2023

“Removal of Active Region Inflows Reveals Solar Cycle Scale Trends in Meridional Flow,” TESS meeting 2022

“Inflows Around Active Regions Explain Solar Cycle Scale Variations in Photospheric Meridional Flow During Cycle 24,” SPD/AAS 2021

MEDIA & PUBLIC COMMUNICATION

KRON4 interview on the Northern Lights 2024

NBC Bay Area appearance on the Northern Lights 2024

ABC7 Bay Area appearance on the Northern Lights 2024

Quoted in *San Francisco Chronicle* on California aurora visibility 2024

Stanford Report, “Four Questions with a Scientist” on the 2024 total solar eclipse 2024

CONFERENCE SESSION ORGANIZATION

Co-convenor, AGU26 session proposal “Solar Connectivity: Linking Interior Dynamics to Magnetic Variability and Heliospheric Evolution for Solar Cycles in the Past, Present, and Future” 2026

Co-organizer/chair, SHINE session “Understanding Variations in Sun’s Global Flows,” Juneau, AK 2024

Co-organizer/chair, SHINE Session 1 / WG1 “Where in the solar interior lies the seat of the dynamo?,” Stowe, VT 2023

Co-organizer/chair, SPD session “Unveiling the Solar Poles” / “SPD: Unveiling the Polar Poles,” Anchorage, AK, with Lisa Upton and Shea Hess Webber 2025

DATA MANAGEMENT & WEB DEVELOPMENT

Prepared and published the SWAN-SF benchmark dataset for AI and solar-flare forecasting 2020

Responsible for producing new electric and velocity field based metadata parameters from SDO/HMI data 2024–present

Responsible for developing an agentic AI-powered JSOC Data Commons server for public query and visualization of SDO data 2026–present

SELECTED PUBLICATIONS, DATASETS, WHITE PAPERS & PROCEEDINGS

Ding, B., Zhao, J., Chen, R., Waidele, M., **Mahajan, S. S.**, and Vesa, O.
Characterizing the Observational Properties of the Sun’s High-latitude $m = 1$ Inertial Mode. *Astrophysical Journal* 2025

Dash, S., DeRosa, M. L., Dikpati, M., Sun, X., **Mahajan, S. S.**, Liu, Y., and Hoeksema, J. T.
Ensemble Kalman Filter Data Assimilation into the Surface Flux Transport Model to Infer Surface Flows: An Observing System Simulation Experiment. *Astrophysical Journal* 2024

Mahajan, S. S., Upton, L. A., Antia, H. M., Basu, S., DeRosa, M. L., Hess Webber, S. A., et al.
The Sun's Large-Scale Flows I: Measurements of Differential Rotation & Torsional Oscillation. Solar
Physics 299, 38 [2024](#)

Mahajan, S. S., Sun, X., and Zhao, J.
*Removal of Active Region Inflows Reveals a Weak Solar Cycle Scale Trend in the Near-Surface
Meridional Flow*. Astrophysical Journal 950, 63 [2023](#)

Pal, S., Bhowmik, P., **Mahajan, S. S.**, and Nandy, D.
Impact of Anomalous Active Regions on the Large-Scale Magnetic Field of the Sun. Astrophysical
Journal 953, 51 [2023](#)

Hess Webber, S. A., **Mahajan, S. S.**, Koufos, A., Chatterjee, S., Leka, K. D., Sadykov, V., et al.
*You Get What You Pay for: Scientific Engineering Challenges for Successful Distributed Multi-
Satellite Missions in Solar and Heliophysics*. Bulletin of the American Astronomical Society 55(3),
168 [2023](#)

Hathaway, D. H., Upton, L. A., and **Mahajan, S. S.**
*Variations in Differential Rotation and Meridional Flow within the Sun's Surface Shear Layer 1996–
2022*. Frontiers in Astronomy and Space Sciences [2022](#)

Mahajan, S. S., Hathaway, D. H., Munoz-Jaramillo, A., and Martens, P. C.
*Improved Measurements of the Sun's Meridional Flow and Torsional Oscillation from Correlation
Tracking on MDI & HMI Magnetograms*. Astrophysical Journal 917, 100 [2021](#)

Ahmadzadeh, A., Aydin, B., Georgoulis, M. K., Kempton, D. J., **Mahajan, S. S.**, and Angryk, R.
A.
How to Train Your Flare Prediction Model: Revisiting Robust Sampling of Rare Events. Astrophys-
ical Journal Supplement Series 254, 23 [2021](#)

Angryk, R. A., Martens, P. C., Aydin, B., Kempton, D., **Mahajan, S. S.**, Basodi, S., et al.
Multivariate Time Series Dataset for Space Weather Data Analytics. Scientific Data 7, 227 [2020](#)

PUBLIC OUTREACH & SERVICE

Volunteer at KIPAC public solar eclipse viewing events, Stanford University [2022–present](#)

Volunteer for “KIPAC + Friends” Community Day public science fair, Stanford University [2025](#)

Lecturer, HI STAR outreach program, Institute for Astronomy, University of Hawai'i [2020–2021](#)

Judge, Maui County Regional Science and Engineering Fair, Hawai'i [2020–2021](#)

Presented “Know Thy Sun” at Charlie Elliott Wildlife Center astronomy club, Georgia [2018](#)

MENTORING

Project mentor for Kevin Brooks, a PhD candidate at New Mexico State University [2025–present](#)

Advised Ansh Malviya on statistical analysis of solar flares [2023](#)

Mentored Prabhanjan Kulkarni on AI powered solar flare forecasting models [2020–2021](#)

COMPUTATIONAL SKILLS

Python, MATLAB, Fortran, bash, OpenMP, MPI, C++, CUDA, ParaView, scientific time-series

analysis, machine learning for forecasting, and agentic AI workflow development.