H0506, Lille Bislett 24
Oslo, 0170, Norway
(+47) 486 13 261
avijeet.prasad@astro.uio.no
prasad.avijeet@gmail.com
Date of birth: 10 July 1988
ORCID: 0000-0003-0819-464X

# Avijeet Prasad

## Education

**March 2016** **Ph.D.** Indira Gandhi National Open University, New Delhi 110068, India.
*Thesis title:* Magnetic Helicity and Force-Free Properties of Astrophysical Magnetic Fields
*Institute:* Indian Institute of Astrophysics, Bangalore, India.
*Adviser:* Prof. Arun Mangalam, Indian Institute of Astrophysics, Bangalore, India.

**June 2010** **Master of Science** Indian Institute of Astrophysics/Indira Gandhi National Open University (Integrated M.Sc.-PhD in Physics and Astrophysics), Bangalore, Karnataka, India.
**Overall percentage: 78%**

**June 2008** **Bachelor of Science** University of Calcutta, Kolkata, West Bengal, India.
**Overall percentage: 69%**

**May 2005** **Senior School Certificate Examination** Kendriya Vidyalaya No.1, Kanchrapara, Central Board of Secondary Education, West Bengal, India.
**Overall percentage: 86%**

**May 2003** **All India Secondary School Examination** Kendriya Vidyalaya No.2, Kanchrapara, Central Board of Secondary Education, West Bengal, India.
**Overall percentage: 85%**

## Research highlights

- Magnetohydrodynamic simulations of the solar corona, with a focus on magnetic reconnections and high energetic phenomena like solar flares and coronal mass ejections.
- Magnetic field extrapolations using numerical models of non-force-free/nonlinear-force-free magnetic fields and their applications to spectro-polarimetric data from solar photosphere and chromosphere.
- Topological and statistical properties of coronal fields derived from magnetic field extrapolations, with focus on magnetic braiding, magnetic helicity, properties of magnetic null points and formation of current sheets.

## Computation and programming

- Working knowledge of Mathematica, Python, IDL, Fortran, C/C++, VAPOR.
- Worked on magnetohydrodynamic simulations for the solar corona using the EULAG-MHD code.
- Worked on numerical extrapolation models of non-force-free coronal magnetic fields from photospheric vector magnetograms.
- Developed galactic dynamo codes in Mathematica written for parallel processing on a computing cluster.

## Research experience

**Aug 2021** ***Postdoctoral Research Fellow***, Rosseland Center for Solar Physics, Institute of Theoretical Astrophysics, University of Oslo, Oslo, Norway

**Oct 2018** ***Postdoctoral Research Assistant***, Center for Space Plasma & Aeronomic Research, The University of Alabama in Huntsville, Huntsville, USA

**June 2016** ***Postdoctoral Fellow***, Udaipur Solar Observatory, Physical Research Laboratory, Ahmedabad, India.

**March 2016** ***Postdoctoral Researcher***, Indian Institute of Astrophysics, Bangalore, India.

**Aug. 2012** ***Senior Research Fellow***, Indian Institute of Astrophysics, Bangalore, India.

**Aug. 2010** ***Junior Research Fellow***, Indian Institute of Astrophysics, Bangalore, India.

## List of Publications:

### Refereed papers

1. *The heating of the solar chromosphere in a sunspot light bridge by electric currents.* Louis R. E., **Prasad A.**, Beck C., Choudhary D. P., Yalim M. S., 2021, A&A, 652, L4.

2. *Are the brightest coronal loops always rooted in mixed-polarity magnetic flux?* Tiwari, S.K., Evans, C.L., Panesar, N.K., **Prasad, A.**, Moore, R.L., 2021, Astrophys. J. 908, 151.

3. *Magnetic reconnections in the presence of three-dimensional magnetic nulls and quasi-separatrix layers.* Kumar, S., Nayak, S.S., **Prasad, A.**, Bhattacharyya, R., 2021, Solar Phys. 296, 26.

4. *Magnetohydrodynamic Simulation of Magnetic Null-point Reconnections and Coronal Dimmings during the X2.1 Flare in NOAA AR 11283.* **Prasad, A.**, Dissauer, K., Hu,Q., Bhattacharyya, R., Veronig, A.M., Kumar, S., Joshi, B.: 2020, Astrophys. J. 903 (2), 129.

5. *An Eruptive Circular-ribbon Flare with Extended Remote Brightenings.* Liu, C., **Prasad, A.**, Lee, J., Wang, H.: 2020, Astrophys. J. 899 (1), 34.

6. *Effects of Cowling Resistivity in the Weakly Ionized Chromosphere.* Yalim, M.S., **Prasad, A.**, Pogorelov, N.V., Zank, G.P., Hu, Q.: 2020, Astrophys. J. Lett. 899 (1), L4.

7. *A Solar Magnetic-fan Flaring Arch Heated by Nonthermal Particles and Hot Plasma from an X-Ray Jet Eruption.* Lee, K.-S., Hara, H., Watanabe, K., Joshi, A.D., Brooks, D.H., Imada, S., **Prasad, A.**, Dang, P., Shimizu, T., Savage, S.L., Moore, R., Panesar, N.K., Reep, J.W.: 2020, Astrophys. J. 895 (1), 42.

8. *Forecasting Solar Cycle 25 Using Deep Neural Networks.* Benson, B., Pan, W.D., **Prasad, A.**, Gary, G.A., Hu, Q.: 2020, Solar Phys. 295 (5), 65.

9. *On the Spontaneous Generation of Three-dimensional Magnetic Nulls.* Nayak, S.S., Bhattacharyya, R., Smolarkiewicz, P.K., Kumar, S., **Prasad, A.**: 2020, Astrophys. J. 892 (1), 44.

10. *Identification of Pre-flare Processes and Their Possible Role in Driving a Large-scale Flux Rope Eruption*

*with Complex M-class Flare in the Active Region NOAA 12371.* Mitra, P.K., Joshi, B., **Prasad, A.**: 2020, Solar Phys. 295 (2), 29.

11. *Three-dimensional magnetic field structure of a flux-emerging region in the solar atmosphere.* Yadav, R., de la Cruz Rodríguez, J., Díaz Baso, C.J., **Prasad, A.**, Libbrecht, T., Robustini, C., Asensio Ramos, A.: 2019, Astron. Astrophys. 632, A112.

12. *Godbillon-Vey helicity and magnetic helicity in magnetohydrodynamics.* Webb, G.M., **Prasad, A.**, Anco, S.C., Hu, Q.: 2019, Journal of Plasma Physics 85 (5),775850502.

13. *A Data-constrained Magnetohydrodynamic Simulation of Successive Events of Blowout Jet and C-class Flare in NOAA AR 12615.* Nayak, S.S., Bhattacharyya, R., **Prasad, A.**, Hu, Q., Kumar, S., Joshi, B.: 2019, Astrophys. J. 875 (1), 10.

14. *Effects of dark matter in star formation.* Arun, K., Gudennavar, S.B., **Prasad, A.**, Sivaram, C.: 2019, Astrophys. Space Sci. 364 (2), 24.

15. *Successive Flux Rope Eruptions from $\delta$-sunspots Region of NOAA 12673 and Associated X-class Eruptive Flares on 2017 September 6.* Mitra, P.K., Joshi, B., **Prasad, A.**, Veronig, A.M., Bhattacharyya, R.: 2018, Astrophys. J. 869 (1), 69.

16. *Extremal charged black holes, dark matter and dark energy.* Sivaram, C., Arun, K., **Prasad, A.**: 2018, Astrophys. Space Sci. 363 (10), 202.

17. *A Magnetohydrodynamic Simulation of Magnetic Null-point Reconnections in NOAA AR 12192, Initiated with an Extrapolated Non-force-free Field.* **Prasad, A.**, Bhattacharyya, R., Hu, Q., Kumar, S., Nayak, S.S.: 2018a, Astrophys. J. 860 (2), 96.

18. *Alternate models to dark energy.* Arun, K., Gudennavar, S.B., **Prasad, A.**, Sivaram, C.: 2018, Advances in Space Research 61 (1), 567.

19. *Topological and statistical properties of nonlinear force-free fields.* Mangalam, A., **Prasad, A.**: 2018, Advances in Space Research 61 (2), 738.

20. *Magnetohydrodynamic Modeling of Solar Coronal Dynamics with an Initial Non-force-free Magnetic Field.* **Prasad, A.**, Bhattacharyya, R., Kumar, S.: 2017, Astrophys. J. 840 (1), 37.

21. *A viable non-axisymmetric non-force-free field to represent solar active regions.* **Prasad, A.**, Bhattacharyya, R.: 2016, Physics of Plasmas 23 (11), 114504.

22. *A Global Galactic Dynamo with a Corona Constrained by Relative Helicity.* **Prasad, A.**, Mangalam, A.: 2016, Astrophys. J. 817 (1), 12.

23. *Separable Solutions of Force-Free Spheres and Applications to Solar Active Regions.* **Prasad, A.**, Mangalam, A., Ravindra, B.: 2014, Astrophys. J. 786 (2), 81.

## Conference proceedings

1. *Polarization Model for the Multi-Application Solar Telescope at the Udaipur Solar Observatory.* Anche,

R.M., Ranganathan, M., Mathew, S.K., Sankarasubramanian, K., Anupama, G.C., Ramya, B., **Prasad, A.**, Yadav, R., Bayanna, R., Proc. SPIE 11451, Advances in Optical and Mechanical Technologies for Telescopes and Instrumentation IV, 114514O (13 December 2020)

2. *A data-driven MHD model of the weakly-ionized chromosphere.* Sarp Yalim, M., **Prasad, A.**, Pogorelov, N., Zank, G., Hu, Q.: 2020, Journal of Physics: Conference Series 1620 (1), 012026.

3. *Study of magnetic field topology of active region 12192 using an extrapolated non-force-free magnetic field.* **Prasad, A.**, Bhattacharyya, R., Hu, Q., Nayak, S.S., Kumar, S.: 2018b, IAU Symposium 340, 81.

4. *Magnetic field topology from non-force free extrapolation and magnetohydrodynamic simulation of its eventual dynamics.* Nayak, S.S., Bhattacharyya, R., **Prasad, A.**, Hu, Q.: 2018, IAU Symposium 340, 183.

5. *Models of force-free spheres and applications to solar active regions.* **Prasad, A.**, Mangalam, A.: 2013, In:Astronomical Society of India Conference Series, Astronomical Society of India Conference Series 10, 51.

### Under review and In preparation

1. *Magnetic Topology of the Inverse Evershed Flow.* **Prasad, A.**, Ranganathan, M., Beck, C., Choudhary, D.P., Hu, Q., under review.

2. *Magnetohydrodynamic simulation of microflaring active region 12234.* **Prasad, A.**, Athiray, P.S., Nayak, S.S., Hu, Q., Bhattacharyya, R., in preparation.

## Current projects

1. Why Do Active Regions Erupt? Modeling of the Active Region from Pre-Eruptive Processes (NSF STR – AGS 1650854).

2. Data-Constrained, Data-driven and Laboratory-Tested MHD Simulations to Understand Successful and Failed Solar Eruptions, (NASA HGCR).

3. Collaborative Research: Investigation of Dynamic and Non-Force-Free Nature of Solar Active Regions and Consequent Initiation Flares (NSF AGS 1954503).

4. Development of a Data-driven Magnetohydrodynamic Simulation Model for Coronal Mass Ejections (NSF STR 2020703).

5. Magnetic Reconnection and its Implications for Fast Reconnection Onset in Solar Flares and Magnetopause (NASA LWS).

6. ISSI science team on Coronal dimmings and their relevance to the physics of solar and stellar coronal mass ejections.

7. Multi-wavelength Spectroscopic and Spectropolarimetric Diagnostics of the Solar Atmosphere.

8. Structure and Magnetic Setting of Coronal and Chromospheric Jets.

## Awards

**Sep. 2013** Awarded the *Shyama Prasad Mukherjee Fellowship (SPMF)* for SRF by Council of Scientific & Industrial Research (CSIR), India.

**Sep. 2011** Awarded the *Shyama Prasad Mukherjee Fellowship (SPMF)* for JRF by Council of Scientific & Industrial Research (CSIR), India.

**Dec. 2010** Secured **3rd** rank in National Eligibility Test (NET) conducted by the University Grants Commission (UGC), India.

**April 2008** Selected in top **1%** in the National Graduate Physics Examination (NGPE), conducted by the Indian Association of Physics Teachers.

## Conferences and workshops

**July 2020** Participated in the 3rd NCSP DKIST Data-Training Workshop on Milne-Eddington Spectro-polarimetric Inversions, July 20-24, 2020, Online.

**Feb 2020** Attended the 5th Asia Pacific Solar Physics Meeting (APSPM); presented a poster on *Magnetohydrodynamic Simulation of Magnetic Null-point Reconnections and Coronal dimmings during the X2.1 flare in NOAA AR 11283*, 3-7 February 2020, IUCAA, Pune, India.

**Jan 2020** Attended the *Coronal dimming workshop at Kanzelhöhe Observatory*; gave an invited talk titled *Magnetohydrodynamic Simulation of Magnetic Null-point Reconnections and Coronal dimmings during the X2.1 flare in NOAA AR 11283*, 20-24, January 2020, Kanzelhöhe Observatory, Austria.

**June 2019** Attended the *234th meeting of the American Astronomical Sociey*; presented a talk titled *Magnetohydrodynamic Simulation of Magnetic Null-point Reconnections and Coronal dimmings in NOAA AR 11283*, 9-13, June 2019, St. Louis, Missouri.

**June 2019** Attended the *1st NCSP Data Training Workshop*, 4-7, June 2019, National Solar Observatory, Boulder, Colorado.

**Aug. 2018** Attended the workshop on *Model coupling and data driven simulations of solar eruptions*; presented a talk titled *Magnetohydrodynamic simulations of solar corona initiated with extrapolated non-force-free magnetic fields*, 13-16, August 2018, High Altitude Observatory, Boulder, Colorado.

**Feb. 2018** Attended the *IAU Symposium 340 "Long Term Datasets for the Understanding of Solar and Stellar Magnetic Cycles"*; presented a poster titled *Magnetohydrodynamic modeling of solar atmosphere using non-force-free magnetic fields*, 19-24, February 2018, B. M. Birla Auditorium, Jaipur, India.

**Nov. 2017** Attended the *32nd National Symposium on Plasma Science & Technology*; presented a poster on *Magnetohydrodynamic modeling of solar coronal dynamics with initial non-force-free magnetic fields*, 7-10 November 2017, Institute for Plasma Research, Gandhinagar Gujarat, India.

**Aug. 2017** Participated in the *Heliophysics summer school* on *Long-term solar activity and the climates of space and Earth*, 1-8 August, 2017, NASA-UCAR, Boulder, Colorado, USA.

**Feb. 2017** Participated in the *Astronomical Society of India meeting*; gave a thesis talk on *Magnetic helicity and force-free properties of astrophysical magnetic fields*, 6-10 March, 2017, Birla Institute of Scientific Research (BISR), Jaipur, India.

**May 2016** Participated in the *Astronomical Society of India meeting*; presented a poster on *A global galactic dynamo with a corona constrained by helicity*, 10-13 May 2016, University of Kashmir, Srinagar, India.

**March 2016** Participated in the *Neighbourhood Astronomy Meeting*; presented a talk on *A global galactic dynamo with a corona constrained by helicity*, 28 March 2016, ICTS Bangalore, India.

**Feb. 2016** Participated in the *Dynamic Sun I conference*; presented a talk on *Modeling of braided magnetic fields in the solar corona using analytic NLFFF solutions*, 22-25 February, IIT BHU, Varanasi, India.

**Feb. 2015** Participated in the *Astronomical Society of India meeting*; presented a talk on *Topological properties of coronal fields derived from NLFFF solutions*, 16-20 February, NCRA, Pune, India.

**Oct. 2014** Attended a conference on *Cosmic Magnetic Fields: Current Knowledge and the Future Ideas*; presented a talk on *A Dynamo with a global helicity constraint for a galaxy with a corona*, 20-24 October,Jagiellonian University, Krakow, Poland.

**Mar. 2014** Participated in the *Astronomical Society of India meeting*; presented a poster on *A helicity constrained model of galactic dynamo*, 20-22 March, IISER, Mohali, India.

**Nov. 2013** Participated in the *NLST-ADITYA meeting*; presented a talk on *Application of non-linear force-free fields to solar active regions*, 18-20 November, IIA, Bangalore, India.

**Nov. 2012** Attended the *International Symposium on Solar Terrestrial Physics*; presented a talk on *Models of self-similar force-free spheres and its application to solar active regions*, 6-9 November, IISER, Pune, India.

**Mar. 2011** Participated in the *1st Asia-Pacific Solar Physics Meeting*; presented a poster on *Models of force-free fields in spherical geometry*, 21-24 March, IIA, Bangalore, India.

**Dec. 2010** Attended the *Chandrasekhar Centenary Conference*, 7-11 December, IIA, Bangalore, India.

## Astronomy Outreach activities

1. Initiated and coordinated multiple astronomy school outreach events for high school students as part of the outreach committees at the Indian Institute of Astrophysics and at the Udaipur Solar Observatory during my PhD and Postdoc tenure in India.

2. In 2019, I initiated and coordinated an informal Google Classroom course called Introduction to Solar Physics, which was attended by more than 20 students and post-docs involved in research related to solar physics and space weather.

3. In 2020, during the Covid-19 pandemic, I helped to initiate and coordinate a series of online lectures for school students through the website: Let's talk astronomy. These lectures were conducted on weekends over two months and were attended by over 1500 students.