Kishor Dattatray Kumbhar

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Personal Profile

My research currently focuses on studying plasma waves and instabilities in large scale magnetic structures such as Interplanetary Coronal Mass Ejections (ICMEs) and Corotating Interaction Regions (CIRs). Along with this I am currently working on understanding the plasma heating caused by these waves and instabilities and thus aim to provide a linkage between them using multi-spacecraft data.

Education

University of Mumbai — *Mumbai, India*

PhD (Physics) — *2022 - Pursuing*

- **Thesis Title:** Exploration of Plasma waves and Instabilities in Large-scale Magnetic Structures.

University of Mumbai — *Mumbai, India*

MSc in Physics — *2018 - 2020*

- **CGPA:** 8.71/10 (72.84 %)

K.V Pendharkar College — *Mumbai, India*

BSc in Physics — *2015 - 2018*

- **CGPA**: 6.51/7 (79.51%)

K.V Pendharkar College — *Mumbai, India*

HSC — *2015*

- **Grade** : Second (56.46 %)

Manjunatha Vidyalaya — *Mumbai, India*

SSC — *2013*

- **Grade** : Distinction (75.80 %)

Other Qualifications

2024	**PhD Admission Category,** National Eligibility Test (NET)- Physical Sciences	*India*
2024	**AIR-2551,** Gradute Aptitude Test in Engineering (GATE - Physics)	*India*
2023	**AIR- 514,** Gradute Aptitude Test in Engineering (GATE - Physics)	*India*
2022	**AIR-861,** Gradute Aptitude Test in Engineering (GATE - Physics)	*India*
2021	**AIR-1544,** Gradute Aptitude Test in Engineering (GATE - Physics)	*India*
2020	**Qualified,** MH-SET	*India*

Work Experience

MES's D.G Ruparel College — *Mumbai, India*

Assistant Professor (Physics) — *August 2024 - Till date*

- **Subjects taught**:
  - MSc-II: Nuclear Physics
  - MSc-I: Quantum Mechanics
  - FYBSc: Practicals- Sem-I, Skill Enhancement Course (SEC) & Vocational Skill Course (VSC)
  - SYBSc: Electronics- (Sem-III) & Quantum Mechanics-(Sem-IV)
  - TYBSc: Nuclear Physics & Practicals
  - FYBCom: Open Elective Course
- **Outreach Program**
  - Delivered a talk on "Mysteries of our sun" at Sharadashram Vidyamandir, Dadar as a part of science popularization lecture.

Jai Hind College (Autonomous) *Mumbai, India*

Assistant Professor (Physics) *Nov 2021 - Apr 2024*

- **Subjects taught**:
  - Nuclear Physics (TYBSc)
  - Atomic and Molecular Physics (TYBSc)
  - Electricity and Electronics (FYBSc)
  - Physics Practical (SyBSc Sem 3 & 4)
  - Physics Practical (FYBSc Sem 1 & 2)
- **Subjects taught under NEP 2020**:
  - Skill Enhancement Course (SEC) - Electronics (FYBSc)
  - Open Elective - Physics in Everyday Life (FYBCom & FYBA)
  - Indian Knowledge System (IKS)
- Framed syllabus for Open Elective and SEC
- Mentored SyBSc students for Avishkar Competition for their project titled "Nuclear batteries: Applications of Nuclear Isomers" in the academic year 2021-22.
- Judge for college-level science exhibition competition Xplore(AY 2022-23) & ((AY 2023-24)
- Part of NAAC tech team mainly focusing on helping with documentation of different criteria.
- Organised field trip to GMRT Pune (AY 2022-23) and Tarapur Atomic Power plant (TAPS) for Fy, Sy, and TyBSc students (AY 2023-24).

Publications

Journal Articles

Distinct polytropic behavior of plasma during icme-hss interaction

KG Kalpesh Ghag, AN Anil Raghav, ZI Zubair Shaikh, GN Georgios Nicolaou, OD Omkar Dhamane, KK Mohit Shah, UP Utsav Panchal, PT Prathmesh Tari, KK Kishor Kumbhar

Advances in Space Research. Elsevier, 2024

Observation of Kinetic Alfvén Waves inside an Interplanetary Coronal Mass Ejection Magnetic Cloud at 1 au

Kishor Kumbhar, Anil Raghav, Omkar Dhamane, Kalpesh Ghag, Vinit Pawaskar, Zubair Shaikh, Ankush Bhaskar, Raffaella D'Amicis, Daniele Telloni

The Astrophysical Journal p. 139. IOP Publishing, 2024

Studying the polytropic behavior of an ICME using Multi-spacecraft observation by STEREO-A, STEREO-B, and WIND

Kalpesh Ghag, Prachi Pathare, Anil Raghav, Georgios Nicolaou, Zubair Shaikh, Omkar Dhamane, Utsav Panchal, Kishor Kumbhar, Prathmesh Tari, Bhagyashri Sathe

Advances in Space Research pp. 1064–1072. Elsevier, 2024

The role of extreme geomagnetic storms in the Forbush decrease profile observed by neutron monitors

Kalpesh Ghag, Prathmesh Tari, Anil Raghav, Zubair Shaikh, Omkar Dhamane, Utsav Panchal, Greg Hilbert, Mayuri Katvankar, Komal Choraghe, Digvijay Mishra, Kishor Kumbhar

Journal of Atmospheric and Solar-Terrestrial Physics p. 106146. Elsevier, 2023

Observation of Alfvén Ion Cyclotron Waves in ICME Magnetic Clouds at 1 au

Omkar Dhamane, Vinit Pawaskar, Anil Raghav, Zubair Shaikh, Raffaella D'Amicis, Kalpesh Ghag, Kishor Kumbhar, Daniele Telloni, Georgios Nicolaou, Prathmesh Tari

The Astrophysical Journal p. 38. IOP Publishing, 2023

Statistical Study of Geo-Effectiveness of Planar Magnetic Structures Evolved within ICME's

Kalpesh Ghag, Bhagyashri Sathe, Anil Raghav, Zubair Shaikh, Digvijay Mishra, Ankush Bhaskar, Tarun Kumar Pant, Omkar Dhamane, Prathmesh Tari, Prachi Pathare, Vinit Pawaskar, Kishor Kumbhar, Greg Hilbert

Universe p. 350. MDPI, 2023

Projects

Kinematics of Coronal Mass Ejections (CMEs) in coronagraphs and EUV imagers *Nainital, India*

7th Aditya L-1 support cell workshop, ARIES, Nainital *21^{st} - 30^{th} May 2024*

Coronal Mass Ejections (CMEs) are large explosive events occurring on the surface of the sun. They are considered as the major drivers of near-Earth space weather. Moreover, depending upon their propagation speed CMEs are classified into three regimes: 1) Slow CMEs ($V < 300$ kms^{-1}), 2) Intermediate CMEs (300 $kms^{-1} \leq V \leq 500$ kms^{-1}), and 3) Fast CMEs ($V > 500$ kms^{-1}). In this project, we estimated the kinematics of limb CMEs using the XT plot (distance-time plot) method. We utilized data from the K-COR ground-based observatory, the GOES Solar Ultraviolet Imager (GOES-SUVI) at a 195 wavelength, and the LASCO C-2 coronagraph onboard the SOHO spacecraft. Image processing techniques such as running differences and multi-Gaussian normalization were employed to filter out solar features and enhance the analysis.

Estimation of Deuterium concentration on Mars using data from MARS Odyssey mission *Mumbai, India*

University of Mumbai *Oct 2021 - June 2022*

The MARs Odyssey mission was one of the long-lasting interplanetary missions carried out by NASA to study the Martian surface. This spacecraft had a gamma-ray detector and a neutron monitor to study the gamma-ray and neutron flux released from the surface of the red planet induced by cosmic rays. In this project, we have used the gamma-ray data from the Gamma-ray suite (GRS) instrument on board the Odyssey spacecraft to study the Deuterium concentration on the Martian surface during two different solar cycles. This particular study helps us to determine the hydrogen concentration on different regions of Mars. In order to carry out the study custom code and algorithms were developed on python for data handling and calibration of gamma-ray spectrum.

Data Analysis of EuBa gamma-ray source using CERN ROOT software *Mumbai, India*

TIFR, Mumbai *Jan 2020 - June 2020*

In this project, a basic data analysis and detector calibration of the germanium detector was performed using EuBa gamma-ray spectrum. The calibration process was carried out using CERN Root software. Additionally, we engineered codes aimed at detecting and eliminating background noise and searching for and removing peaks in the spectrum. These efforts resulted in precise detector calibration and provided valuable data for future experiments.

Nuclear Target preparation and its thickness measurement using α spectroscopy. *Mumbai, India*

TIFR, Mumbai *Jun 2019 - Dec 2019*

The thickness of a material can be determined by measuring the energy loss as it passes through the substance, provided that the stopping power of the material is well-established. This technique finds extensive application in assessing the thickness of energy degraders, backings, and targets essential for nuclear reaction experiments. In our investigation, we explored various nuclear target preparation methods such as mechanical rolling, vacuum vapor deposition, and DC glow discharge. We then fabricated targets using materials such as carbon, selenium, lithium-aluminum-carbon, bismuth, and copper. Employing the relationship $\Delta E = -(\frac{dE}{dx}).t$, we gauged their thickness via alpha spectroscopy, utilizing a Silicon detector alongside ^{241}Am and ^{237}Np as the source.

Conferences and Oral presentations

Poster presentation:

Name of conference: Sun, Space Weather, and Solar Stellar Connection
Poster Title: Limit of Alfvénic Heating in ICME Magnetic Clouds: An Observational Perspective
Venue: St. John's Research Institute, Bengaluru, India Organised by Indian Institute of Astrophysics, India
Date: 20^{th}-25^{th} January 2025

Name of conference: Science from In-Situ Measurements of Aditya-L1 (SIMA-01)
Poster Title: Observation of Kinetic Alfvén waves in Magnetic Cloud
Venue: Space Physics Lab (SPL), Vikram Sarabhai Space Center (VSSC), Thiruvananthapuram, Kerala
Date: 11^{th}-13^{th} April 2023

Invited Lectures:

1. Title of the Talk: Observation of Kinetic Alfvén waves in ICME Magnetic Cloud at 1 Au.
Venue: INDUS (Indian Network for Dynamical and Unified Solar Physicists) Online Seminar Series
Date: 27^{th} November 2024

2. Title of the Talk: Need for Space weather studies
Venue: Jai Hind College (Autonomous), Mumbai
Date: 23^{rd} August 2024

3. Title of the Talk: Unveiling the Secrets of our Sun – India's first space-based solar mission Aditya –L1
Venue: Jai Hind College (Autonomous), Mumbai
Date: 13^{th} September 2023

Workshops and Schools

7th Aditya L-1 Support cell workshop *Nainital, India*

ARIES, Nainital *21^{st} - 30^{th} May 2024*

Capacity building for science teachers teaching at UG level *Mumbai, India*

HBCSE, Mumbai *11^{th}-16^{th} March 2024*

Winter School in Concepts of Solar Physics — *Delhi, India*
National Institute of Technology, Delhi and Aryabhatta Research Institute of Observational Sciences (ARIES) — *19^{th}-23^{rd} December 2023*

School on ROOT based Analysis — *Delhi, India*
Inter-University Accelerator Centre (IUAC) — *1^{st}-3^{rd} March 2022*

PtRC Project Outreach Training Program — *Online*
Indian Neutrino Observatory, TIFR — *18^{th} September 2023*

Web-based course on Radiation Detectors: A how to approach — *Online*
Department of Physics, Central University of Jharkhand, and UGC-DAE Consortium for Scientific Research, Kolkata Centre — *5^{th}-9^{th} April 2021*

Beneficial effects of Radiation and Indian Nuclear Energy Program — *Mumbai, India*
Organised by Indian Association for Radiation Protection (IARP) at VES College of Arts, Science and Commerce, Chembur — *February 2019*

Achievements

2022 **Selected as Junior Research Fellow (JRF) for the Ph.D. Program in UM-DAE CEBS,**
2018 **Overall College Topper,** awarded by K.V Pendharkar College *India*
2018 **Physics Topper for the AY 2017-18,** awarded by K.V Pendharkar College *India*

Skills

Programming Python, MatLab, IDL, Basics of C/C++, CERN ROOT.
Miscellaneous Linux, LaTeX(Overleaf), SRIM, Origin, WiX for Website development
Experimental Skill-set DC glow discharge setup, Mechanical rolling, Vaccum deposition by resistive heating, GM counter, NaI (Tl) Scintillation detector, Silicon detector.
Soft Skills Time Management, Teamwork, Problem-solving, Documentation, Engaging Presentation.
Language English, Hindi, Marathi

Extra-curricular

1. Member of Indian Network for Dynamical and Unified Solar Physicists (INDUS)
2. Part of INDUS Website team—developed a new website for INDUS using WIX.
3. Worked as a Observer for National Standard Exam 2024 (NSE-2024) organised by Indian Association for Physics Teachers (IAPT).

References available upon request.