

Newsletter of the Physical Research Laboratory

THE SPECTRUM

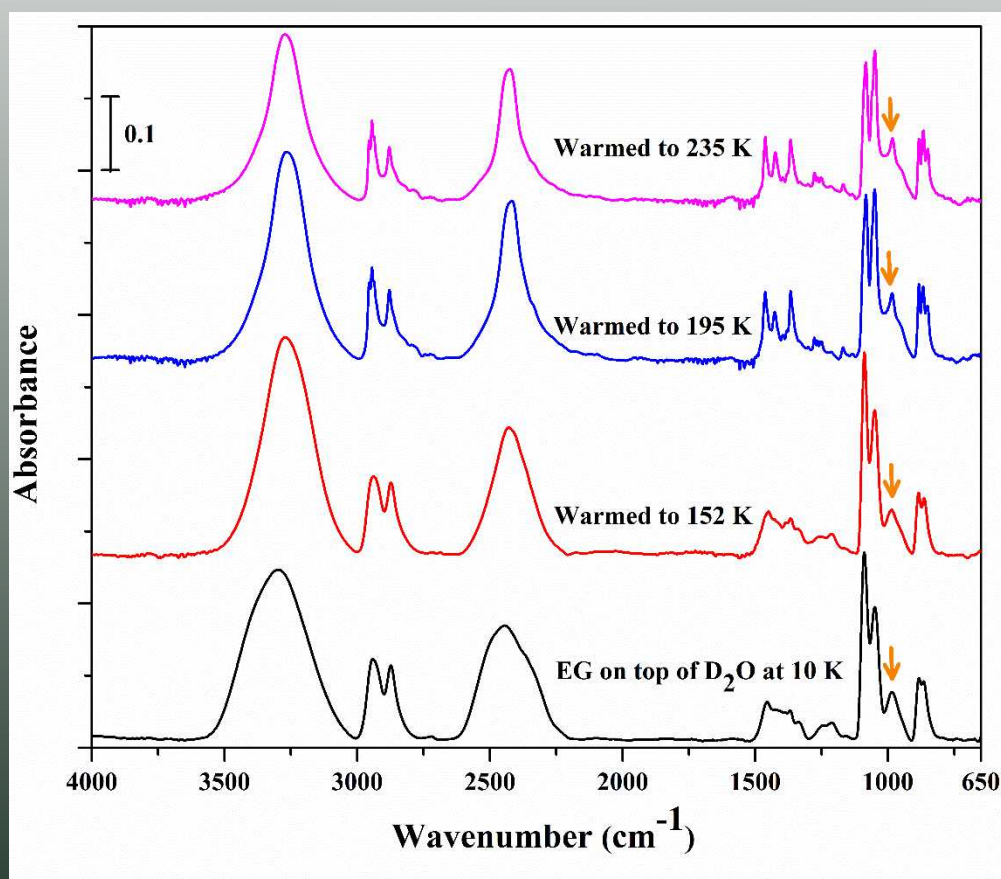


Image of the Month

Mid-infrared spectra of layered Ethylene Glycol (EG) and Deuterium Oxide (D_2O) using Simulator for Astrochemical Molecules at Low Temperature (SALT) experimental setup at PRL, where D_2O can be seen to be present in the ice phase until 235 K (arrows indicate the peak due to interaction between EG and D_2O)

February 2025

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The Author



**Lokesh Kumar
Dewangan**

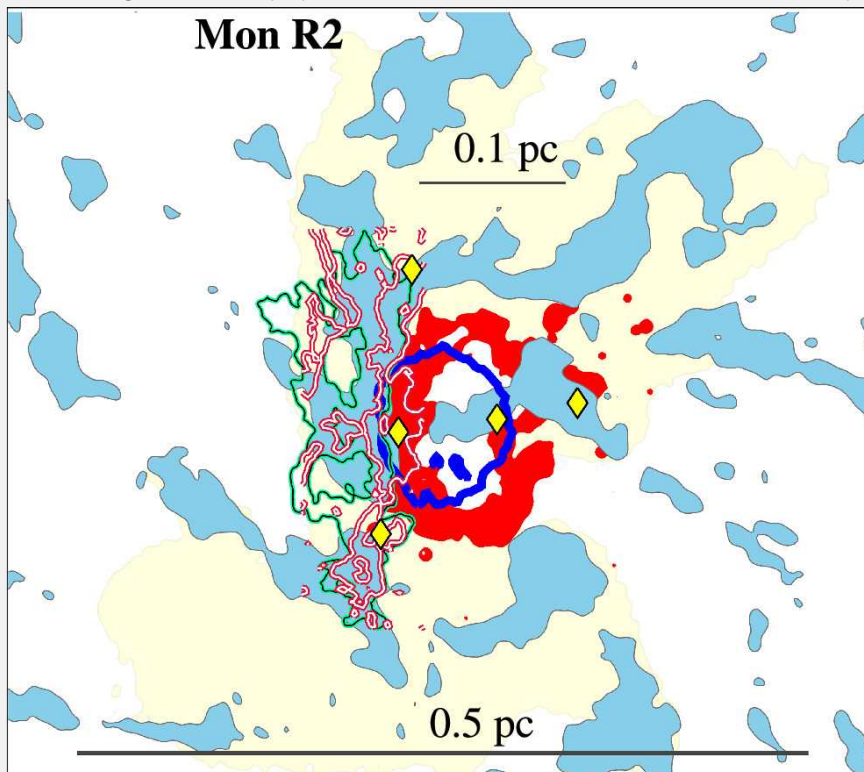
Mon R2: A Hub-Filament System with an Infrared Bubble at the Hub Center

(Lokesh Kumar Dewangan, N. K. Bhadari, A. K. Maity, O. R. Jadhav, Saurabh Sharma, A. Haj Ismail)

The formation process of massive stars ($> 8 M_{\text{sun}}$) is not yet fully understood. It is thought that the formation of such stars is intricately linked to accretion through filaments in hub-filament systems (HFSs). In these systems, gas and dust are funneled through filaments into a central hub, establishing the necessary conditions for the birth of massive stars. This study focuses on an evolved HFS in Monoceros R2 (Mon R2), a region characterized by active star formation and the presence of massive stars. Situated at a distance of ~ 830 pc, Mon R2 is one of the nearest known HFSs. To probe the processes of mass accumulation and the impact of massive stars in the Mon R2 HFS, this study examined gas kinematics across various physical scales using multi-scale and multi-wavelength continuum and line data sets from the Atacama Large Millimeter/sub-millimeter Array (ALMA), along with near-infrared data from the Hubble Space Telescope (HST). The Mon R2 HFS displays a spiral structure, with the central hub containing more mass than its filaments. ALMA C18O(1-0) emission reveals several accreting filaments connected to a molecular ring (size ~ 0.18 pc \times 0.26 pc). The molecular ring surrounds the infrared ring (size ~ 0.12 pc \times 0.16 pc), which is not usually observed. Figure 1 highlights the spatial arrangement of various structures observed in Mon R2, including the molecular and infrared rings, as well as an ionized spherical shell. The infrared ring encircles infrared dark regions and a population of embedded near-infrared sources (not shown in Figure 1), including

the massive stars. Both the infrared ring and the dense molecular ring are likely shaped by feedback from massive stars. Overall, the derived outcomes support that the Mon R2 HFS transitioned from an infrared-quiet to an infrared-bright phase, driven by the interaction between gas accretion and feedback from massive stars.

Source/Reference of the Work: <https://doi.org/10.3847/1538-3881/ad9b22>



- Large scale dust cont emission at 350 micron (in light yellow)
- Molecular ring (in sky blue) -Infrared sources (filled diamonds)
- Infrared ring (in red) -1.14 mm dust cont emission (in crimson)
- Ionized emission (in blue) -Mirrored B structure (in spring green)

Summary of the various structures observed toward the high mass star forming region Mon R2 in this study.

The Author



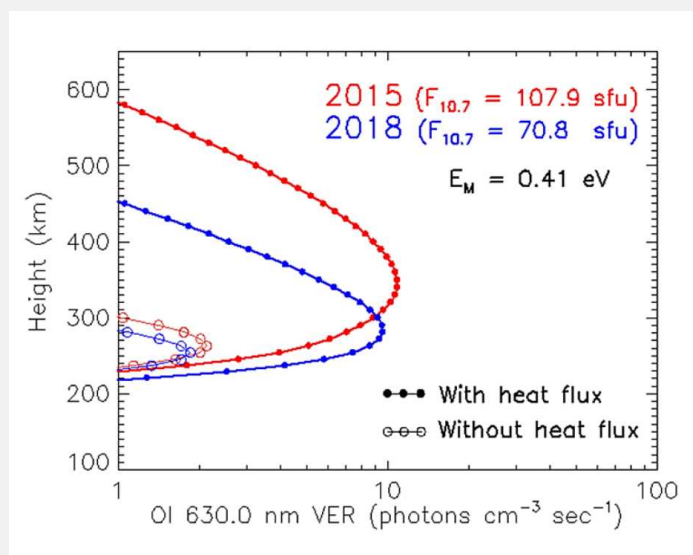
**Kshitiz
Upadhyay**

Determination of Electron Heat Flux of SAR Arcs under Different Solar Activity Epochs

(*Kshitiz Upadhyay, Kazuo Shiokawa, Duggirala Pallamraju, and Artem Gololobov*)

The electron heat flux refers to the flow of thermal energy carried by electrons along the magnetic field lines from higher altitudes or regions with higher temperatures to lower altitudes. During geomagnetic disturbances, this heat energy from the overlap region of Earth's ring current and outer plasmasphere flows into the upper atmosphere over mid-latitudes. The downward electron heat flux into the topside ionosphere leads to ionospheric heating, raising the temperature of ambient electrons. This ionospheric heating excites oxygen atoms to their O(1D) state, resulting in red line emission at a wavelength of 630.0 nm, known as the Stable Auroral Red (SAR) arcs. Although various in-situ measurements have reported elevated electron temperatures during nighttime SAR arcs, the associated downward heat flux cannot be directly measured using current space plasma measurement techniques. Therefore, in this work, estimates of the electron heat flux for various nighttime SAR arc events observed over mid-latitudes during 2012-2020 of solar cycle 23 have been reported. The required electron heat flux was obtained using the measured SAR arc emission intensities and the corresponding measurements of in-situ electron temperature variation for each of the events were input into a physics-based model, GLOW. The measured electron heat flux was found to be larger ($8.05 \times 10^{12} \text{ eV-cm}^{-2}\text{-sec}^{-1}$) during periods of high solar activity compared to the low solar activity periods ($2.89 \times 10^{11} \text{ eV-cm}^{-2}\text{-sec}^{-1}$), showing a positive correlation with the solar cycle variation. This work also suggested that SAR arcs can peak at lower altitudes (below 300 km) during low solar activity periods. Thus, these results illustrate the influence of electron heat flux during low and high solar activity periods, a crucial parameter to understand the consequences of magnetosphere-ionosphere coupling under varying space weather conditions.

Source/Reference of the Work: <https://doi.org/10.1016/j.asr.2024.12.046>



The model calculated volume emission rates (VER; photons $\text{cm}^{-3} \text{sec}^{-1}$) for typical red line nightglow (without heat flux) and SAR arcs (with heat flux) are shown by circles and filled dots, respectively. The red and blue colors represent the high and low solar activity durations during the years 2015 and 2018, using the F10.7 index. Both SAR arc profiles were calculated at nearly the same characteristic energy ($E_M = 0.41 \text{ eV}$). Compared to typical nightglow, the VER profiles of SAR arc show larger variation for the high solar activity period during 2015 due to additional downward heat flux.

Impact of Residual Modular Symmetries in Neutrino Sector

The Author



Monal Kashav

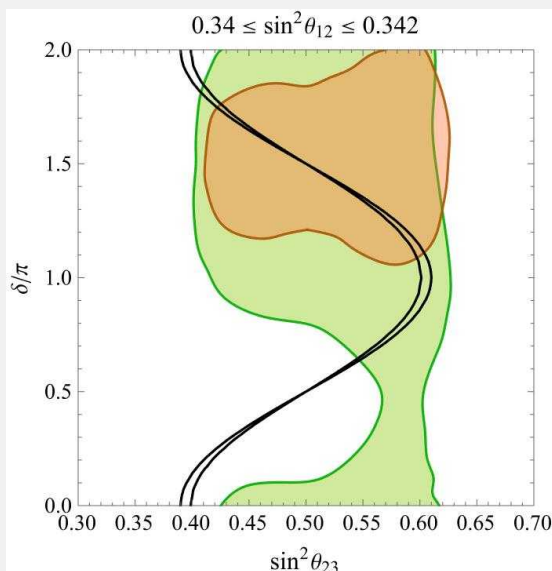
(**Monal Kashav** and Ketan M. Patel)

For decades, scientists have sought to understand the underlying mechanisms behind the significant mixing of neutrinos, some of the smallest and most elusive fundamental particles. A particularly promising theoretical framework that has emerged in recent years is modular symmetry, which provides a systematic approach to determining neutrino properties rather than relying on arbitrary assumptions regarding Yukawa couplings. This framework reformulates the structure of neutrino masses and interactions in terms of a complex variable, known as the modulus, which governs their behavior in a mathematically well-defined manner.

A key insight from studies in this area is that many modular symmetry models favor values of the modulus near i ($\tau = i$), a special fixed point where certain mathematical properties remain invariant under modular transformations. Research conducted by PRL scientists demonstrated that at this specific point, residual symmetries emerge, imposing nontrivial constraints on neutrino masses and mixing angles. These residual symmetries lead to predictive structures in neutrino mixing, offering a more organized and theoretically motivated explanation for observed patterns. For example, for group Γ_3 modular group, the correlations between two unknown parameters independent of model are shown in the figure below.

This approach extends traditional methods based on discrete flavor symmetries, yet provides greater flexibility in constructing models while naturally incorporating elements of higher symmetry groups. Despite its theoretical appeal, this framework is not without challenges. Effects such as quantum corrections, supersymmetry breaking, and possible higher-order deformations of modular forms could

influence model predictions, necessitating further refinement. Additionally, the precise mechanisms by which modular symmetry is realized in ultraviolet-complete theories remain an open question, requiring connections to string theory, extra-dimensional models, or grand unified theories. Nonetheless, modular symmetry provides a compelling new paradigm for understanding neutrino properties, particularly the origin of large mixing angles observed in oscillation experiments. Ongoing research efforts focus on testing these predictions against experimental data, exploring new modular groups, and incorporating residual symmetries into broader phenomenological and cosmological contexts. If validated, this framework could significantly advance our comprehension of the fundamental structure of particle physics and the role of neutrinos in the evolution of the universe.



Source/Reference of the Work: <https://doi.org/10.1103/PhysRevD.111.015010>

The image shows predictions for two neutrino mixing matrix columns. The top displays the possible solar mixing angle range. Black outlines indicate the theoretical link between the atmospheric mixing angle and the Dirac CP phase. Green and red areas show values matching experimental data for normal and inverted mass ordering, respectively.

The Author



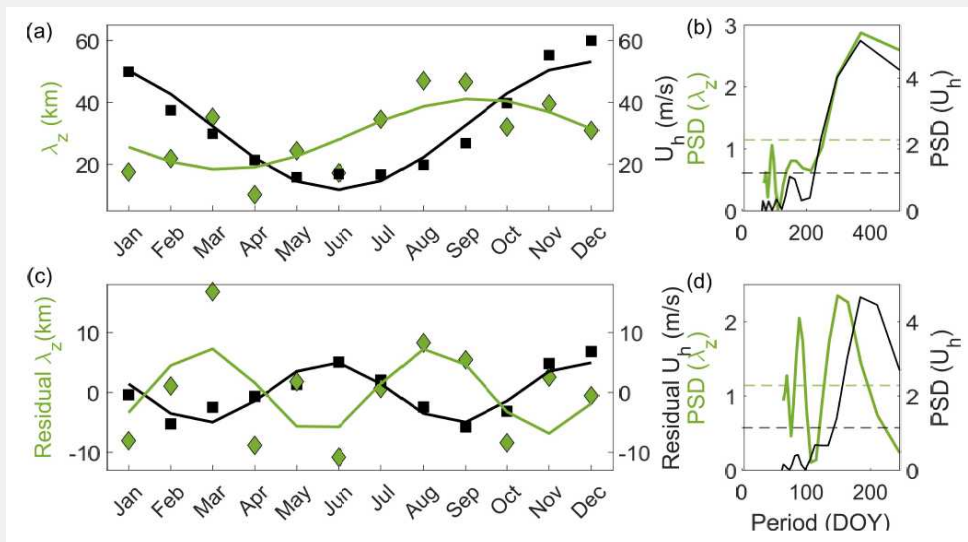
Kiran

On the Vertical Wave Characteristics in the Mesosphere Lower Thermosphere Region and its Seasonal Variation over Ahmedabad

(Kiran and Ravindra P. Singh)

The dynamics of the Middle Atmosphere and Thermosphere (MLT) region (~60–110 km) are driven by vertically propagating atmospheric waves of various spatial and temporal scales. These waves transfer energy and momentum from the lower to higher altitudes. While propagating, vertical wave characteristics of these waves are influenced by the horizontal winds. In this study, we utilize the Krassovsky's ratio method to derive the vertical parameters i.e. periods (τ), vertical wavelengths (λ_z) and vertical phase speeds (C_z) of such waves. These parameters have been derived from the simultaneous observations from PAIRS (PRL Airglow InfraRed Spectrometer) obtained OH(3-1) nightglow brightness and corresponding rotational temperature at 87 km altitude. We have found that there are 85 nights (28%) out of total 304 observable nights over Ahmedabad (23°N, 72.6°E) in the year 2023 for which vertical wavelength has been calculated. Seasonal variations is observed in values, which is studied using Horizontal Wind Model (HWM-14) derived horizontal winds (U_h), to see how they influence waves behaviour. Annual variations of monthly mean λ_z and U_h and the their residuals showed anti-correlation between the observed Annual oscillation (AO) and Semi-annual oscillation (SAO) in both the parameters. To better understand and predict how these waves behave over time, we developed a sine fitting model accounting for the AO and SAO patterns in wind. It serves as a first-order estimation of upward propagating wave as function of day of year in the MLT region over Ahmedabad. Such systematic investigation reveals insights into the dynamics of wave propagation in the MLT region, contributing to our understanding of atmospheric dynamics and their broader implications for atmospheric circulation.

Source/Reference of the Work: <https://doi.org/10.1016/j.asr.2025.01.017>



(a) Variability of monthly mean U_h (black square) and λ_z (green diamond) show AO and (c) the residuals of the same show SAO. Lomb-Scargle spectral analysis reveals significant periodicities of (b) 365 days in both U_h and λ_z corresponding to AO and (d) 162 days and 182 days in the residuals of λ_z and U_h , respectively corresponding to SAO.

The Author



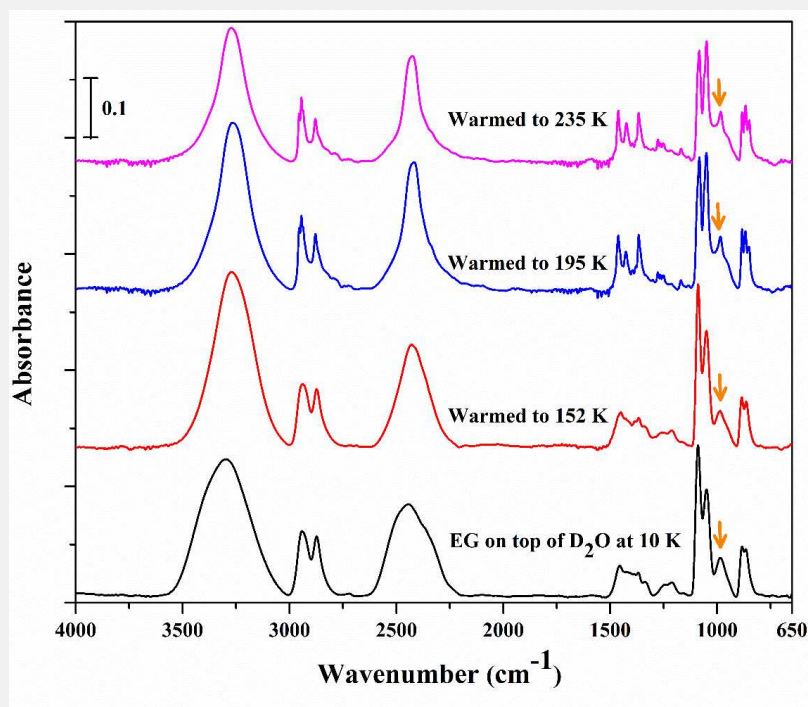
Wafikul Khan

Infrared Spectroscopy Reveals Ethylene Glycol is An Anti-Crystallizer in Water Mixed Astrochemical Ices

(**Wafikul Khan**, R Ramachandran, S Gupta, J K Meka, V Venkataraman, H Hill, B N Rajasekhar, P Janardhan, Anil Bhardwaj, N J Mason, and B Sivaraman)

Ethylene glycol (EG), $(\text{CH}_2\text{OH})_2$, is among the numerous molecules identified in comets and the interstellar medium (ISM). In terrestrial conditions, EG is used as an antifreeze to prevent liquid H_2O from turning into ice. However, in an environment where both of these molecules are frozen, the effect of EG on water is unknown. To investigate this, we simulated the low-temperature, low-pressure astrochemical conditions in the laboratory using the Simulator for Astromolecules at Low Temperature (SALT) experimental set-up in PRL. In our experiments, we prepared the ices of EG and D_2O on top of ZnSe substrate, which acts as a dust analog. The ices were prepared as pure layers, layered combinations, or mixtures under ultra-high vacuum of $\sim 10^{-10}$ mbar at 10 K. The resultant ices were gradually heated to higher temperatures until their sublimation. The behavior of the ices was studied in-situ using mid-infrared (MIR) spectroscopy at various temperatures. The reason for using D_2O instead of H_2O was to avoid the spectral overlap arising due to the presence of the hydroxyl group ($-\text{OH}$) in both EG and H_2O . We observed significant interactions between EG and D_2O molecules even under our extreme experimental conditions. These interactions affected the typical phase transition of D_2O ice (amorphous to crystalline), which usually occurs at 152 K. This shows that EG can act as an “anti-crystallizer” in icy environments of comets and ISM, much like its role as an antifreeze on Earth. Moreover, while pure D_2O ice sublimation is known to occur at 182 K, it is increased to 240 K when it is present with EG in layered or mixed forms. Hence, based on these experiments we have compelling evidence that on comets containing EG, H_2O can exist on the cometary nucleus at temperatures higher than previously known.

Source/Reference of the Work: <https://doi.org/10.1016/j.jssr.2025.01.006>



Mid-infrared (MIR) spectra of layered EG and D_2O where D_2O can be seen to be present in the ice phase until 235 K (arrows indicate the peak due to interaction between EG & D_2O).

Chasing A Natural Multi-Component Dark Sector

The Author

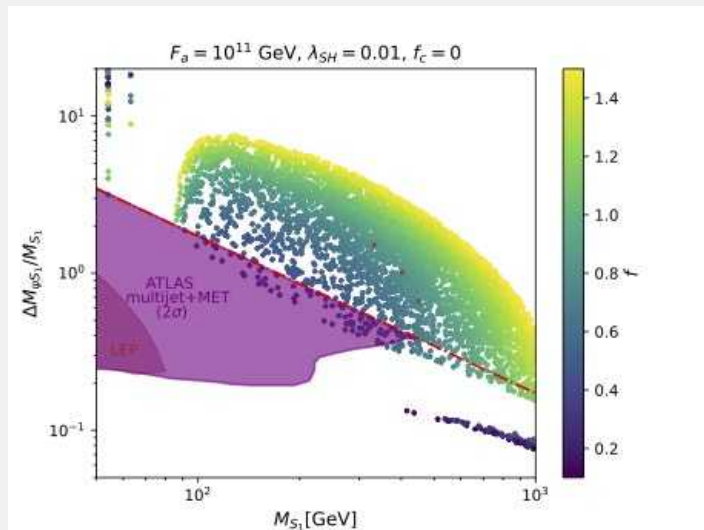


Partha Konar

(Anupam Ghosh and **Partha Konar**)

Our Universe is composed predominantly of some enigmatic form of matter (so-called Dark Matter, or DM), along with a minor component that is only well-explored as a standard model of particle physics. Although DM remains elusive in different experiments, its gravitational influence is evident across various cosmological scales, from galaxies to the Universe. PRL scientists are exploring to untwist the mystery of DM. The present work explores a straightforward extension of Peccei-Quinn (PQ) symmetry, creating the possibility of a natural multi-component form of DM, which is likely why we have failed to detect DM so far! This framework provides a unique opportunity to explore DM signatures at the Large Hadron Collider (LHC) through sophisticated machine-learning techniques. This interdisciplinary approach combines theoretical advancements with cutting-edge data analysis to shed light on the elusive nature of dark matter.

Source/Reference of the Work: <https://doi.org/10.1016/j.dark.2024.101746>



The parameter spaces that satisfy the measured DM abundance, permitted by the direct search experiments, and comply with other restrictions as stated in the work are displayed. The 2σ exclusion regions from the LEP and ATLAS (multijet + MET) analyses are represented by brown and purple regions, respectively

PRL Amrut Rajbhasha Vyakhyaan - 20



"पीआरएल अमृत राजभाषा व्याख्यान (पर्व)" का 20वां व्याख्यान 27 जनवरी, 2025 को आयोजित किया गया था। इस अवसर के प्रख्यात वक्ता श्री उज्जवल शुक्ला, मास्टर ऑफ जर्नलिज्म (एमजे), मुख्य संपादक (समाचार), नई दुनिया, जबलपुर संस्करण थे।

The 20th lecture of "PRL Amrut Rajbhasha Vyakhyaan (PARV)" was held on January 27, 2025. The eminent speaker for the occasion was Shri. Ujjaval Shukla, Master of Journalism (MJ), Chief Editor (News), Nayi Duniya, Jabalpur Edition.

श्री उज्जवल शुक्ला पत्रकारिता में 20 वर्ष से अधिक का अनुभव रखते हैं। वह भारत के सबसे स्वच्छ शहर इंदौर (मध्य प्रदेश) के रहने वाले हैं। वर्तमान में वे नई दुनिया समाचार पत्र जबलपुर संस्करण के मुख्य संपादक (समाचार) हैं। उन्होंने माखनलाल चतुर्वेदी राष्ट्रीय पत्रकारिता एवं संचार विश्वविद्यालय, भोपाल से पत्रकारिता में स्नातकोत्तर की डिग्री प्राप्त की है। श्री. उज्जवल शुक्ला को उद्भव राष्ट्रीय पत्रकारिता पुरस्कार 2021, एन.डी. समाज गौरव पुरस्कार, मध्य प्रदेश के वर्तमान कृषि मंत्री और पूर्व मुख्यमंत्री द्वारा अभिनंदन सम्मान, इंदौर शहर के मेयर द्वारा अभिनंदन सम्मान प्राप्त हुआ है।

Mr. Ujjaval Shukla has more than 20 years of experience in journalism. He hails from Indore (Madhya Pradesh), the cleanest city in India. Currently, he is the Chief Editor (News) of Nayi Duniya newspaper, Jabalpur Edition. He has obtained a master's degree in Journalism from Makhanlal Chaturvedi National University of Journalism and Communication, Bhopal. Shri. Ujjaval Shukla has received the Udbhav National Journalism Award 2021 and N.D. Samaj Gaurav Award, felicitation honor by the current Agriculture Minister and former Chief Minister of Madhya Pradesh, and felicitation honor by Indore City Mayor.

व्याख्यान का शीर्षक था "पत्रकारिता के बदलते आयाम" / The vyakhyaan was titled " पत्रकारिता के बदलते आयाम"।

श्री. उज्जवल शुक्ला ने व्याख्यान के दौरान भारतीय पत्रकारिता की शुरुआत और वर्तमान स्थिति के बारे में विस्तार से बताया। इसके अलावा, वातावरण, समय और सामाजिक, राजनीतिक और आर्थिक परिस्थितियों ने भी पत्रकारिता में कई नए आयामों के उद्भव में योगदान दिया है। पहले के समाचार मूलतः साहित्यिक होते थे। पहले इसका सम्बन्ध साहित्य से था। कहानियाँ, किताबें, आदि। हालाँकि, आज ऐसा नहीं है। आज के समाचार लिखने के लिए प्रयुक्त भाषा अनौपचारिक है। डिजिटल क्रांति के परिणामस्वरूप पत्रकारिता में कई बदलाव देखने को मिले हैं। वर्तमान में, समाचार का सबसे महत्वपूर्ण घटक तात्कालिकता है।

Shri. Ujjaval Shukla gave a detail of the beginnings and current state of Indian journalism during the Vyakhyaan. He discussed that the environment, time, and social, political, and economic circumstances have all contributed to the emergence of numerous new dimensions in journalism. The news from earlier was essentially literary. In the past, it was related with literature, tales, books, etc. However, that isn't the case today. The language used to write today's news is informal. Journalism has seen numerous changes as a result of the digital revolution. Nowadays, immediacy is the most crucial component of news.

Youtube Link:

https://www.youtube.com/watch?v=MjOYOm90rFE&list=PL12xjTGd3ldgQXLe9_O8ygpF92DY2hj6P&index=20

PRL Ka Amrut Vyakhyaan - 100



The 100th PRL ka Amrut Vyakhyaan was delivered by Prof. Shailendra Saraf (Director, National Institute of Pharmaceutical Education and Research (NIPER), Ahmedabad), on 29th January 2025. He delivered the Vyakhyaan on the evolution of the healthcare system in our country, titled “Healthcare system in India: ancient to contemporary”.

An effective health care system is essential for the general physical and mental well-being of the people of a country. Prof. Saraf began the Vaykhyaan with the oldest health care system of our country, the Ayurveda, which depends on natural resources for cure. He stressed that the root

of ancient pharmacy is Ayurveda, where healers and herbalists prepare remedies using natural ingredients. He then discussed evolution and science of Ayurveda such as the theory of panchamahabhuta and tridoshas, and also discussed the limitations and myths of or about Ayurveda. Subsequently he talked about the era of apothecary, the foundation of modern pharmacology and the struggle of Ayurveda to establish it as a proven medicinal practice in the international arena during the 17th and 18th centuries. Then he discussed the birth of modern pharmacy, where the rise of pharmaceutical companies, and mass production and distribution of medicine occurred during the 17th to 19th century. He talked about the advancements made in the 20th century, where discoveries of antibiotics, insulins, and life-saving drugs were made as well as educational reforms were undertaken and the collaboration between physicians and pharmacists occurred. He also eluded the era of the digital age and contemporary medicine, where the efficiency and accuracy of medication management as well as convenient access to medication and health products happened. He stressed the modern era proper regulatory and ethical standards to be maintained and practiced under a common umbrella across the globe to prevent pandemics like COVID-19. He also discussed how the pandemic taught us that the uniform distribution of pharmaceutical laboratories and products is absolutely needed across the country and the initiative taken by the government of India to enhance the pharmaceutical industry across the country. Towards the end of the Vaykhyaan, he stressed the role pharmacists and pharma industries could play with the new norms of the modern era for the better life of

human beings. Overall, his talk was very illuminating on the evolution of medicines from ancient times to the modern era and the role of the healthcare system in our lives.

You Tube Link: <https://www.youtube.com/live/ljh8DX0dASo>


Via **webex**

1. Ancient Origins: The Birth of Pharmacy

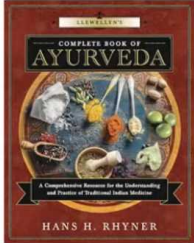
Early Practices and Herbal Medicine

- Roots of pharmacy can be **traced back** to ancient civilizations
- Where healers and herbalists prepared remedies using **natural ingredients**.
- In India, around 600 BCE, texts like the Ayurveda, Charak Samhita, & Sushruta Samhita documented various medicinal substances and their uses.

Charak Samhita (c. 600 BCE)	Sushruta Samhita (c. 600 BCE)
Foundational text of Ayurveda, focusing on internal medicine.	Key Ayurvedic text dealing with surgery and surgical procedures.



Dhanvantari
Father of Ayurveda & his Teachings are well recorded in the Atharvaved



Vikram Discussions - II



As a part of the national science network building initiation of the Physical Research Laboratory, the institute has started “Vikram Discussions,” an annual discussion series to bring together scientists of particular science fields to discuss, debate and design the future course of the community. This discussion series is named after the visionary Dr. Vikram Sarabhai, the founder of PRL and the Indian Space program.

As a suitable tribute to the ideals of Dr. Vikram Sarabhai, the newly formed Interdisciplinary Program for Astrobiology and Astrochemistry (IPAA), PRL, organized the second Vikram Discussion (VD-II) on Astrobiology and Astrochemistry at PRL on 2nd January 2025.

Based on Vikram Discussions-II, the following focused points were arrived:

1. Tardigrade map of India - to identify the species that best survives extreme conditions. First mapping of tardigrades in the known Indian craters, Ladakh, Kutch, Dunes, Deccan traps, and caves.
2. Samples from Barren island and ISRO's clean rooms to study the microbial diversity.
3. Microgravity payload for astrobiology - Need, design and development.
4. Space bricks or Space binders - 3D printing or binding of lunar and martian analogues.
5. Building a new experimental system for gas-grain interaction in astrochemical environment.

The discussions were intense and the participants (24 experts) agreed that the above five points are to be given utmost priority. A set of action items were agreed to be taken up over the next few months, especially the exploration of Barren island for astrobiology and analogue studies. Several new collaborations were fostered in the VD-II.

CNIT – Synergy for Effective Technology Utilization (SETU) - 2025



The CNIT Division organized an event titled “Synergy for Effective Technology Utilization (SETU) 2025” on January 9, 2025, in hybrid mode from 09:30 am to 11:30 am. Approximately 70 participants attended the session, wherein discussions were conducted in mixed format with 70% in Hindi and 30% in English.

The event was aimed at:

- Inauguration of the New Information Security Website
- Announcement of New IT Services
- Facilitation of Knowledge Exchange among Participants
- Strengthening the Relationship between the CNIT Division and PRL Colleagues
- Enhancing the Effectiveness and Efficiency of PRL’s IT Services and Facilities

Mr. Jigar Raval welcomed all the attendees and provided an overview of the session, highlighting that this initiative was aimed at fostering stronger interactions between the CNIT division and the PRL community to enhance IT services.

Dr. Namit Mahajan, Chair of the IT-Cyber Security Committee, delivered the opening remarks, emphasizing the vital role of cybersecurity in safeguarding our IT infrastructure.

Professor Anil Bhardwaj, Director, PRL, inaugurated the newly developed Information Security website. In his inaugural address, he underscored the critical importance of information security in the digital age and its essential role in ensuring secured daily operations. He explained how a layered security approach enhances the organization’s overall cybersecurity position. Professor Bhardwaj also highlighted the crucial role of users in cybersecurity and emphasized that protecting our assets is a collective and shared responsibility.

Mr. Yagnik Lakum delivered a talk on the Audio-Visual (AV) and Video Conference (VC) infrastructure at PRL, covering:

1. AV & VC Facilities at the KR Ramanathan Auditorium (KRRA), Ground Floor Lecture Hall (GFL), NanoSIMS Seminar Hall, VC Room, CNIT Committee Room, and Room No. 852.
2. Recent enhancements, such as, the introduction of an Interactive Intelligent Panel (86”) in the CNIT Committee Room to improve AV/VC services.
3. Features of desktop-based VC setups and tools like Vconsole and Google Meet.
4. Statistics of KRRA, GFL, NanoSIMS Seminar Hall utilization.

Apart from this talk, the following two new services were also demonstrated:

1. Temporary File Transfer Service (TempShare): Mr. Girish Padia discussed the newly established services for data transfer within PRL LAN, PRL LAN to Spacenet, and vice versa. He explained the technology implemented and demonstrated its usage for quick data transfer, especially within LAN and SPACENET.
2. Individual Photo Search Service: Mr. Prashant Jangid and Mr. Vaibhav Rathore introduced a new service for searching individual photos from PRL events using Deep Learning, named Comprehensive Human Image Visualization Interface (CHHAVI) - "Where Faces Meet Technology." They explained how the open-source model was customized for PRL's requirements. Mr. Tejas Sarviaya presented the overall activities of CNIT division like Topics of upcoming Chai Pe Byte, RustDesk & VPN service utilization and future project plans of 2025.

Apart from this, there were very brief discussions on Remote Desktop Service and Auto deletion of email from INBOX.Trash folder. CNIT will check technical possibilities of auto deletion of specific allusers emails related to area seminar notification etc. CNIT will also check technical feasibility to implement 'auto delete' old emails from INBOX and Trash folder of Horde webmail that are six months or older.

CNIT will also send allusers email regarding recent implementations of CHHAVI, Temporary File Sharing, VSAT Link and Common Mark Certificate (CMC).

The event was graced by Chairs/Co-Chairs of various scientific division/sections, Chair, PPEG, Co-Chair, IT-Cyber Security Committee, PRL and other senior faculties. All the sessions proved highly beneficial as they provided insights of Audio-Video & VC Services at PRL, newly added services – File Transfer within PRL LAN as well as SPACENET, Individual Photo Search, etc. All the attendees expressed their deep appreciation for the useful information given. The CNIT division's innovative "CNIT Nukkad – Chai Pe Byte" initiative was also complimented.

On behalf of CNIT division, Mr. Hitendra Mishra thanked Prof. Anil Bhardwaj, Director, PRL, for his motivation and guidance. He thanked Prof. D. Pallamraju, Dean, PRL, Prof. Varun Sheel, Prof. Bijaya Kumar Sahoo, Prof. Namit Mahajan, and Dr. Shanmugam for their support and cooperation. He thanked all the participants for their active participation and valuable feedback which always help CNIT division to improve the IT services.

The collaborative efforts of the participants and the CNIT division made the session a success, laying a strong foundation for achieving the goals of SETU 2025. The report reflects the collective contributions of all participants.

The CNIT members sincerely thanks the Director, PRL, the Dean, PRL, and the Registrar, PRL for their constant guidance and motivation to initiate such activities in different IT verticals. The members also thank Prof. Bijaya Sahoo, Prof. Varun Sheel, Prof. Namit Mahajan, and Dr. Shanmugam for their guidance and support in all the IT related activities and projects. CNIT members thank all the participants who enthusiastically participated and provided their valuable feedback and encouragement in conducting similar events in the future. CNIT members also thank all the PRL users for their cooperation and help.





World Hindi Day 2025

विश्व हिंदी दिवस 2025 के अवसर पर 10 जनवरी को पीआरएल के सभी परिसरों में हिंदी आशु लेखन प्रतियोगिता का आयोजन किया गया था। इसमें सदस्यों के भाषा क्षेत्र के अनुसार तीन भाषा श्रेणियों में अलग-अलग पुरस्कार दिया गया। हिंदी आशु लेखन प्रतियोगिता के विजेताओं की सूची निम्नानुसार है-

On the occasion of World Hindi Day 2025, a Hindi Aashulekhan competition was organized in all the campuses of PRL on 10th January 2025. In this competition, prizes were given in three language categories according to the language region of the members. The winners of the Hindi Aashulekhan competition are:

Sl. No.	नाम Name	क्षेत्र Region	पुरस्कार Prize
1.	श्री अवध कुमार, थलतेज परिसर Mr. Avadh Kumar, Thaltej Campus	क क्षेत्र A Region	प्रथम पुरस्कार First Prize
2.	सुश्री आंचल साहू, थलतेज परिसर Ms. Aanchal Sahu, Thaltej Campus	क क्षेत्र A Region	द्वितीय पुरस्कार Second Prize
3.	श्री हार्दिक कलावत, माउंट आबू परिसर Mr. Hardik Kalawat, Mount Abu Campus	क क्षेत्र A Region	तृतीय पुरस्कार Third Prize
4.	श्रीमती हर्षा परमार, मुख्य परिसर Ms. Harsha Parmar, Main Campus	ख क्षेत्र B Region	प्रथम पुरस्कार First Prize
5.	श्री केयूर पंचासरा, मुख्य परिसर Mr. Keyur Panchasara, Main Campus	ख क्षेत्र B Region	द्वितीय पुरस्कार Second Prize
6.	श्री आशीष मंडल, थलतेज परिसर Mr. Ashish Mandal	ग क्षेत्र C Region	प्रथम पुरस्कार First Prize
7.	सुश्री रचिता नंदन, थलतेज परिसर Ms. Rachita Nandan, Thaltej Campus	ग क्षेत्र C Region	द्वितीय पुरस्कार Second Prize

सभी विजेताओं को गणतंत्र दिवस समारोह के दौरान पुरस्कार प्रदान किया गया।

All the winners were awarded during the Republic Day celebration.

Blood Donation Camp at PRL Thaltej Dispensary

The Blood Donation Camp held at the Thaltej Dispensary on January 10, 2025, was a significant and successful event organized by the Dispensary in collaboration with Sarvodaya Charitable Trust Blood Centre, Ahmedabad. Prior to the event, a comprehensive campaign was conducted to promote awareness and encourage participation. Registration was facilitated through an online Google form, and outreach efforts were made to engage various groups, including PRL employees, Research Fellows, Contractual staff, and CISF personnel.

The camp aimed to ensure an organized flow of donors, with their arrivals scheduled in phases for smooth operation. In total, 42 individuals had registered in advance, and the blood donation drive, which ran from 08:30 am to 01:00 pm, successfully collected 52 units of blood. The event was completed in just 4.5 hours, showcasing the collective spirit of the donors.

The Dispensary PRL extends its heartfelt gratitude to all the volunteers for their selfless contribution, helping save lives through their donations.



Republic Day Celebration at PRL

Republic Day marks the adoption of the Constitution of India. It is a day of National pride. The 76th Republic Day was celebrated on Sunday, 26th January 2025, at the PRL Thaltej campus. Prof. Anil Bhardwaj, Director, PRL, hoisted the National Flag, followed by the National Anthem.

In his address to the PRL family, the Director briefed them about the various events, activities, achievements, honors, etc., acquired by PRL during the year.

Three Merit awards were given to the CISF, as per the practice in vogue.

Following this, the children of PRL staff members who had secured the highest marks in Hindi subject in 10th and 12th Standard in the year 2024 were felicitated. The prize distribution for various events was carried out, such as the Essay Writing competition held during Vigilance Awareness Week 2024, the Ashulekhan Competition held on World Hindi Diwas, SOLIS- Hindi Incentive Scheme, and the Poster Competition organized by the Internal Complaint Committee-PRL.

To mark the occasion, kids and PRL family members released tri-colour balloons. Tree plantation was done by the newly joined PRL staff and other PRL members.

Thereafter, the Director PRL formally inaugurated the PRL Football tournament. An inaugural friendly football match was played between Team Director and Team Dean, and Team Dean won the game by 2-1.

At the PRL USO Observatory, the event commenced with the hoisting of the National Flag by Prof. Shibu K. Mathew, Head, USO. The National Anthem was sung by all attendees, filling the atmosphere with a sense of pride and unity. Prof. Mathew addressed the gathering, emphasizing the importance of Republic Day and the responsibilities of every citizen toward nation-building. Dr. Bhuwan Joshi, Dy. Head (Tech.), provided the guests with a detailed explanation of the history of the USO Island Observatory and its various functions. Following the flag hoisting, a prize distribution ceremony was held to honor the winners of the Hindi Maah Programme who excelled in various competitions held during the Hindi Maah in recognition of their efforts to promote the Raajbhasha. In addition to the above events, an award was presented to Mr. Vikram for being the Best Housekeeping / Horticulture Employee for 2024-25. His dedication and hard work in maintaining the cleanliness of the premises were highly appreciated.

As part of the sustainability initiative, a tree plantation drive was organized, where newly joined members of USO/PRL, Udaipur Mr. Abhishek Upadhyay, Miss. Divya Paliwal, Miss. Shruti Girish Kumar along with Head and Dy. Head of USO/PRL took the lead in planting saplings. This initiative symbolized a commitment to environmental conservation and growth, aligning with the values of sustainable development. After the tree plantation, the Head, USO and Sr. Prof. Nandita Srivastava, showcased and explained the SPAR observation facility at the USO Observatory to all the guests and family members of USO colleagues.

The celebration concluded with a vote of thanks, acknowledging the contributions of all participants and organizers. The event successfully fostered a sense of patriotism, unity, and commitment toward a better future.





Hindi Merit Award to the Children of Staff Members of PRL - 2024

वर्ष 2024 में दसवीं एवं बारहवीं कक्षा में उत्तीर्ण पीआरएल स्टाफ सदस्यों के उन बच्चों को पुरस्कार प्रदान किया गया जिन्होंने हिंदी विषय में सर्वाधिक अंक प्राप्त किए हैं। ये पुरस्कार 26 जनवरी 2025 को गणतंत्र दिवस समारोह में थलतेज परिसर में निदेशक, पीआरएल प्रो. अनिल भारद्वाज के कर-कमलों द्वारा प्रदान किया गया।

PRL staff members' children who passed classes 10th and 12th in the year 2024 and achieved the highest marks in Hindi subject have been awarded. These awards were presented by Director PRL, Prof. Anil Bhardwaj at Thaltej Campus during the Republic Day celebrations on 26 January 2025.

क्र.सं.	बच्चे का नाम	कक्षा	अभिभावक का नाम	बोर्ड	पुरस्कार
1.	ऋषभ थाजाठकल Rishabh Thazhathakal	दसवीं Tenth	श्री टी.ए. राजेश Shri T.A. Rajesh	सीबीएसई CBSE	प्रथम First

क्र.सं.	बच्चे का नाम	कक्षा	अभिभावक का नाम	बोर्ड	पुरस्कार
1.	खुशी बी. पांचाल Khushi B. Panchal	दसवीं Tenth	श्री भूपेंद्र जे. पांचाल Shri Bhupendra J. Panchal	राज्य बोर्ड (गुजरात) State Board (Gujarat)	प्रथम First
2.	सोनिया कोटेड Sonia Koted	दसवीं Tenth	श्री सोमा एन कोटेड Shri Soma N Koted	राज्य बोर्ड (राजस्थान) State Board (Rajasthan)	द्वितीय Second

Martyr's Day

In accordance with the directives from the Ministry of Home Affairs, Government of India, and the Department of Space, 30th January is observed annually as Martyrs' Day. This day commemorates the death anniversary of Mahatma Gandhi. On this occasion, a two-minute silence is to be observed across the country in memory of those who sacrificed their lives in the struggle for India's freedom. It serves as a solemn moment to pay tribute to all individuals who fought and died for India's independence.

In line with these instructions, PRL staff members also observed a two-minute silence in remembrance of the freedom fighters on Thursday, the 30th January, 2025, at their respective workplaces.

PRL Monthly Publications Digest

Astronomy & Astrophysics Division [4]

1. Shrey Mehta, G. K. Samanta, and Raghwinder Singh Grewal, 2025, Dead-zone-free single-beam atomic magnetometer based on free-induction-decay of Rb atoms, Applied Physics Letters, 126, 044002 (2025), Date of Publication: 28/01/2025, Impact Factor: 3.5
2. Wafikul Khan, R Ramachandran, S Gupta, J K Meka , V Venkataraman, H Hill, B N Rajasekhar, P Janardhan, Anil Bhardwaj, N J Mason , B Sivaraman, 2025, Infrared spectroscopy reveals ethylene glycol is an anti crystallizer in water-mixed astrochemical ices, Life Sciences in Space Research, Date of Publication: 27/01/2025, Impact Factor: 2.9
3. Rituparna Das, Amit Bhojani, Madhusudhan P, Vinitha Nimma, Pranav Bhardwaj, Dheeraj K. Singh and Rajesh Kumar Kushawaha, 2025, Strong field-induced three-body fragmentation dynamics of CH₃Cl₂⁺, Journal of Physics B: Atomic, Molecular and Optical Physics, Date of Publication: 21/01/2025, Impact Factor: 1.5
4. Bijaya Kumar Sahoo, Steven A Blundell, Alexander Oleynichenko, Ronald Fernando Garcia Ruiz, Leonid V Skripnikov and Ben Ohayon , 2025, Recent advancements in atomic many-body methods for high-precision studies of isotope shifts, Journal of Physics B; DOI 10.1088/1361-6455/adacc1, Date of Publication: 21/01/2025, Impact Factor: 2.0

Atomic Molecular and Optical Physics Division [3]

1. Lokesh Kumar Dewangan, N. K. Bhadari, A. K. Maity, O. R. Jadhav, Saurabh Sharma, A. Haj Ismail, 2025, Mon R2: A Hub-Filament System with an Infrared Bubble at the Hub Center, The Astronomical Journal, 169, 80, DOI:10.3847/1538-3881/ad9b22, Date of Publication: 17/01/2025, Impact Factor: 5.1
2. Arup Kumar Maity, Lokesh Kumar Dewangan, N. K. Bhadari, Y. Fukui, A. Haj Ismail, O. R. Jadhav, Saurabh Sharma, H. Sano , 2025, G321.93-0.01: A Rare Site of Multiple Hub-Filament Systems with Evidence of Collision and Merging of Filaments, The Astronomical Journal, 169, 56; DOI: 10.3847/1538-3881/ad98ff, Date of Publication: 09/01/2025, Impact Factor: 5.1
3. Evans, A., Banerjee, D.P.K., Geballe, T.R., Polin, A., Hsiao, E.Y., Page, K.L., et al. , 2025, Near-infrared spectroscopy of the LMC recurrent nova LMCN 1968-12a, Monthly Notices of the Royal Astronomical Society, 536, 1710. doi:10.1093/mnras/stae2711 , Date of Publication: 01/01/2025, Impact Factor: 4.8

Geosciences Division [1]

1. Pallab Roy, Amzad H. Laskar, S. Ghoshmaulik, S. K. Bhattacharya, R. Rangarajan, Mao-Chang Liang, 2025, Triple oxygen isotopic fractionation in CO₂-CaCO₃-H₂O system during CO₂-H₂O exchange, carbonate precipitation, and acid digestion, Chemical Geology, Date of Publication: 27/01/2025, Impact Factor: 3.6

Space & Atmospheric Sciences Division [5]

1. Garima Shukla, N. Ojha, Ashwini Kumar, S. Harithasree, I. Girach, Lokesh K. Sahu, 2025, Chemical composition of aerosols over the Arabian Sea based on global reanalyses data and on-board ship measurements, Atmospheric Environment, Date of Publication: 31/01/2025, Impact Factor: 4.2

2. Arundhati Kundu, Shyam S. Kundu, Arup Borgohain, Mukunda M. Gogoi, S. Suresh Babu, Som Kumar Sharma, Manasi Gogoi, 2025, Role of atmospheric boundary layer dynamics in driving surface black carbon concentrations over a high-altitude station in north-east India, Atmospheric Pollution Research, Date of Publication: 22/01/2025, Impact Factor: 3.9
3. Dharmendra Kumar Kamat, Som Kumar Sharma, Prashant Kumar, Kondapalli Niranjana Kumar, Aniket, Sourita Saha, Hassan Bencherif, 2025, Investigation of atmospheric clouds and boundary layer dynamics during a dust storm in the Western-Indian region, Remote Sensing Applications: Society and Environment, Date of Publication: 16/01/2025, Impact Factor: 3.8
4. Kamran Ansari and S. Ramachandran, 2025, Global insights on absorption characteristics of aerosols, Science of the Total Environment, Date of Publication: 10/01/2025, Impact Factor: 8.2
5. K. Rajagopal, S. Ramachandran and R.K. Mishra, 2025, Influence of local meteorology and gaseous pollutant emissions on atmospheric nanoparticle concentrations in a pedestrian way in urban region, Atmospheric Pollution Research, Date of Publication: 01/01/2025, Impact Factor: 3.9

Planetary Sciences Division [5]

1. D. Ray, S. Sarkar, A. Das, G. Arora, A.D. Shukla and A. Bhardwaj, 2025, The Kopargaon LL5 chondrite: A new fall of monomict breccia from India, Journal of Earth System Science, Date of Publication: 28/01/2025.
2. Nizy Mathew, K. Durga Prasad, Dinakar Prasad Vajja, V. Aasik, Fazil Mohammad, P.P. Pramod, M. Satheesh Chandran, Kiran John Antony, M. Ram Prabhu, M.B. Dhanya, Manu V. Unnithan, Shiju G. Thomas, Chandan Kumar, Dona Mathew, R. Suresh, K.P. Subhakaran, P.S. Ajeeshkumar, P. Kalyana Reddy, Samik Jash, K. Kannan, K. Sunitha, Sanjeev Mishra, Janmejaya Kumar, V. Sathiyamoorthy, Anil Bharadwaj, 2025, Chandra's Surface Thermophysical Experiment (ChaSTE) onboard Chandrayaan-3 Lander, Advances in Space Research, Date of Publication: 22/01/2025, Impact Factor: 2.8
3. Rishitosh K. Sinha, Akash Gautam, Jayanta Laha, Neha Panwar, S. Vijayan, Neeraj Srivastava, Anil Bhardwaj, 2025, Geological mapping of Chandrayaan-3 landing area: New insights into provenance of materials, crater chronology and origin of rocks, Advances in Space Research, Date of Publication: 20/01/2025, Impact Factor: 2.8
4. G. K. INDU, S. JAMES, Sachana SATHYAN, J. ASWATHI, V. R. RANI, V. M. NAIR, Libiya M. VARGHESE, K. S. SAJINKUMAR, Nayan SHARMA, Mitthu DHALI, Aryavart ANAND, V. J. RAJESH, M. N. PRAVEEN, Anil CHAVAN, Subhash BHANDARI, and Javed N. MALIK, 2025, Revised chronology and expanded insights: Geologic perspective on the Luna impact event and its influence on the Harappan Civilization, Meteoritics & Planetary Science journal, Date of Publication: 10/01/2025, Impact Factor:
5. D. Ray, K.K. Marhas, V. Sheel and A. Bhardwaj, 2025, Report on the International Conference Meteoroid, Meteor and Meteorites: Messengers from Space - MetMESS-2024 held during 20-22 November 2024, Journal Geological Society of India, Date of Publication: 01/01/2025.

Theoretical Physics Division [2]

1. Monal Kashav, Ketan M. Patel, 2025, Residual flavor symmetries at the modular self-dual point and constraints on neutrino masses and mixing, Phys. Rev. D 111, 015010, Date of Publication: 14/01/2025, Impact Factor: 4.6
2. P. S. Bhupal Dev, Srubabati Goswami, Chayan Majumdar, Debashis Pachhar, 2025, Neutrinoless double beta decay from scalar leptoquarks: interplay with neutrino mass and flavor physics, Journal of High Energy Physics, Date of Publication: 02/01/2025, Impact Factor: 5.0

Awards & Honours

- (1) **Dr. Som Kumar Sharma**, Professor, Space & Atmospheric Sciences Division, PRL has **received the Best Paper Award** for his paper entitled, “पीआरएल के इंडियन लिडार नेटवर्क प्रोग्राम के मध्यम से वायुमंडलीय बादलों और सीमा परतों का विश्लेषण” presented in the अंतर-केंद्र हिंदी तकनीकी संगोष्ठी-2024 held at the Space Applications Center (ISRO), Ahmedabad..
- (2) **Dr. M. Devaprasad**, Post-Doctoral Fellow, Geosciences Division, PRL has **won The Third Prize** in the platform presentation in **The National Conference of the Indian Aerosol Science and Technology Association (IASTA 2024)** held at the Doon University, Dehradun.
- (3) **Dr. Arup Chakraborty**, Post-Doctoral Fellow, Atomic, Molecular and Optical Physics Division, PRL has **won The Best Poster Award** at the **24th National Conference on Atomic and Molecular Physics (NCAMP2025)** held at IIT(ISM), Dhanbad.
- (4) **Prof. Srubabati Goswami**, Sr. Professor, Theoretical Physics Division, PRL has been **elected as the President of Indian Physics Association for 2025-2026. She is the first woman president of the IPA.**
- (5) **Prof. D. Pallam Raju**, Senior Professor, Space and Atmospheric Sciences Division and Dean, PRL, has been **nominated as a Member of the Research Council of the Gujarat Technological University, Ahmedabad.**
- (6) **Dr. Namita Uppal**, a former Research Fellow of the Astronomy & Astrophysics (A&A) Division of PRL has been **selected for Honorable Mention of the Justice Oak Outstanding Thesis Award for 2024** by the **Astronomical Society of India (ASI).**

Visitors

1. Smt. Padma Jyoti S, Deputy Secretary to the Govt. of India, Department of Space, Bangalore has visited Udaipur Solar Observatory, Udaipur from 02.01.2025 to 04.01.2025 for Annual Rajbhasha Inspection 2023-24 and Observatory visit.
2. Ms. Ketaki Deshpande, a Ph.D. Researcher from ROB and KU Leuven, Belgium visited Udaipur Solar Observatory, Udaipur on 09.01.2025 for scientific discussion and to deliver a talk in the USO divisional seminar.
3. Mr. Adrien Maurice Darwin Vuillaume from CAMECA, CEDEX-France visited PRL on 09.01.2025 in connection with the scientific discussion and presentation of a few new technical specifications for HR-nanoSIMS.
4. Dr. Zucca Pietro from Netherlands Institute of Radio Astronomy (ASTRON), Netherlands visited Udaipur Solar Observatory (USO), Udaipur from 16.01.2025 to 17.01.2025 in connection with scientific discussion on potential collaborations regarding Solar Radio physics research with the Scientists of USO and to deliver a talk in the divisional seminar.
5. Dr. Nitta Nariaki Vincent from Lockheed Martin Solar and Astrophysics Laboratory, USA visited Udaipur Solar Observatory (USO), Udaipur from 16.01.2025 to 17.01.2025 in connection with the scientific discussion on possible collaborations on CME research with the USO scientists.

6. Dr. Pankaj Sharma and Mrs. Archana Sharma both from Purdue University, USA have visited Physical Research Laboratory, Ahmedabad on 20.01.2025 in connection with exploring the Geosciences facilities and interacting with the faculty and staff.
7. Prof. Shailendra Saraf, Director, National Institute of Pharmaceutical Education and Research (NIPER), Ahmedabad visited PRL, Ahmedabad on 29.01.2025 to deliver the lecture on 100th PRL Ka Amrut Vyakhyaan.
8. Ms. Anitha Nandhini R, Director, Intl. Co-operation and Policy, Department of Space, Bangalore visited Udaipur Solar Observatory, Udaipur on 30.01.2025 to see the scientific facilities at USO/PRL.
9. Dr. Abhishek Samanta of IIT, Gandhinagar visited PRL, Ahmedabad on 30.01.2025 to deliver a talk in the divisional seminar.
10. During January 2025, the following visitors have visited Infrared Observatory, PRL, Mount Abu:-
 - (i) DIG, CRPF, Mt. Abu along with their 4 other staff members.
 - (ii) Seventeen (17) DOS/ISRO staff members,
 - (iii) Sixteen (16) defense personnel
 - (iv) Sixty Seven (67) students
 - (v) Forty-five (45) general public

Hearty welcome to our new member



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DESIGNATION: JRF-ANRF

DATE OF JOINING: 02.01.2025

DIVISION/AREA: Atomic, Molecular & Optical Physics
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