Newsletter of the Physical Research Laboratory

THE SPECTRUM

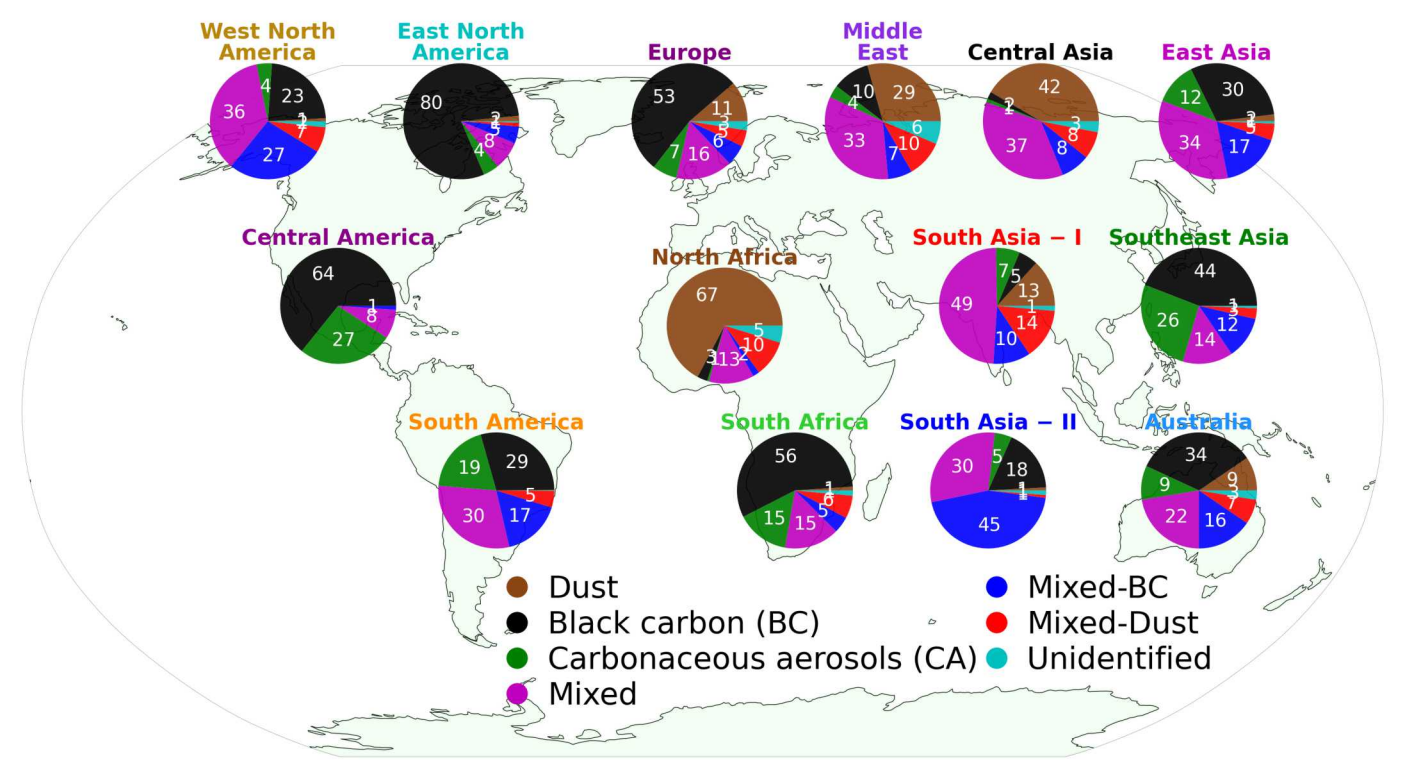


Image of the Month

Regional variation of annual mean % contribution of different absorbing aerosol types (Dust, Black Carbon (BC), Carbonaceous Aerosols (CA), Mixed, Mixed-BC, and Mixed-Dust) across the globe.

December 2025

Table of Contents

1. Enhancing accuracy in identifying absorbing aerosol types and their radiative impacts.....4

2. Contrasting Latitudinal/Longitudinal Response of Equatorial Ionization Anomaly (EIA) Arounnd ± 75^0 Longitude Sectors During the 23–24 April 2023 Geomagnetic Storm.....5

3. Photospheric radius expansion thermonuclear burst and X-ray reflection from the neutron star X-ray binary 4U 1702-429.....6

4. Discovery of Changing-look Behavior in AGN NGC3822: A Long-term Multiwavelength Study 7

5. MetNet: A deep learning approach for classifying meteorites using reflectance spectroscopy.....9

6. Propagation and energy dissipation of shock waves in the solar chromosphere.....10

7.Investigation of signal enhancement of aluminum emission in LIBS using gold nanoparticles in air and vacuum.....11

8. Exploring stellar activity in a sample of active M dwarfs.....12

9. DEX in near Earth orbit in light of Venus Orbiter Dust Experiment.....13

10. Characteristics of Uniformly Distributed Cirrus Clouds over the Arabian Sea.....14

11. On the Origin of Neutron-capture elements in r-I and r-II stars: A differential-abundance Analysis.....15

12. Dynamical simulation of the Interstellar Comet 3I/ATLAS.....16

13. PRL-Structured Training Programme (STP) – 2025.....17

14. Library's Online Session on ONOS, APC, RIMS & Literature Mapping Tools.....18

15. Seasonal Influenza Vaccination Camp 2025.....20

16. SIMS & Beyond.....21

17. PRL Ka Amrut Vyakhyaan (PKAV) - 110.....22

18. PRL Amrut Rajbhasha Vyakhyaan (PARV) - 30.....24

19.Cyber Security Awareness Session: "Safeguarding Your Digital World – Cybersecurity for Women"..... 27

20. Celebration of Constitution Day.....28

21.PRL's Monthly Publications Digest.....29

22. Awards & Honours.....31

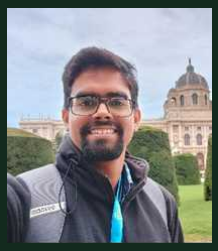
23. Visitors.....31

24. Obituary.....32

Enhancing accuracy in identifying absorbing aerosol types and their radiative impacts

(Kamran Ansari, *S. Ramachandran)*

The Author



Kamran Ansari

Atmospheric aerosols, the tiny solid and/or liquid particles suspended in air, are ubiquitous in the atmosphere. As these particles interact with radiation and clouds, they exert a significant influence on the Earth's energy balance and climate. Despite their significant importance, aerosols remain the most uncertain climate driver in quantifying the present-day climate and its future projections. The major contributor to this high uncertainty arises due to the imprecise quantification of absorbing aerosol type, which is most critical. Therefore, precise identification and quantification of different absorbing aerosol types are essential to enhance the accuracy of aerosol radiative and climate impact assessments, as well as for their mitigation and emissions control. In this study, a new classification method for absorbing aerosol types is developed, for the first time, using high-quality AErosol RObotic NETwork (AERONET) datasets by leveraging the spectral characteristics of aerosol optical depth and single scattering albedo of different absorbing aerosols. This new classification scheme remarkably reduces the contribution of unidentified absorbing aerosol type to almost nil (~2%) globally, demonstrating its robustness and enhanced accuracy compared to previous methods. Mixed absorbing aerosol type dominates South Asia – I (~50% annually). Whereas, East North America and Europe are mostly influenced by black carbon (BC) type (≥50%). Furthermore, a structured framework is provided to integrate this new scheme into global models, which facilitates a one-to-one comparison of model simulated type-wise contribution with observations, and enables the identification of biases for specific types. This innovative classification approach offers significant potential for advancing research in climate modeling, satellite-based retrieval, and aerosol monitoring applications, for accurately assessing the aerosol-climate interactions.

Source/Reference of the Work: https://doi.org/10.1038/s41612-025-01167-w

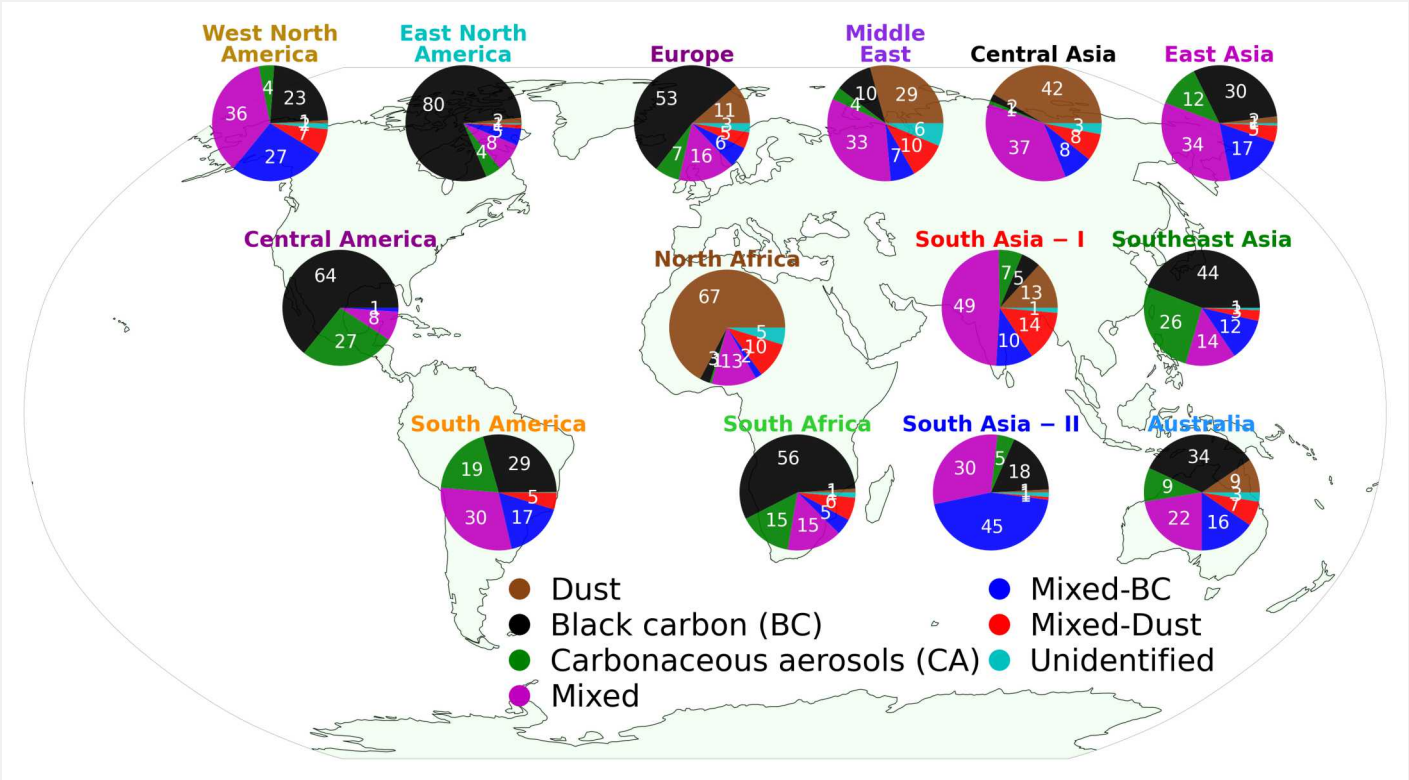


Figure Caption: Regional variation of annual mean % contribution of different absorbing aerosol types (Dust, Black Carbon (BC), Carbonaceous Aerosols (CA), Mixed, Mixed-BC, and Mixed-Dust) across the globe.

The Author

Dr. Sardar Singh Rao

Contrasting Latitudinal/Longitudinal Response of Equatorial Ionization Anomaly (EIA) Around ± 75^{0} Longitude Sectors During the 23–24 April 2023 Geomagnetic Storm

(**S. S. Rao**, *Nandita Srivastava, D. Chakrabarty, Monti Chakraborty)*

The multiple electric fields penetrate over the Equatorial Ionization Anomaly (EIA) region during the Geomagnetic storm (Figure). Usually, it is observed that the Total Electron Content (TEC) in the EIA increases or decreases compared to geomagnetically quiet days during geomagnetic storms, and the resulting changes in TEC are mainly associated with the Prompt Penetration (PP) and Disturbance Dynamo (DD) electric fields. However, our analysis of the 23-24 April 2023 geomagnetic storm provides additional insight into EIA dynamics during the event. We observed a contrasting EIA structure, which appears to be longitudinally elongated over the Indian sector and latitudinally expanded over the American sector (Figure). Our results reveal that strong trans-equatorial meridional winds converging to the geomagnetic equator and enhanced ∑O/N2 disturbances during the storm recovery phase produce longitudinal elongation of EIA in the Indian longitude sector. On the contrary, the presence of poleward meridional winds along with strong PP field produces latitudinal expansion of EIA over the American sector. This work seems to suggest that in addition to the individual effects of the space weather drivers (like penetration electric field, neutral, wind and compositional disturbances), their interactions are equally important for the assessment of ionospheric impact.

Source/Reference of the work: https://doi.org/10.1029/2025JA034563

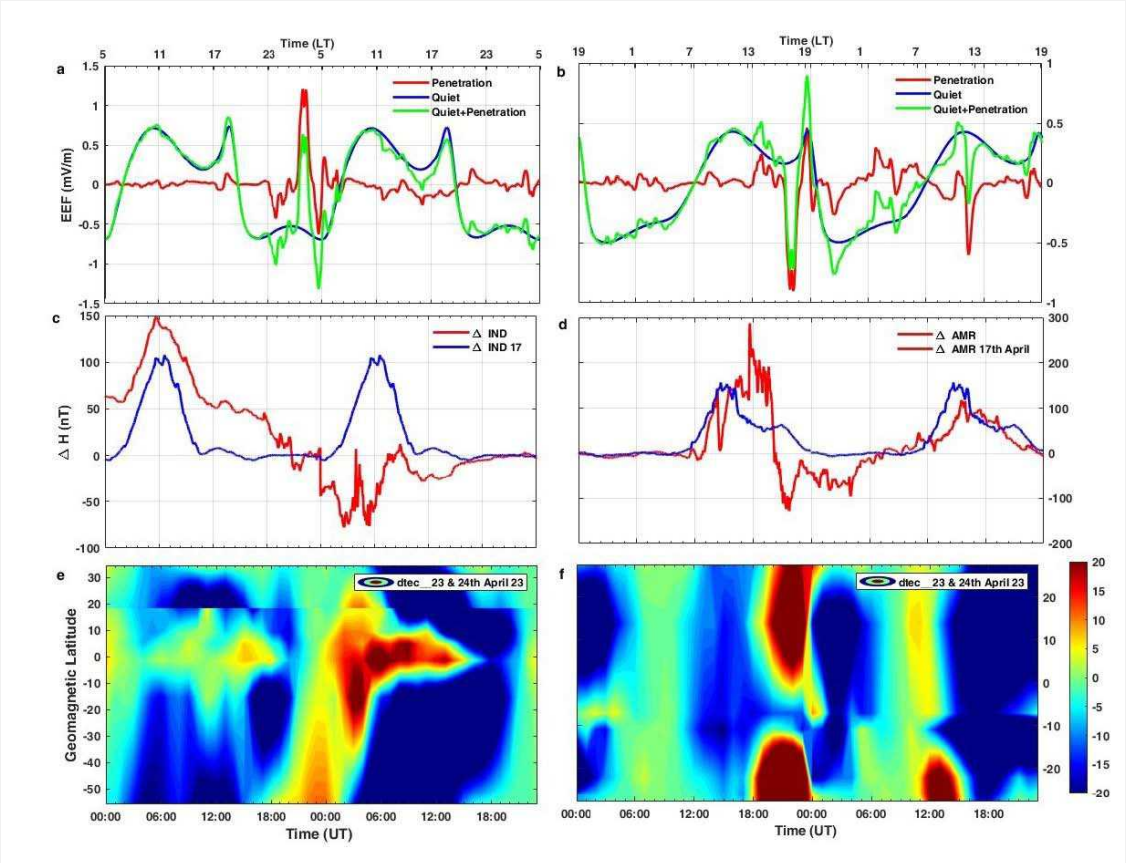


Figure Caption:(a) PPEEFM (Prompt Penetration Eastward Electric Field Model) electric field for the 75ºE, (b) PPEEFM electric field for the 75ºW, (c) ΔH Variation over the Indian equatorial sector, (d) ΔH Variation over the American equatorial sector, (e) Equatorial Ionization Anomaly (EIA) profile over the 75ºE, and (f) EIA profile over the 75ºW during the 23–24 April period are shown. The EIA profile is shown as the difference of Total Electron Content of event days minus quiet day in latitude-time frame.

The Author

Manoj Mandal

Photospheric radius expansion thermonuclear burst and X-ray reflection from the neutron star X-ray binary 4U 1702-429

(***Manoj Mandal***, *Sachindra Naik, and Gaurava Kumar Jaisawal)*

A neutron star low-mass X-ray binary (LMXB) consists of a neutron star (NS) and a low-mass companion star orbiting their common centre of mass. Matter from the companion is transferred to the neutron star via Roche-lobe overflow, leading to the formation of an accretion disk around the compact object. A thermonuclear X-ray burst is the unstable burning of accreted material from the companion star onto the surface of the weakly magnetized (10^7 -10^9 Gauss) neutron star in low-mass X-ray binaries. The thermonuclear burst is characterized by a rapid rise in X-ray luminosity, occurring over just a few seconds, followed by an exponential slow decay that typically lasts for several tens of seconds. During the burst, the observed peak count rate usually exceeds the persistent (pre-burst) count rate by more than an order of magnitude. In some cases, the peak luminosity during the bursts reaches the Eddington limit. Due to the high radiation pressure at this phase, the photosphere of the neutron star expands, resulting in a photospheric radius expansion (PRE) event. Investigating such PRE bursts allows one to reliably estimate the radius of the neutron star. We perform a comprehensive study of thermonuclear bursts from the neutron star low-mass X-ray binary 4U 1702-429, detected with the space-based X-ray observatories NICER and XMM-Newton. The thermonuclear burst detected with NICER shows clear evidence of a PRE event and a distinct feature in the burst profile. The burst profiles demonstrate significant energy dependence, with the hardness ratio varying notably during the PRE phase. Our study revealed that the radius of the photosphere of the neutron star is expanded to a maximum of 25 km while its temperature reached a minimum of 1.4 keV during the PRE phase (shown in the left panel of Figure. The estimated preburst mass accretion rate indicates that the PRE burst observed with NICER may be a He-powered or mixed H/He burst. We conducted a detaled spectral analysis of the 2025 NuSTAR observation of 4U 1702-429, revealing a broad iron emission line at 6.4 keV and a Compton hump at around 20 keV, indicating X-ray reflection features in the persistent emission (shown in the right panel of Figure. The disc reflection modeling provides an inner disc radius of nearly 24 km and an inclination angle of nearly 39 degrees. The magnetic field strength at the poles of the neutron star is estimated to be 5.1 × 108 Gauss, assuming that the accretion disc is truncated at the magnetosphere boundary.

Source/Reference of the Work: Published: https://doi.org/

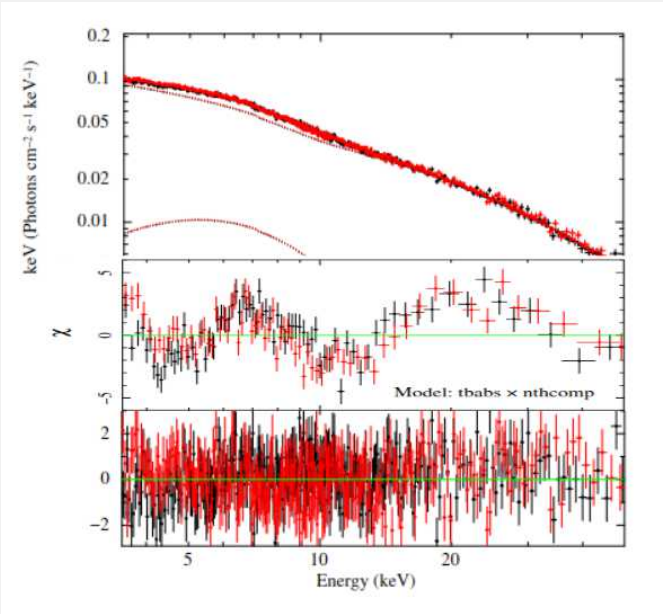
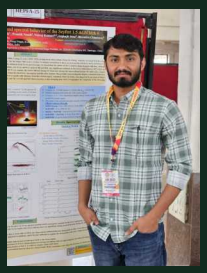


Figure : The best-fit NuSTAR persistent spectra revealed a broad iron line at 6.4 keV and a Compton hump at ~20 keV, confirming the presence of X-ray reflection features.

The Author



Narendranath Layek

Discovery of Changing-look Behavior in AGN NGC3822: A Long-term Multiwavelength Study

*(**Narendranath Layek**, Prantik Nandi, Sachindra Naik, Birendra Chhotaray, Arghajit Jana, Priyadarshee P. Dash, Neeraj Kumari, C. S. Stalin, S. Bandari, and S. Muneer)*

Active galactic nuclei (AGNs) are the most luminous and energetic sources in the universe, powered by the accretion of matter onto the supermassive black holes (SMBHs) located at the centers of the host galaxies. In the optical/UV range, the AGNs are commonly classified as type 1 or type 2 based on the widths of their optical emission lines. Type 1 AGNs show both broad emission lines (BELs) with FWHM > 1000 km s^{-1}, from the rapidly rotating clouds near the SMBHs, and narrow emission lines (NELs) with FWHM < 1000 km s^{-1}, originating from the slowly moving clouds located far away from the SMBHs, whereas type 2 AGNs show only NELs in their UV/optical spectra. In recent years, several tens of subclasses of AGNs have been discovered, exhibiting dramatic optical and X-ray spectral variability on timescales ranging from months to decades. These are known as changing-look AGNs (CL-AGNs) and are currently an open issue in AGN physics. Here, we present 17 years (2008–2025) of X-ray, UV, and optical observations, incorporating data from Swift, XMM-Newton, and NuSTAR, as well as optical data from the Very Large Telescope (VLT) and the Himalayan Chandra Telescope (HCT) at Hanley, for the AGN NGC 3822. Optical spectroscopic monitoring of NGC 3822 reveals variation in emission lines over time (See Figure). The 2018 spectrum shows only narrow Balmer emission (Hβ and Hα), whereas the 2022 spectra reveal clear broad Hβ and Hα components, confirming a type transition from type 2 to type 1. Subsequent HCT monitoring from July 2024 to July 2025 shows that the broadness of the Hβ and Hα lines significantly decreased, indicating that the source is transitioning back toward a type 2 state. Optical spectroscopic monitoring confirms the changing-look nature of NGC 3822, characterized by the appearance and disappearance of BELs in the spectra. These CL transitions are driven by changes in the mass accretion rate rather than variable obscuration. The BELs appear only when the mass accretion rate is relatively high (~8.4×10^{-4} $M_\odot$ yr^{-1}) and disappear when it drops to a lower value (~2.0×10^{-4} $M_\odot$ yr^{-1}). The multi-wavelength light-curve analysis reveals significant flux variability across the X-ray to optical/UV bands. A sudden outburst is observed during the 2022 epoch, which could be linked to a tidal disruption event (TDE), and its signature is also seen in the 2022 optical spectra. X-ray spectral analysis indicates the presence of intrinsic absorption in this AGN during the 2016 and 2022 observations. However, this absorption disappeared before and after these epochs. The presence and absence of the absorber are attributed to clouds moving in and out of the line of sight. .

Source/Reference of the Work: https://doi.org/10.3847/1538-4357/ae10ae

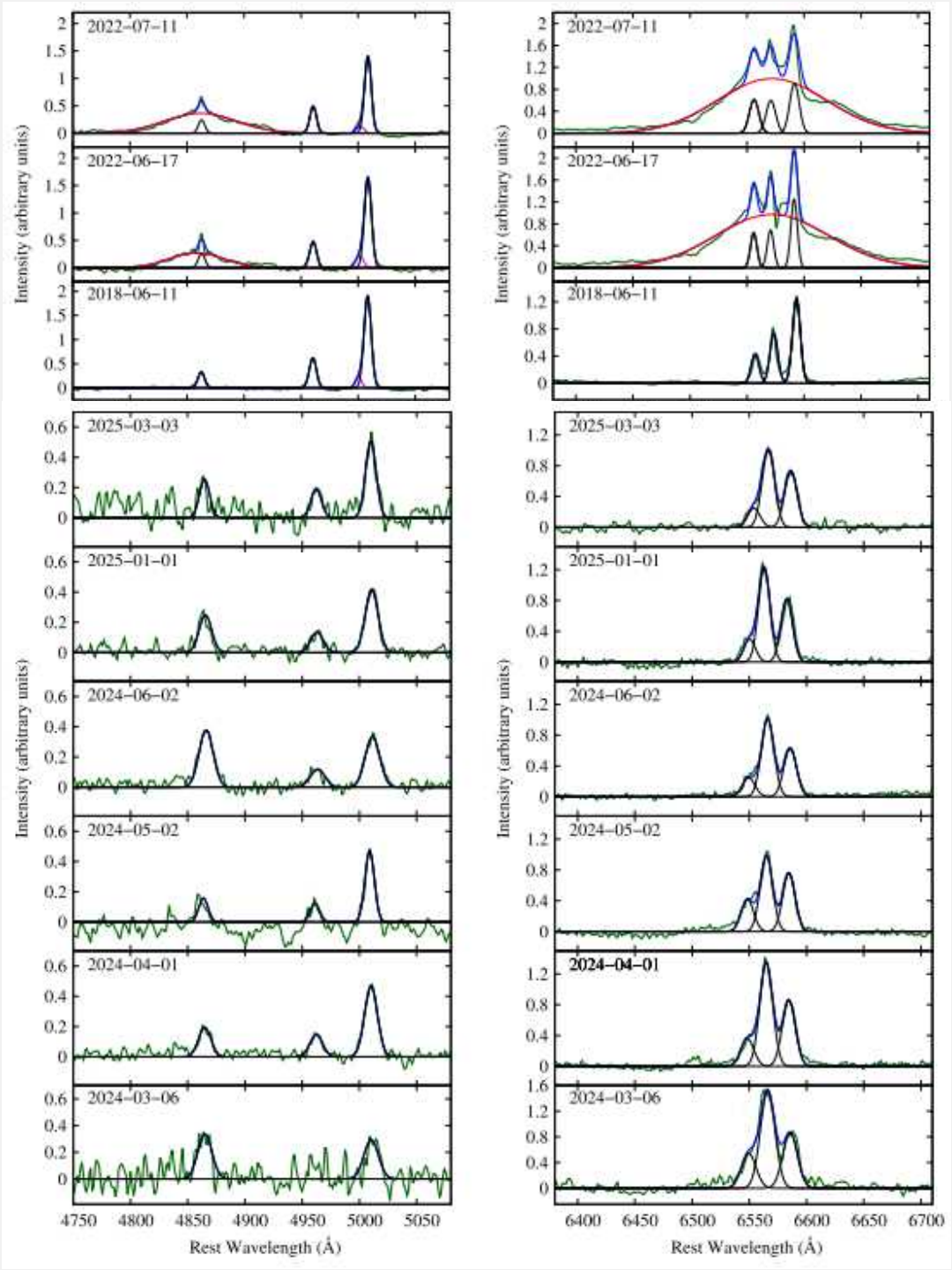


Figure Caption: The Hβ and [O III]λλ4959, 5007 (Left Panel) as well as Hα+[N II] regions (Right Panel) are shown for all the epochs of HCT (top six panels) and X-Shooter (bottom three panels) observations of NGC 3822. For both spectral ranges, the green lines represent the observed spectra, the blue line represents the fitted model, and the black lines represent each narrow emission line. A clear Balmer broad component (in red) appears in the 2022 spectra.

The Author

Neeraj Srivastava

MetNet: A deep learning approach for classifying meteorites using reflectance spectroscopy

(R. Nath, S. Mali, Denesh. K, N. Panwar, A.J. Verma, A. Kumar, R. R. Mahajan, M.E. Varela, S.A. Ehgamberdiev, T. Kapadia, ***N. Srivastava****)*

Meteorites are invaluable specimens, offering critical information about the history and evolution of our solar system. Traditionally, analyzing these rare samples has relied on destructive geochemical techniques, which consume the sample and limit future research opportunities. Accurate petrological classification is a prerequisite for any further analysis. To address the limitations of destructive methods, reflectance spectroscopy has emerged as a promising, nondestructive alternative for meteorite classification. This technique analyzes the light reflected from a sample to interpret its surface characteristics. Crucially, it often allows for examination with minimal to no sample preparation. Reflectance spectroscopy reveals key spectral features, including absorption bands, band centers, symmetry, inflection points, and the overall spectral slope. In this study, we utilized spectral reflectance data of diverse meteorite samples from open source spectral libraries RELAB, C-TAPE, and data from the Planetary Remote Sensing Laboratory, PRL, to develop, refine, and validate a deep learning model for accurate, automated classification. The model achieved a high validation accuracy of 93%. A vital advantage of this model is its ability to identify complex nonlinear relationships among spectral features. This innovative method accelerates classification and emphatically demonstrates the efficiency and potential of integrating deep learning with reflectance spectroscopy, providing an accurate, non-destructive alternative to the traditional, sample-depleting methods of meteorite classification.

Reference of the Work: https://onlinelibrary.wiley.com/doi/full/10.1111/maps.14342

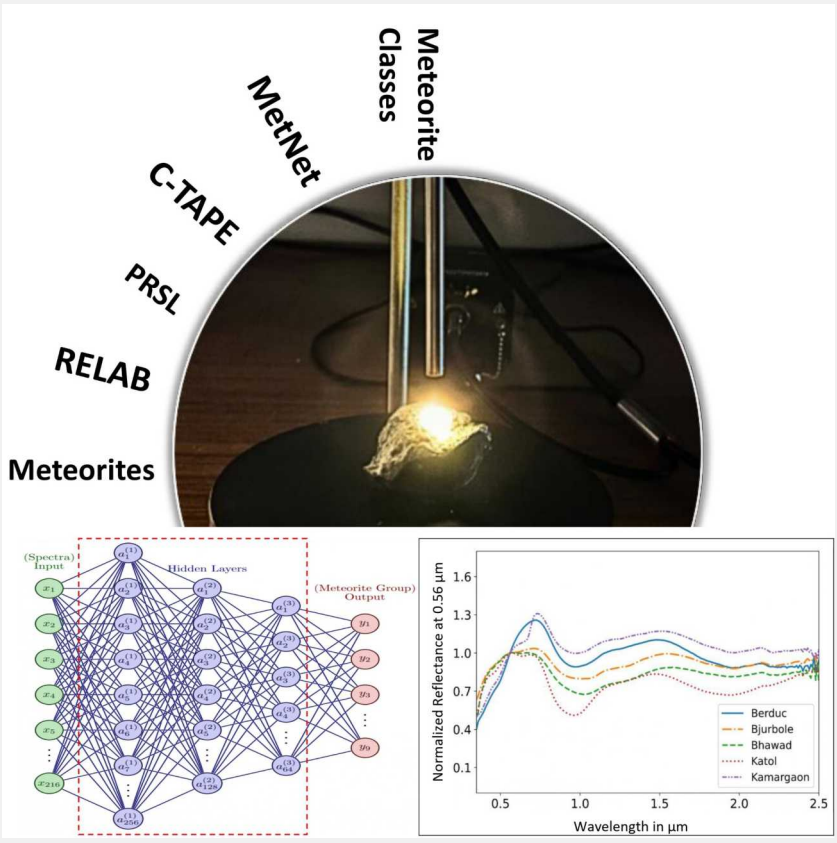


Figure Caption: Meteorite classification using Reflectance Spectroscopy and Deep Learning

The Author

Ravi Chaurasiya

Propagation and energy dissipation of shock waves in the solar chromosphere

(***Ravi Chaurasiya***, *Ankala Raja Bayanna and Robertus Erdélyi)*

The Sun's atmosphere is constantly filled with waves that are generated by the boiling, convective motions beneath its surface. As these waves move upward, they travel into regions where the solar atmosphere becomes rapidly thinner. Because of this sharp drop in density, the waves gradually steepen and eventually turn into shock waves. These shock waves leave behind a very distinctive signature: a repeating, saw-tooth–shaped pattern that can be clearly seen in λ–t plots of common chromospheric spectral lines such as Hα and Ca II 8542 Å. In this study, we use coordinated observations from the Swedish 1-meter Solar Telescope (SST), the Interface Region Imaging Spectrograph (IRIS), and the Solar Dynamics Observatory (SDO) to follow these shocks through the Sun's lower atmosphere. Our results show that once these shock waves form in the chromosphere, they do not stop there. Instead, they continue to move upward, leaving detectable signatures not only in the transition region but even in low-temperature coronal channels. As they propagate, these shocks gradually lose siginificant energy into the surrounding plasma and hence play an important role in keeping the chromosphere hot.

Source/Reference of the Work: https://academic.oup.com/mnras/article/543/4/3791/8275912

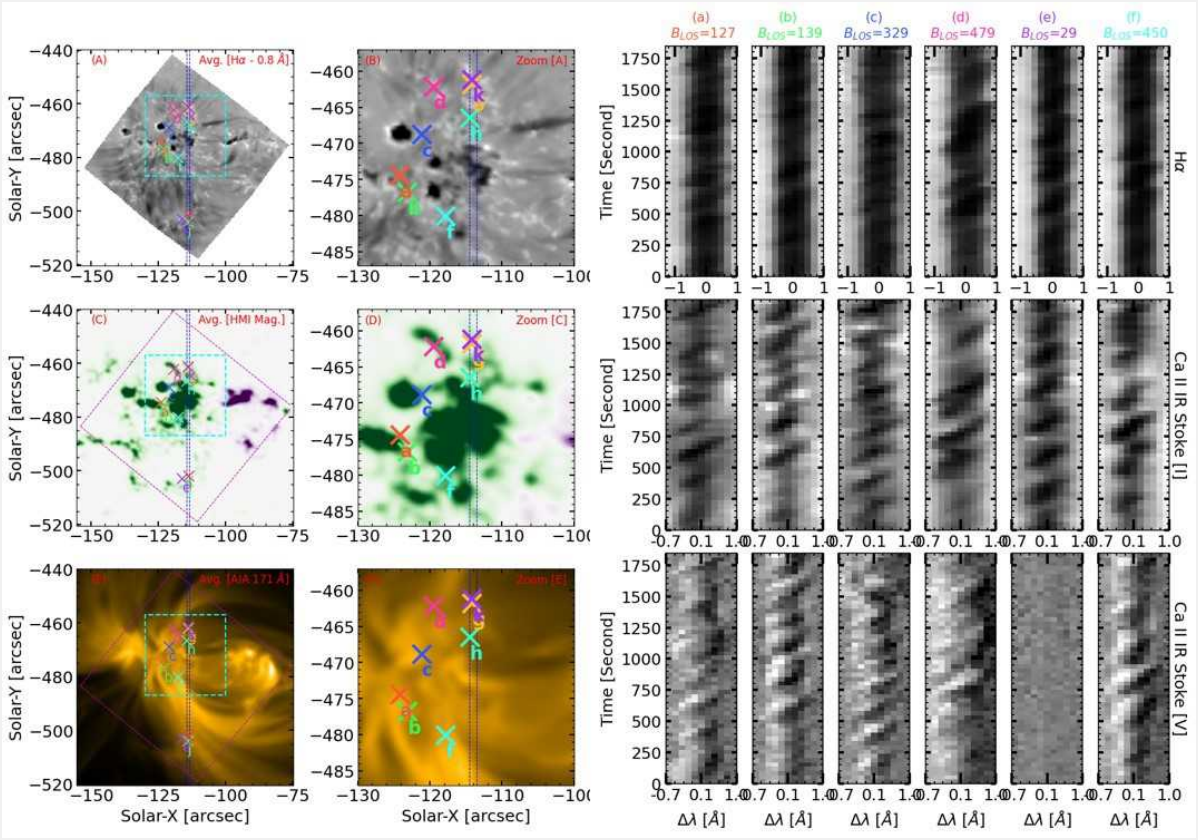


Figure Caption: Examples of shock waves, marked by different colored crosses, in coordinated observations (left), manifesting as characteristic sawtooth patterns in the λ–t diagrams of Hα (Stokes I) and Ca II 8542 Å (Stokes I and Stokes V).

The Author

Swetapuspa Soumyashree

Investigation of signal enhancement of aluminum emission in LIBS using gold nanoparticles in air and vacuum

(***Swetapuspa Soumyashree*** *and Prashant Kumar)*

The present study aims to understand the temporal changes in emission line intensity observed in nanoparticle enhanced LIBS (Laser Induced Breakdown Spectroscopy) for experiments conducted under different ambient conditions. Although nanoparticles have been extensively used for signal enhancement in LIBS, only a handful of literature exists which discusses their behavior in low-pressure ambient. We have carried out a systematic study of signal enhancement in LIBS in presence of nanoparticles for both neutral and ionic lines in vacuum and air ambient. We have observed 2–3 times signal enhancement in the emission line intensities of neutral species in nanoparticle enhanced LIBS in both ambient. While ionic species show a similar enhancement in air for LIBS with nanoparticles, the trend is opposite in case of vacuum. The observed signal enhancements in LIBS in presence of nanoparticles for both neutral and ionic species were explained through the study of plasma parameters, temperature and electron number density. Temporal evolution of signal enhancements was compared for air and vacuum ambient for both neutral and ionic lines emphasizing the role of acquisition delay and proper selection of emission lines in case of nanoparticle enhanced LIBS.

Source/Reference of the Work: https://doi.org/10.1016/j.sab.2025.107395

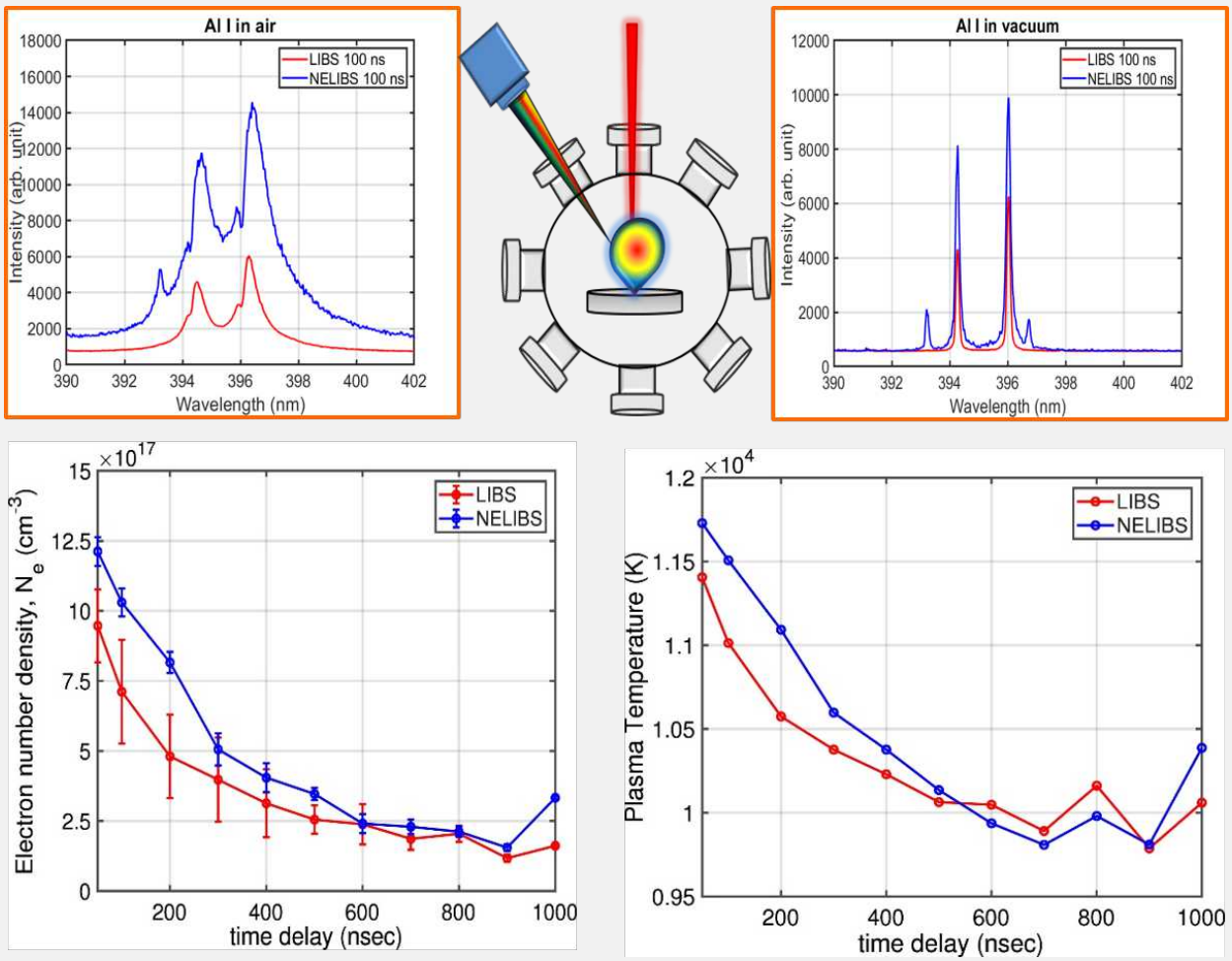


Figure Caption: (top left) shows the emission intensities of Al spectra for LIBS (red) and NELIBS(Nanoparticle-Enhanced LIBS) (blue) in air, respectively. (top right) shows the emission intensity of Al spectra for LIBS (red) and NELIBS (blue) in vacuum, respectively. (bottom left) shows temporal evolution of electron number density (cm-3) for LIBS (red) and NELIBS (blue). (bottom right) shows temporal evolution of plasma temperature (K) for LIBS (red) and NELIBS (blue) in air.

The Author

Arvind Singh Rajpurohit

Exploring stellar activity in a sample of active M dwarfs

(***A. S. Rajpurohit***, *V. Kumar, M. K. Srivastava, L. Labadie, K. Rajpurohit and J. G. Fernández-Trincado)*

M dwarf stars are among the most magnetically active stars in the Galaxy, often showing much stronger activity than the Sun. This high activity can strongly influence the atmospheres and potential habitability of planets orbiting these stars. Since M dwarfs are prime targets in the search for Earth-like exoplanets, understanding their magnetic behavior is essential.

We investigated the activity of active M dwarfs using a combination of TESS photometric data and ground-based spectroscopic observations. Our study focused on the relationship between stellar rotation, chromospheric activity, starspots, and flare properties. We analyzed flare rates, energies, amplitudes, and durations, along with key activity indicators such as Hα emission.

We find that flare activity remains roughly constant for early M dwarfs (M0–M4) and decreases for later spectral types. Rapidly rotating stars (with rotation periods shorter than one day) show significantly higher flare rates. Interestingly, stars with frequent flares tend to produce many low-energy events rather than fewer powerful flares. We also identify a transition in stellar activity around spectral type M4.

Overall, our results show that magnetic activity in M dwarfs is closely linked to rotation and follows simple scaling relations. These findings help clarify how M dwarfs release magnetic energy and provide important context for evaluating the environments of planets in their habitable zones.

Source/Reference of the Work: https://doi.org/10.1051/0004-6361/202554816

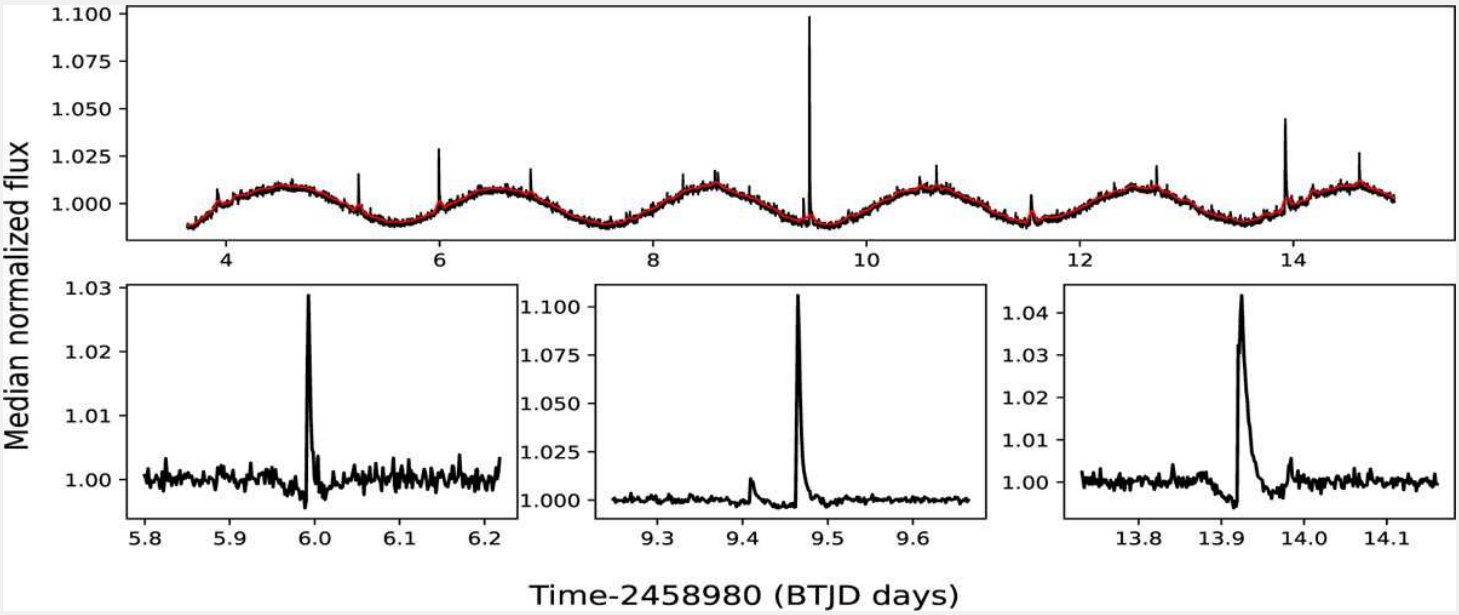


Figure Caption: **Top:** TESS light curve of the M2.0 star PM J16170+5516 from Sector 25, showing a rotation period of 1.98 days. The black curve shows the 2-min cadence data, and the red curve is the smoothed, filtered light curve. **Bottom:** Zoomed-in views of the detrended light curve highlighting multiple flares with different strengths.

The Author

Dr. Jayesh Pabari

DEX in near Earth orbit in light of Venus Orbiter Dust Experiment

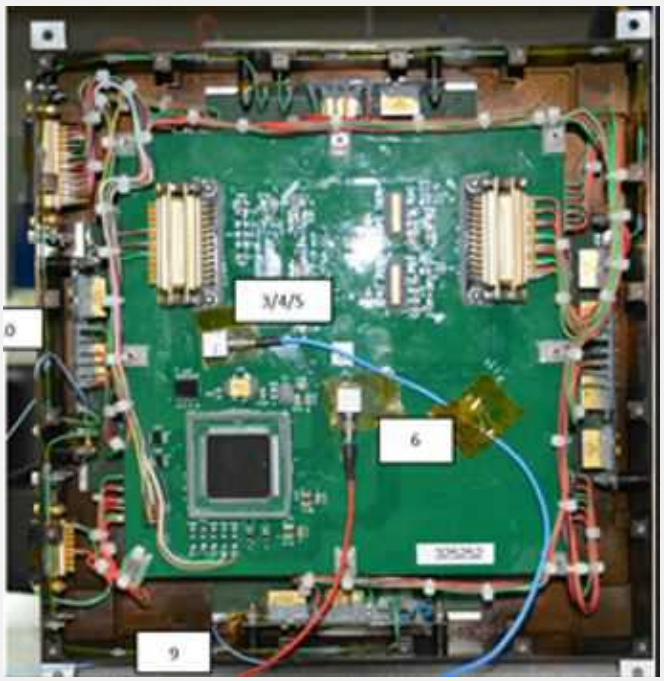
*(**Jayesh Pabar**i, Srirag Nambiar, Rashmi Singh, Sonam Jitarwal, Anil Bhardwaj, S. M. K. Praneeth, Bhavik Shah, Pinal Suthar, Shilpa Pandya, Jaimin Rami, Deepak Kumar, V. K. Singh, Rahul Khandekar, Rajesh Kumar Singh, Aanchal Sahu, Hiteshkumr Adalja and Arpit Patell)*

The Dust EXperiment (DEX), India's first cosmic dust experiment, has been indigenously designed and developed by PRL to detect Interplanetary Dust Particles (IDPs) in space. The IDP are microscopic shrapnel from comets and asteroids that form our atmosphere's mysterious "meteor layer." The compact technology of DEX is tuned to "hear" impacts, capturing vital data that redefines our understanding of the universe and charts the path for safe human deep-space missions! At the core of the experiment lies a 3-kilogram cosmic dust detector based on the cutting-edge hypervelocity principle designed to capture high-speed space dust impacts with only 4.5 W power consumption!

DEX (Figure) was flown on POEM of PSLV C-58 (XPoSat) mission on 1 January 2024 and rocketed to 350 km altitude. With its 140° field of view, DEX successfully logged signals of IDP impacts during the observation period from 1st January to 9th February 2024, confirming the instrument's capability to identify such events. Skimming Earth's atmosphere on a 9.5° inclination, the detector registered a hit: a cosmic invader striking every thousand seconds! DEX has provided the most recent observations of IDP entering Earth. The IDP flux during entire observational period is 6.46×10^{-3} [2.95×10^{-3}, 9.97×10^{-3}] particles $m^{-2}\,s^{-1}$ (Figure) from direct detection of IDP in near-Earth environment.

There are no measurements of IDP in the Venusian and Martian atmospheres. DEX is the replica of a dust detector which can provide measurements of IDP in the atmospheres of Venus and Mars. Also, it can measure distribution of IDP in the interplanetary space between Earth and Venus/Mars. The ability to measure IDPs is essential for monitoring the space environment, precisely assessing hazards for our technology, and ultimately, ensuring the safety and success of future manned missions to deep space!

Source/Reference of the Work: https://doi.org/10.1038/s41598-025-21988-2



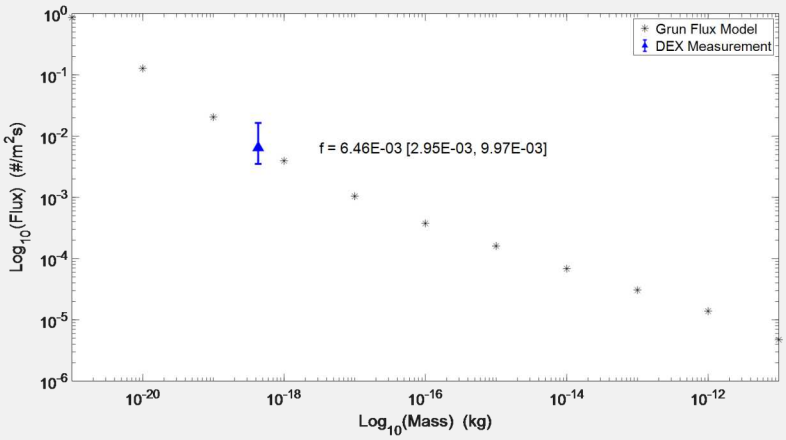


Figure Caption: **Left Panel:** DEX electronics compartment in open condition and **Right Panel:** IDP flux derived from the DEX measurement, plotted along with Grün et al. (1985) flux model.

Characteristics of Uniformly Distributed Cirrus Clouds over the Arabian Sea

*(**Ruchita Shah**, Som Sharma, Harish Gadhavi, Aniket, and Dharmendra Kamatl)*

The Author

Ruchita Shah

High-level clouds (mostly icy cirrus clouds) play a significant role in modulating the Earth's radiation budget by trapping outgoing longwave radiation and reflecting incoming shortwave radiation. Rising temperatures might influence their contribution in regulating climate feedbacks, demands a need to investigate role of high-level clouds at regional level. The present study inferred the characteristics of high-level (or cirro-type) clouds for long-term, covering more than last 20 years (January 2003-November 2024) over the Arabian Sea (09.00-19.07^{0}N, 57.56-72.86^{0}E) region using the Moderate Resolution Imaging Spectrometer (MODIS) and Atmospheric Infra-Red Sounder (AIRS) satellite observations. Findings revealed the occurrence of ~25% of cirro-type of clouds over Arebian Sea, with no significant trends in annual variability of Cloud Optical Thickness (COT), Cirrus Reflectance (CR) and Outgoing Longwave Radiation (OLR). On the other hand, their monthly variations exhibited a positive correlation between COT-CR and a negative correlation between CR-OLR. Moreover, cirro-type of clouds were further differentiated into Cirrus (Ci) (~52%), Cirrostratus (Cs) (~39%), and Deep convective (Dc) (~9%) clouds. Our findings revels that the daily averaged variations in COT was not varying much for Ci and Cs clouds, signifies uniform distribution over a long period of time. Furthermore, a strong correlation (R^2 = ~0.77) between COT and CR for Ci clouds to signify their role in modifying the reflective flux. These type of clouds have low amount of liquid/ice cloud water but their uniform distribution over the Arebain Sea underscores need to further quantify regional radiative flux, and could be useful as an input to improve the Earth's radiation balance in regional weather and climate models.

Source/Reference of the Work: https://doi.org/10.1080/2150704X.2025.2578818

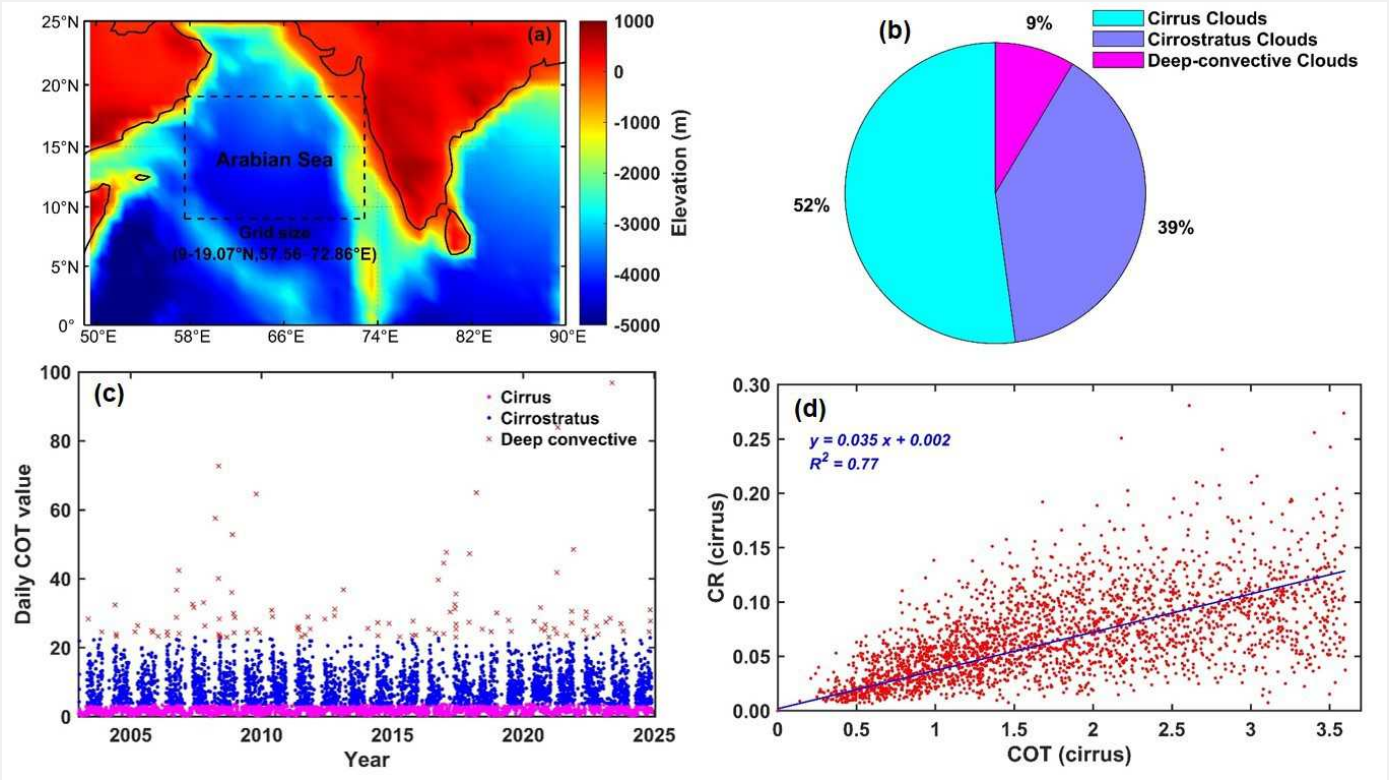


Figure Caption: : (a) Selected study region (the Arabian Sea: 09.00-19.07^{0}N, 57.56-72.86^{0}E), (b) Cloud occurrence frequency (%) of Cirrus (Ci), Cirrostratus (Cs) and Deep convective (Dc) clouds, (c) Daily (area-averaged) COT values individually for Ci (in pink), Cs (in blue) and Dc (in red) clouds, and (d) Correlation between CR and COT for Ci clouds, during January 2003-November 2024.

The Author

Pallavi Saraf

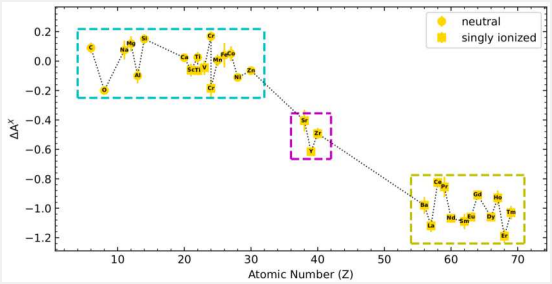
On the Origin of Neutron-capture elements in r-I and r-II stars: A differential-abundance Analysis

(***Pallavi Saraf***, *Thirupathi Sivarani, Timothy C. Beers, Yutaka Hirai, Masaomi Tanaka, Carlos Allende Prieto, and Drisya Karinkuzhi)*

Understanding the origin and distribution of the chemical elements in the universe is one of the major challenges of modern astrophysics. The oldest stars in our Milky Way Galaxy are the remaining rare fossils of the early Universe. They preserve the chemical footprints of the First stars and Supernova explosions ever to take place. They can thus be used to answer outstanding questions about the element formation processes that took place some 13 billion years ago. The rapid neutron-capture process, or r-process, is one of the fundamental ways that stars produce the elements listed along the bottom two-thirds of the periodic table, but key aspects of the r-process are still poorly understood.

In this study, we present a strictly line-by-line differential analysis of a moderately r-process-enhanced (RPE) star (r-I: HD 107752) with respect to a strongly r-process-enhanced star (r-II: CS 31082-0001) to investigate the possible common origin of their heavy element nucleosynthesis with high precision abundances. This approach is applied for the first time to RPE stars, and we achieved a precision better than 0.08 dex. This improved precision allowed us to constrain the sites of the natal clouds where these RPE stars originated. We note three distinct regions in the differential abundance patterns as shown in Left Panel. Light elements exhibit differential abundances very close to zero, suggesting a similar origin in both stars, e.g., CCSNe. However, the differential abundances of the first and second r-process peak elements suggest that they were formed under different astrophysical conditions. Simple dilution of the r-process yield from a single site, such as an NSM, collapsar, or magnetorotational supernova, cannot explain the observed differential abundance patterns. We have illustrated the differential abundance pattern under the assumption of two elemental sources: one producing the light and iron peak elements, and another contributing the neutron capture elements. In that case, the expected differential pattern would resemble the Middle one. However, the observed pattern corresponds more closely to Left Panel, with a similar illustration shown in Right Panel.

Source/Reference of the Work: https://iopscience.iop.org/article/10.3847/1538-4357/ae08a1/meta



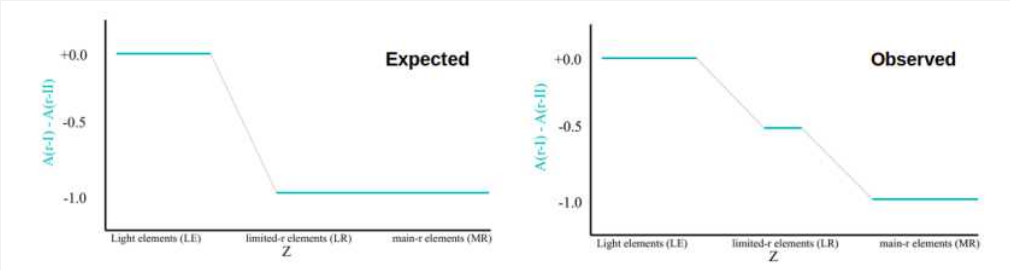


Figure Caption: *Left panel:* Differential abundance pattern of the r-I star HD 107752 with respect to the r-II star CS 31082-0001. *Middle:* Schematic of the expected differential abundance pattern of HD107752 relative to CS 31082-0001, assuming similar progenitor r-process sites for neutron capture elements. *Right Panel:* Schematic showing the expected differential abundance pattern of HD107752 relative to CS 31082-0001, assuming lighter and main r-process elements arise from distinct progenitor sites.

The Author

Goldy Ahuja

Dynamical simulation of the Interstellar Comet 3I/ATLAS

(***Goldy Ahuja*** *and Shashikiran Ganesh)*

In this work, we have explored the trajectory of the comet, from its past to its future orbital evolution. We simulated the orbit of the comet using the Python-based N-body dynamics package, REBOUND. We created 500 statistical clones of the comet using Monte Carlo sampling of the 6×6 covariance matrix based on the orbital elements. These clones were integrated for different timescales: a 100-year run to see where it came from, and a 20-year run to see how planets affect it. From the first simulation, it shows that the comet is coming from the direction of Sagittarius and moving toward Gemini at about 58 km/s. Once we account for the Sun's movement in the Galaxy, the comet appears to lie in a region between the Milky Way's thin and thick disks. In the second simulation, spanning 20 years, we have investigated the effects of two planets, Mars and Jupiter, on the interstellar comet. We have found that the comet would be facing the stronger effect from Jupiter due to its motion, which is very close to the Hill radius of Jupiter (the region where Jupiter's gravity dominates over the Sun). This results in the effect of the change in the orbital elements. We also added small non-gravitational forces caused by outgassing in our simulation and many of the comet's clones still get close enough for Jupiter to disturb them. These results confirm that Jupiter will perturb the comet's orbital motion. We also identify a promising observation window for the Juno spacecraft: between March 9 and 22, 2026, when the comet comes within 0.4 au of Juno under gravitational forces alone.

Source/Reference of the Work: https://iopscience.iop.org/article/10.3847/2041-8213/ae21cf

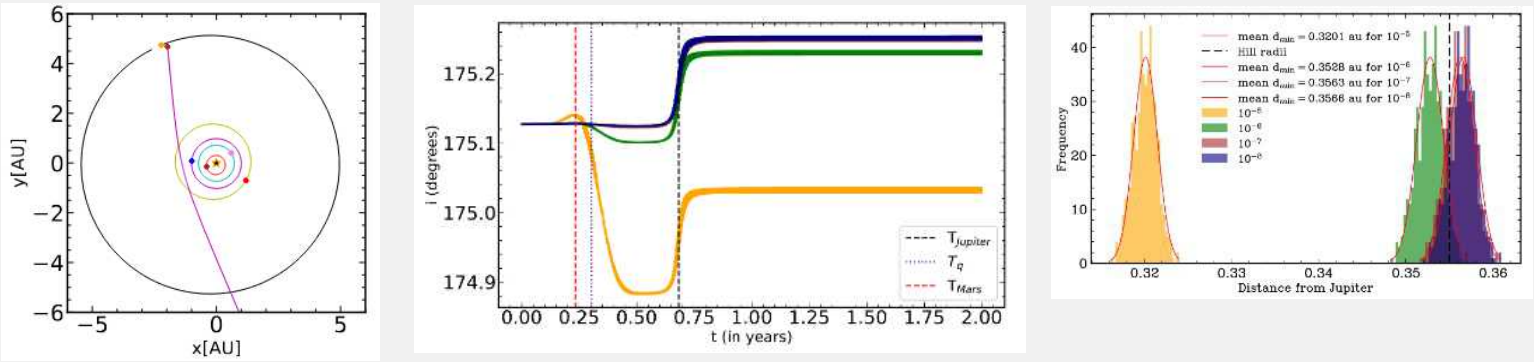


Figure Caption: Left: Orbit of the interstellar comet during its encounter with Jupiter. Center: Change in the comet's inclination over its future path. Right: Histogram of 500 orbital clones for different non-gravitational accelerations.

PRL-Structured Training Programme (STP) – 2025

The Physical Research Laboratory (PRL) organised the ISRO Structured Training Programme (STP) on “Evolution of Inner Solar System: Remote Sensing Data Analysis and Instruments for Space Missions” during 10–14 November 2025. The programme aimed to train researchers, scientists, and engineers from various ISRO centres to help carry forward India’s expanding planetary science ambitions. It saw the participation of 31 scientists from 10 ISRO centres along with 6 participants from PRL.

In his welcome address, Prof. Varun Sheel, STP Course Director and Head of the Planetary Sciences Division, highlighted ISRO’s growing role in planetary exploration and emphasised the societal relevance of planetary science, including the technological spin-offs that emerge from space missions. He also outlined India’s significant progress in planetary science over the past two decades and underscored PRL’s pivotal role in capacity building, particularly in instruments and remote sensing.

Prof. Jayesh Pabari, Chair of the STP Local Organising Committee, ensured that the programme’s 17 lectures and daily hands-on practical sessions in the second half kept participants actively engaged with experts and encouraged them to explore diverse datasets. The training is expected to serve as a foundation for developing a larger national pool of planetary scientists and instrument specialists in the coming years.

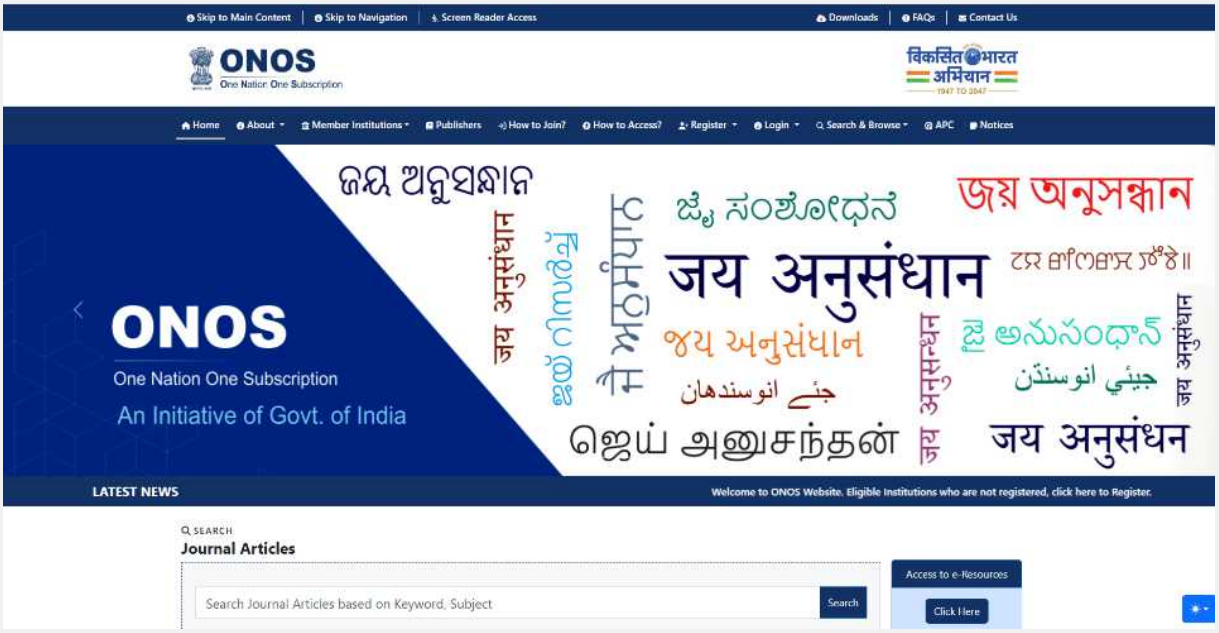
Library's Online Session on ONOS, APC, RIMS & Literature Mapping Tools

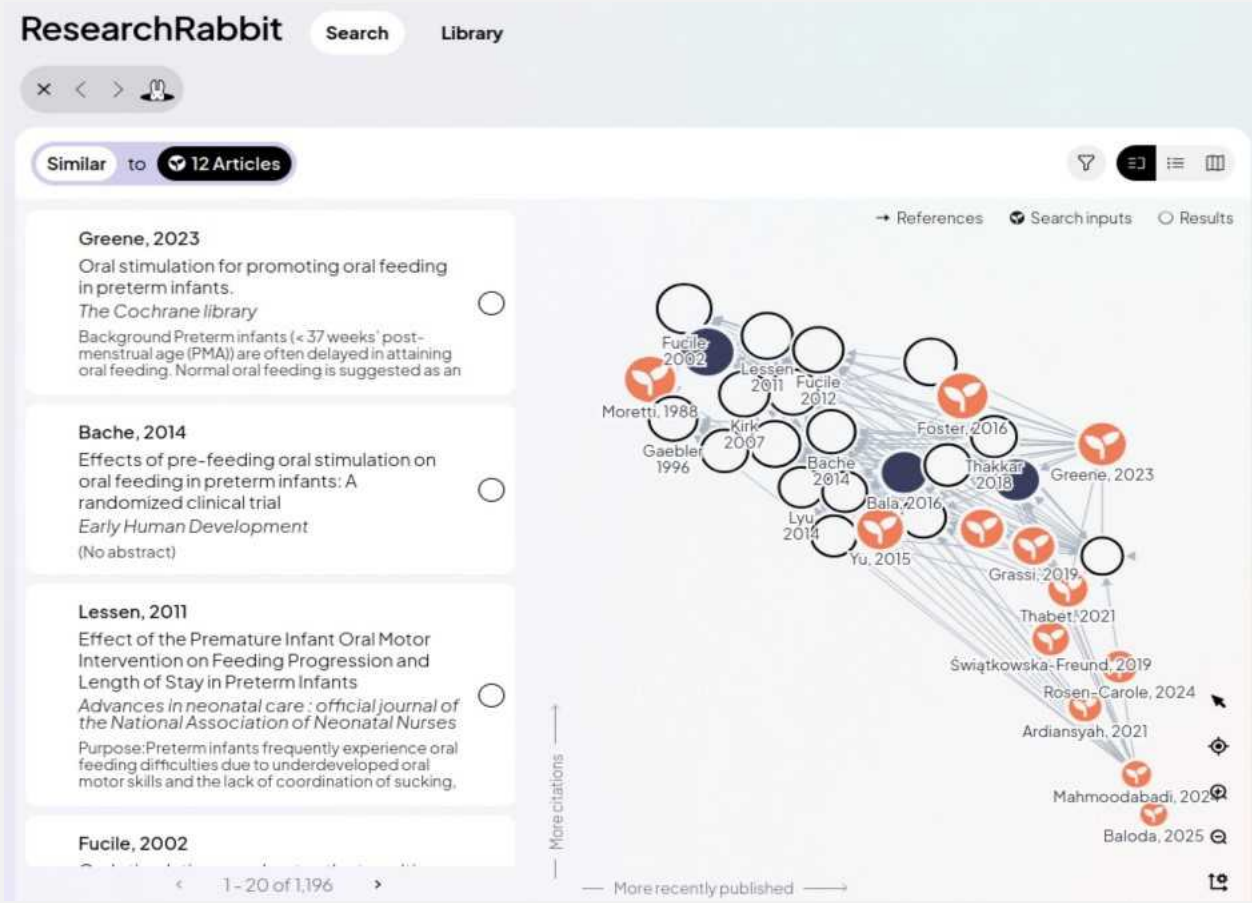
Library and Information Services, PRL organized an online awareness and training session on "ONOS, APC, RIMS & Literature Mapping Tools: An Overview of Research Support Services" on 10 November 2025 as part of its continued efforts to strengthen research support and scholarly communication at PRL. The session was delivered by Dr. Md. Nurul Alam and witnessed active participation from researchers, faculty members, and research scholars.

The session commenced with an overview of the One Nation One Subscription (ONOS) initiative, a flagship Government of India programme aimed at providing equitable nationwide access to scholarly journals and research databases through a centralized subscription model. The scope, implementation mechanism, and benefits of ONOS. The presentation then moved to Article Processing Charges (APCs) in the context of Open Access publishing under ONOS. The speaker elaborated on APC concepts, eligibility criteria for authors, journals, and articles, quality indicators such as CiteScore, SNIP, and SJR, and the structured APC application workflow.

A key highlight of the session was the segment on AI-enabled Literature Mapping Tools and research workflows. Dr. Alam demonstrated how tools such as ResearchRabbit can effectively support systematic literature reviews by enabling semantic discovery of relevant literature, identifying emerging research trends, and visually mapping knowledge domains and citation networks. The demonstration illustrated how such tools help researchers overcome information overload, discover related works efficiently, and gain deeper insights into research landscapes.

The final segment focused on PRIME (PRL Research Information and Metrics Engine)—a cutting-edge in-house Research Information Management System developed at PRL. The speaker showcased PRIME's objectives, architecture, and key features, highlighting its role in centralizing research data, enabling advanced analytics, ensuring interoperability with global standards, and enhancing institutional research visibility through bibliometric and altmetric integrations.
The session concluded with an interactive discussion, reflecting strong interest among participants in ONOS access, APC workflows, literature mapping tools, and research impact assessment. Overall, the session successfully enhanced awareness of evolving scholarly communication practices and reinforced the Library's role as a strategic research partner at PRL.

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References
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Greene, 2023
Oral stimulation for promoting oral feeding in preterm infants.
The Cochrane library
Background Preterm infants (< 37 weeks' post-menstrual age (PMA)) are often delayed in attaining oral feeding. Normal oral feeding is suggested as an
Bache, 2014
Effects of pre-feeding oral stimulation on oral feeding in preterm infants: A randomized clinical trial
Early Human Development
(No abstract)
Lessen, 2011
Effect of the Premature Infant Oral Motor Intervention on Feeding Progression and Length of Stay in Preterm Infants
Advances in neonatal care : official journal of the National Association of Neonatal Nurses
Purpose:Preterm infants frequently experience oral feeding difficulties due to underdeveloped oral motor skills and the lack of coordination of sucking.
Fucile, 2002
1 - 20 of 1,196
Fucile 2002
Lessen 2011
Fucile 2012
Moretti, 1988
Kirk 2007
Gaebler 1996
Foster, 2016
Thakkar 2018
Greene, 2023
Bache 2014
Bala, 2016
Lyu 2014
Yu, 2015
Grassi, 2019
Thabet, 2021
Świątkowska-Freund, 2019
Rosen-Carole, 2024
Ardiansyah, 2021
Mahmoodabadi, 202
Baloda, 2025
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212
7131
38
Atomic, Molecular and Optical Physics
1162
164
9,942
49
Geosciences
1573
229
25,192
78
Planetary Sciences
Space and Atmospheric Sciences
Theoretical Physics

Seasonal Influenza Vaccination Camp 2025

Every year Dispensary PRL organizes Influenza Vaccination Camp for the CHSS beneficiaries. This vaccine is beneficial to provide immunity and protect them against the possible influenza infection for next 11-12 months. Though this vaccine can be taken at any time throughout the year, the best time to inject this is between August to November. This is because the chances of Flu infections spread are highest during the winter.

CHSS beneficiaries were informed about this Camp well in advance by circulation of Notice through allusers mail, PRL Notices Site, PRL Retired Employees Portal, and by telephonic communication. The message was also conveyed to the CHSS beneficiaries during their visit to dispensary for one or other reason. More than 230 beneficiaries had registered themselves by filling necessary details in the circulated Google form. Registered beneficiaries were allotted different time slot to avoid mass gathering at the camp and informed about it through respective e-mail.

The influenza vaccination camp was held at Dispensary Navrangpura PRL on 17.11.2025 (Monday) and 18.11.2025 (Tuesday). The beneficiaries were given Vaxiflu (2025-2026) Influenza Vaccine. Total 250 beneficiaries were covered under Anti-flu vaccination during this camp.

Benefits of Influenza vaccination:

1. Protects the beneficiaries against seasonal flu including H1N1.
2. Reduces the risk of flu-associated hospitalization.
3. Important preventive measure for people with co-morbid conditions like lung diseases, High BP, Diabetes, Cardiac conditions.

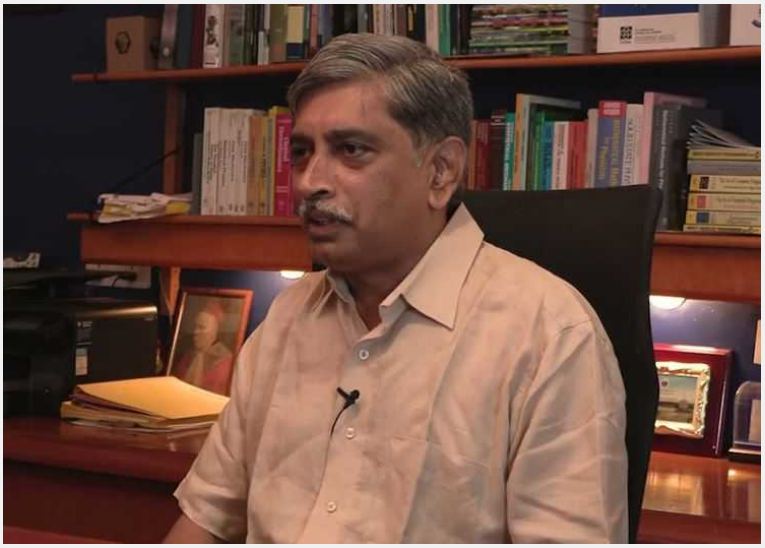
Dispensary PRL conveys heartiest thanks to all CHSS beneficiaries for making this Influenza vaccine camp successful.

SIMS & Beyond

The one-day "SIMS and Beyond" meeting, organized by the Physical Research Laboratory (PRL) on November 18, 2025, served as a scientific commemoration of Professor Jitendra Nath Goswami's extraordinary career and lasting mentorship in Planetary Sciences. The symposium, which drew approximately 50 participants, was strategically designed not only to celebrate Prof. Goswami's legacy as a pioneer who inspired generations of scholars but also to foster forward-looking discussions inspired by his work. The central scientific focus was the origin and early evolution of the solar system, a research area that critically depends on the high-resolution analysis of extra-terrestrial materials like meteorites and lunar samples—precisely the kind of work enabled by Secondary Ion Mass Spectrometry (SIMS). Around ten invited speakers, including early collaborators of the PRL SIMS laboratory, presented research covering the chronological aspects of both terrestrial and meteorite samples, alongside new projects utilizing advanced instruments, specifically the 1300 HR and the nanoSIMS. By gathering Prof. Goswami's mentees and collaborators, the event successfully ensured that the torch of his intellectual curiosity and analytical rigor continues to be carried forward within the scientific community.

Figure Caption: Professor J. N. Goswami with some of his former Postdoctoral fellows, Graduate students, and the next generation of researchers (grand students)—representing the academic lineage established over three decades.
Standing Left to Right: Dr. Kuljeet Kaur Marhas, Dr. G. Srinivasan, Dr. Maibam Bidyananda, Professor J. N. Goswami, Dr. Michael Wiedenbeck, Mr. Vikram Goyal, Dr. Dipak Panda, Dr. Ritesh Kumar Mishra, Dr. Deepak Dhingra.
Sitting Left to Right: Ms. Neha, Ms. Divyadarshini, Mr. Mohit Gomi, Mr. Jaseem Shan, Ms. Gayathri Vinod Kumar , Ms. Shreeya Natrajan, Mr. Ankit Prakash Singh, Mr.Antariksh Mitra.

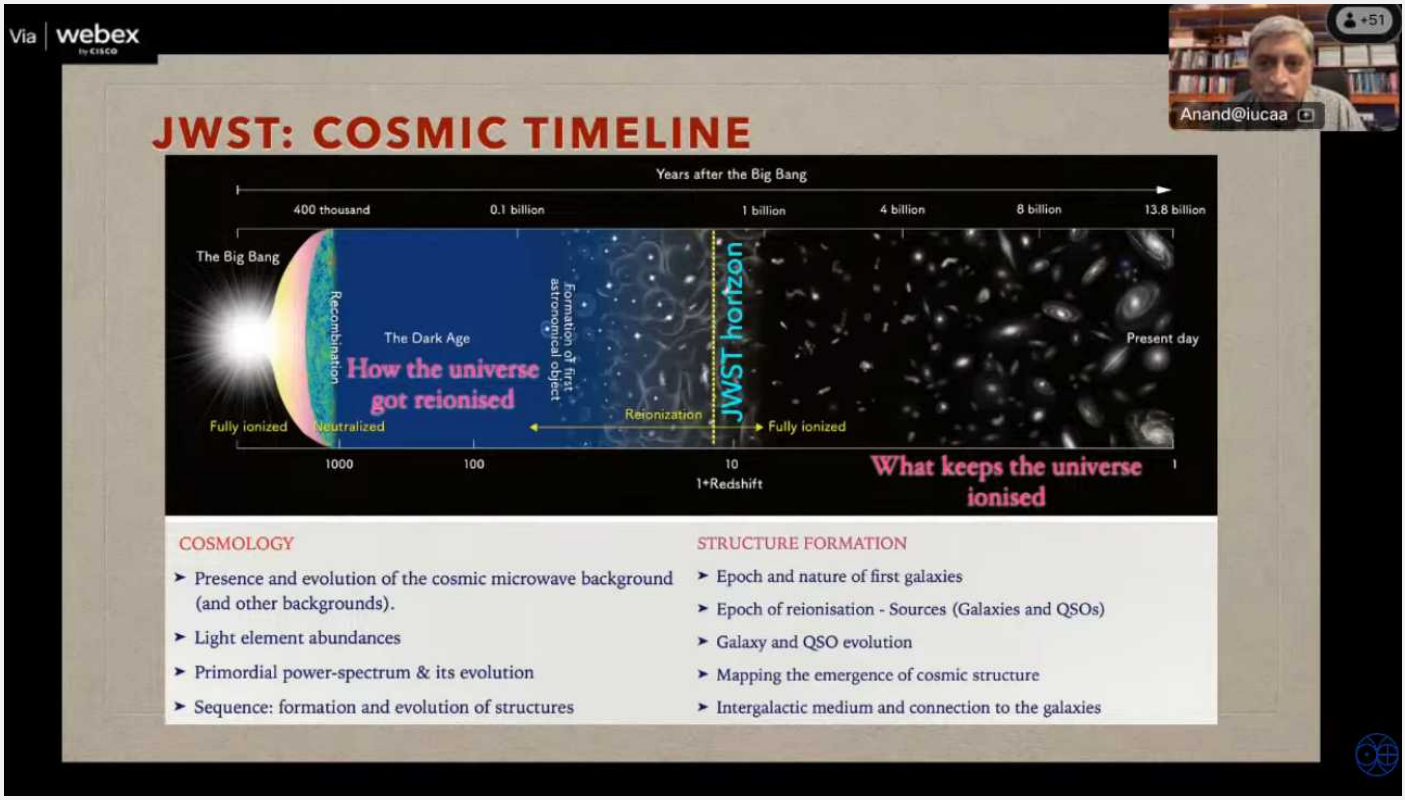
PRL ka Amrut Vyakhyaan - 110



The 110th PRL Ka Amrut Vyakhyaan was delivered on 19 November 2025 by the eminent astrophysicist Prof. Raghunathan Srianand, Director of the Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune. In his Vyakhyaan, titled “Physics of Young Galaxies in the Early Universe”, Prof. Srianand presented an up-to-date perspective on the early Universe, highlighting how recent observational breakthroughs, particularly with the James Webb Space Telescope and advanced numerical simulations are transforming our understanding of the formation and evolution of the first galaxies.

Prof. Srianand began the Vyakhyaan with an overview of galaxies, emphasizing their multiwavelength nature and key constituents—stellar mass, gas and dust, dark matter, and central active galactic nuclei and noting that realistic galaxy simulations must self-consistently incorporate all these components. He then outlined the evolution of the Universe from the Big Bang to the present, highlighting how JWST has enabled the detection of galaxies within ~400 Myr of the Big Bang through deep imaging and spectroscopy. The presence of heavy elements in these early galaxies indicates that several had already undergone multiple episodes of star formation. He further discussed that JWST is revealing a larger population of galaxies and candidate young black holes at high redshift than predicted by earlier models and observations, posing significant challenges to existing theories of galaxy formation and early black hole growth. To address these challenges, Prof. Srianand described new numerical simulations being developed by his group at IUCAA in collaboration with NISER, detailing the physical processes and spatial scales involved. He then presented key results from these simulations, showing that the simulated galaxy luminosity functions are in good agreement with JWST observations, except at the highest redshifts (z 10). In addition, he highlighted that most properties of the simulated galaxies are consistent with existing benchmark models and simulations, indicating steady progress in constraining the relevant parameter space of galaxy formation and evolution and the associated underlying physics. He also discussed current limitations of the simulations, particularly in reproducing black hole luminosity functions and chemical enrichment of the galaxies, and outlined future directions to address these challenges.

Altogether, Prof. Srianand’s Vyakhyaan highlighted how new observational breakthroughs and next-generation simulations together are driving a deeper understanding of the evolution of the early Universe.



Youtube Link: https://www.youtube.com/watch?v=IdhGo8xnzVI

PRL Ka Amrut Rajbhasha Vyakhyaan (PARV) - 30

"पीआरएल अमृत राजभाषा व्याख्यान (PARV)" का 30वां व्याख्यान 19 नवंबर, 2025 को के.आर. रामनाथन सभागार में, हाइब्रिड मोड में आयोजित किया गया था। इस अवसर के प्रख्यात वक्ता पद्म भूषण श्री कमलेश डी. पटेल (दाजी) , ग्लोबल गाइड हार्टफुलनेस संस्थान थे, साथ ही सह-वक्ता और प्रशिक्षक: श्री सुरेश राजगोपालन, श्रीमती शिवानी सोनी थे।

The 30th lecture of "PRL Amrut Rajbhasha Vyakhyaan (PARV)" was held on November 19, 2025, at K.R. Ramanathan Auditorium in Hybrid mode. The eminent speaker for the occasion was Padma Bhushan Shri Kamlesh D. Patel (Daaji), Global Guide Heartfulness Institute along with Co-speakers and Trainers: Mr. Suresh Rajagopalan, Mrs. Shivani Soni.

दाजी हार्टफुलनेस आंदोलन के वैश्विक मार्गदर्शक और श्री राम चंद्र मिशन के अध्यक्ष हैं। उनका जन्म 28 सितंबर 1956 को गुजरात, भारत में हुआ। बचपन से ही उनमें जीवन के गहरे अर्थ को जानने की जिज्ञासा थी। उन्होंने फार्मेसी की पढ़ाई की और आगे चलकर न्यूयॉर्क में एक सफल फार्मासिस्ट और व्यापारी बने, लेकिन उनके हृदय की गहराई में सदैव एक खोज थी – आंतरिक शांति और आत्मिक विकास की।

Daaji is the global guide of the Heartfulness movement and President of the Shri Ram Chandra Mission. He was born on September 28, 1956, in Gujarat, India. From childhood, he was curious to understand the deeper meaning of life. He studied pharmacy and went on to become a successful pharmacist and businessman in New York, but deep within his heart, he always craved inner peace and spiritual growth.

ध्यान और साधना के माध्यम से दाजी ने अपने भीतर गहन परिवर्तन का अनुभव किया और 2014 में वे सहज मार्ग आध्यात्मिक परंपरा के चौथे मार्गदर्शक बने।

Through meditation and spiritual practice, Daaji experienced profound inner transformation and in 2014, he became the fourth guide of the Sahaj Marg spiritual tradition.

दाजी के नेतृत्व में हार्टफुलनेस ध्यान आंदोलन आज 160 से अधिक देशों में फैल चुका है और करोड़ों लोगों के जीवन में शांति, प्रेम और संतुलन का संचार कर रहा है। वे ध्यान, शिक्षा, स्वास्थ्य और पर्यावरण संबंधित पहलुओं के माध्यम से हर वर्ग के लोगों के जीवन में सकारात्मक परिवर्तन ला रहे हैं जो भीतर से शुरू होता है। दाजी प्राचीन योगिक ज्ञान को आधुनिक विज्ञान के साथ जोड़ते हैं। वे यह बताते हैं कि अध्यात्म कोई आस्था या मान्यता मात्र नहीं, बल्कि एक जीवंत अनुभव है, जिसे हर व्यक्ति अपने भीतर महसूस कर सकता है।

Under Daaji's leadership, the Heartfulness meditation movement has spread to more than 160 countries and is infusing peace, love, and balance into the lives of millions. He brings positive change to people from all walks of life through meditation, education, health, and environmental initiatives, starting from within. Daaji combines ancient yogic wisdom with modern science. He explains that spirituality is not merely a belief or a concept, but a living experience that everyone can experience within.

दाजी की दूरदृष्टि से कान्हा शांति वनम, हैदराबाद के पास, स्थापित हुआ है – यह विश्व का सबसे बड़ा ध्यान केंद्र है। यहाँ हजारों साधक प्रतिदिन आंतरिक शांति का अनुभव करते हैं। यह स्थान केवल ध्यान का केंद्र नहीं बल्कि प्रकृति, विज्ञान और आध्यात्मिकता का संगम है।
Daaji's vision led to the establishment of Kanha Shanti Vanam, near Hyderabad—the world's largest meditation center. Thousands of seekers experience inner peace here every day. This place is not only a centre of meditation but also a confluence of nature, science and spirituality.

भारत सरकार ने उन्हें आध्यात्मिकता के क्षेत्र में उनके योगदान हेतु पद्म भूषण से सम्मानित किया है। उन्होंने कई प्रेरणादायी पुस्तकें लिखी हैं – जैसे "द हार्टफुलनेस वे", "डिज़ाइनिंग डेस्टिनी", और "स्पिरिचुअल एनाटॉमी", जिनके माध्यम से वे बताते हैं कि हम अपने हृदय से जुड़कर अपनी नियति स्वयं बना सकते हैं।
The Government of India honored him with the Padma Bhushan for his contributions to spirituality. He has written several inspirational books—such as "The Heartfulness Way," "Designing Destiny," and "Spiritual Anatomy," through which he explains that by connecting with our hearts, we can create our own destinies.

व्याख्यान का शीर्षक था/ The vyakhyaan was titled "ध्यान - आनंद और श्रेष्ठा का आंतरिक जागरण"-लाइव गाइडेड मैडिटेशन वर्कशॉप"

व्याख्यान की शुरुआत सह-वक्ताओं और प्रशिक्षकों, श्री सुरेश राजगोपालन और श्रीमती शिवानी सोनी द्वारा की गई, जिन्होंने हार्टफुलनेस इंस्टीट्यूट और दुनिया के 160 देशों में इसके विस्तार के बारे में जानकारी दी।
The Vyakhyaan was initiated by Co-speakers and Trainers, Mr. Suresh Rajagopalan and Mrs. Shivani Soni, who gave the brief about the Heartfulness Institute and its popularities across 160 countries in the world.

इसके बाद, दाजी व्याख्यान में ऑनलाइन माध्यम द्वारा शामिल हुए और दर्शकों को संबोधित किया। दाजी ने बताया कि हम सभी जीवन में सफलता, शांति और आनंद चाहते हैं और हमारा मानना है कि इन्हें बाहरी परिस्थितियों, स्थिति, धन या भौतिक संपत्ति के माध्यम से प्राप्त किया जा सकता है। लेकिन सच्चाई यह है कि आनंद कोई ऐसी चीज़ नहीं है जिसे हम बाहर से पा सकते हैं; यह हमारा आंतरिक स्वभाव है। इस आंतरिक आनंद को जगाने का सबसे सरल तरीका है ध्यान। आज की चर्चा इसी विषय पर केंद्रित है.
Thereafter, Daaji joined the lecture through online mode and addressed the audience. Daaji explained that we all seek success, peace, and joy in life and we believe that these can be obtained through external circumstances, status, wealth, or material possessions. But the truth is that joy is not something we can find externally; it is our inner nature. The simplest way to awaken this inner joy is meditation. Today's discussion focuses on this topic.

उन्होंने आगे बताया कि ध्यान की प्रक्रिया हमें अपने विचारों की अव्यवस्था से बाहर निकालकर शांति की गहरी स्थिति में ले जाती है। जब हम अपने दिल के साथ कुछ समय बिताते हैं, तो हम अपने भीतर की ऊर्जा, करुणा और ज्ञान से जुड़ना शुरू कर देते हैं। जब मन शांत होता है तो हमारी अंतरात्मा की आवाज स्पष्ट हो जाती है। हमारे निर्णय बेहतर हो जाते हैं, हमारा दृष्टिकोण व्यापक हो जाता है और हम हर स्थिति में संतुलित रहते हैं। यह अतिक्रमण का आंतरिक जागरण है।
He further elaborated that the process of meditation takes us out of the clutter of our thoughts and into a deeper state of peace. When we spend some time with our heart, we begin to connect with the energy, compassion, and wisdom within us. When the mind is calm, the voice of our conscience becomes clearer. Our decisions become better, our perspective broadens, and we remain balanced in every situation. This is the inner awakening of transcendence.

जब हम नियमित रूप से ध्यान करते हैं तो हमारे भीतर से तनाव, डर और अस्थिरता धीरे-धीरे गायब हो जाती है। उनके स्थान पर हम शांति, स्थिरता और आनंद का अनुभव करते हैं। यह खुशी हमारे व्यवहार, हमारे रिश्तों और हमारे काम में झलकने लगती है। इसलिए, ध्यान केवल मन को शांत करने का अभ्यास नहीं है; यह जीवन को बढ़ाने की कला है। यह हमें हमारे भीतर से जोड़ता है, हमें संवेदनशील बनाता है और हमें एक ऐसा इंसान बनाता है जो खुद तो खुश है ही, दूसरों के जीवन में भी रोशनी फैला सकता है।
When we meditate regularly, stress, fear, and instability gradually disappear from within us. In their place, we experience peace, stability, and joy. This joy begins to reflect in our behavior, our relationships, and our work. Therefore, meditation is

not just a practice to calm the mind; it is the art of enhancing life. It connects us to our inner self, makes us sensitive, and makes us a person who is happy within ourselves and can also spread light in the lives of others.

इसके बाद, दाजी ने दर्शकों को ध्यान करने का निर्देश दिया और इससे दर्शकों को अत्यधिक आंतरिक शांति और शांति मिली। उक्त व्याख्यान का पीआरएल यूट्यूब चैनल पर सीधा प्रसारण किया गया और PARV व्याख्यान श्रृंखला का एक रिकॉर्ड स्थापित किया गया, इस व्याख्यान के दर्शकों की संख्या 10,000 से अधिक हुई। पीआरएल परिवार के सदस्य, सेवानिवृत्त और आईसीएसएफ अधिकारी अभ्यास और लाइव निर्देशित ध्यान में शामिल हो गए हैं। इस वार्ता के माध्यम से दर्शकों को ध्यान की शक्ति और आंतरिक शांति का गहन अनुभव हुआ।

Thereafter, Daaji instructed the audience to do meditation and that gave audience immense inner peace and calmness. The said lecture was live telecast in PRL youtube channel and set a record of PARV vyakhyaan series, the viewership of this vyakhyaan has crossed more than 10,000. PRL family members, retirees and officials have joined the vyakhyaan and live guided meditation. The audience thoroughly experienced the power of meditation and inner peace through this talk.

Cyber Security Awareness Session: "Safeguarding Your Digital World – Cybersecurity for Women"

A Cyber Security Awareness Session titled "Safeguarding Your Digital World – Cybersecurity for Women" was held on 20 November 2025 at 4:00 PM in the Nanosims Hall. The programme was co-hosted by Ms. Srishti Sharma from the CNIT Division and Dr. Pragya Pandey from the Library & Information Services Division and conducted in hybrid mode, enabling participation from the Main Campus, Thaltej Campus, Mt. Abu, and Udaipur Campuses. Fifty PRL women employees attended the session.

The session aimed to empower women with essential knowledge of online safety and to highlight the growing importance of cybersecurity in everyday digital activities. Ms. Srishti Sharma introduced the fundamentals of cybersecurity, explaining the importance of protecting devices, networks, and personal data in today's digitally dependent world. She highlighted the increasing incidence of cyber threats such as phishing, online fraud, identity theft, and cyberstalking, with particular focus on challenges commonly faced by women.

The session covered various cyber threat actors, including hackers, scammers, impersonators, and stalkers, along with common cyber threats such as phishing emails, malicious links, malware, and data breaches. These discussions helped participants understand how cyberattacks occur and emphasized the need for vigilance in the digital environment. Dr. Pragya Pandey discussed the financial, emotional, and psychological impacts of cyberattacks and addressed women- and child-specific online threats such as cyberbullying, doxxing, sextortion, grooming, and misuse of personal information. A brief overview of the POCSO Act was provided to raise awareness about legal safeguards available for children. The session further emphasized digital hygiene practices, including safe browsing, use of strong and unique passwords, regular device updates, responsible management of application permissions, and avoidance of untrusted applications.

Ms. Srishti introduced the participants to practical cybersecurity tools such as VirusTotal, Have I Been Pwned, Wayback Machine, and Fing, and were informed about cybercrime reporting mechanisms including the 1930 Helpline, the National Cyber Crime Reporting Portal, Sanchar Saathi, and the CEIR portal. The programme concluded with practical tips for securing mobile devices and online accounts, followed by a 20-question quiz that demonstrated participants' understanding and enhanced confidence in cybersecurity concepts. The session proved to be highly beneficial and well appreciated by all participants.

Celebration of Constitution Day

The "Day of Constitution" in India is celebrated annually on November 26th as Constitution Day (Samvidhan Diwas), commemorating the historic adoption of India's Constitution by the Constituent Assembly on November 26, 1949. This day honors the founding fathers and promotes the values and principles enshrined in the document, which came into effect on January 26, 1950 (Republic Day).

As per the directives received from Department of Space, Bengaluru, 26th November, 2025 is to be observed as Constitution Day in PRL.

Accordingly, the Constitution Day was celebrated in PRL on Wednesday, 26th November 2025. On this occasion, the "PREAMBLE OF THE CONSTITUTION "was read by PRL members at respective work place.

Glimpses from the Pledge Taking

PRL's Monthly Publications Digest

Atomic, Molecular and Optical Physics [04]

1. Jalaja Pandya, Malika Singhal, Navinder Singh, Naveen Chauhan, 2025, DFT Investigations of Major Defects in Quartz Crystal: Implications for Luminescence and ESR Dosimetry and Dating, Radiation Physics and Chemistry, Date of Publication: 29/11/2025, Impact Factor: 3.3
2. Satyendra Nath Gupta, 2025, Single Quantum Emitter Strong Coupling with Plasmonic Cavities: A Review, Physica Status Solidi B, Date of Publication: 22/11/2025, Impact Factor:
3. Swetapuspa Soumyashree, Prashant Kumar, 2025, Investigation of signal enhancement of aluminum emission in LIBS using gold nanoparticles in air and vacuum, Spectrochimica Acta Part B: Atomic Spectroscopy, Date of Publication: 20/11/2025, Impact Factor: 3.8
4. Vinny Cris M, Preeti Gangwani, Haider Ansari MD, Ravi Kumar, Salla Gangi Reddy, Shashi Prabhakar, J. Banerji, R.P. Singh, 2025, Theoretical and experimental analysis of coherence vortices and their propagation characteristics, Optics and Lasers in Engineering, Date of Publication: 01/11/2025, Impact Factor: 3.7

Astronomy & Astrophysics Division [03]

1. Layek, Narendranath, Prantik Nandi, Sachindra Naik, Birendra Chhotaray, Arghajit Jana, Priyadarshee P. Dash, Neeraj Kumari, C. S. Stalin, Srikanth Bandari, and S. Muneer, 2025, Discovery of Changing-look Behavior in AGN NGC 3822: A Long-term Multiwavelength Study, The Astrophysical Journal, Date of Publication: 27/11/2025, Impact Factor: 5.4
2. Barchiesi, L., L. Marchetti, M. Vaccari, C. Vignali, F. Pozzi, I. Prandoni, R. Gilli, M. Mignoli, J. Afonso, V. Singh, C. L. Hale, I. Heywood, M. J. Jarvis, I. H. Whittam, 2025, Tracing AGN-Galaxy Co-Evolution with UV Line-Selected Obscured AGN, Monthly Notices of the Royal Astronomical Society, Date of Publication: 25/11/2025, Impact Factor: 4.8
3. Saraf, P., T. Sivarani, T. C. Beers, Y. Hirai, M. Tanaka, C. A. Prieto, and D. Karinkuzhi, 2025, On the Origin of Neutron-capture Elements in r-I and r-II Stars: A Differential-abundance Analysis, The Astrophysical Journal, Date of Publication: 20/11/2025, Impact Factor: 5.4

Planetary Sciences Division [02]

1. Misra, S., D. Ray, 2025, Hybrid volcanic rocks from Alech Hills, Saurasthra, western India- insight into the role of magma mixing in the evolution of Late Cretaceous Deccan Traps Volcanic Province, Earth-science Review, Date of Publication: 26/11/2025, Impact Factor: 10
2. Varsha M Nair, Sana Hasan Jagmag, Amit Basu Sarbadhikari, 2025, The role of magnetite-rich environments in prebiotic chemistry and astrobiology: insights into serpentinization processes on Mars, Frontiers in Astronomy and Space Sciences, Date of Publication: 21/11/2025, Impact Factor: 2.6

Space and Atmospheric Sciences Division [03]

1. Ruchita Shah, Som Sharma, Harish Gadhavi, Aniket, Rohit Srivastava & Dharmendra Kamat, 2025, Characteristics of uniformly distributed cirrus clouds over the Arabian Sea, Remote Sensing Letters, Date of Publication: 07/11/2025, Impact Factor: 1.5
2. Fagundes, P.R., Pillat, V.G., Anoruo, C.M., Picanço, G.A.S., Pezzopane, M., Habarulema, J.B., Venkatesh, K., Tardelli, A., Christovam, A.L. and Vieira, F., , 2025, Midnight simultaneous observations of spread F and multiple F layer stratifications during the 11–12 May 2024 geomagnetic superstorm, Journal of Geophysical Research: Space Physics, Date of Publication: 06/11/2025, Impact Factor: 2.9
3. Kamran Ansari and S. Ramachandran, 2025, Enhancing accuracy in identifying absorbing aerosol types and their radiative impacts, npj Climate and Atmospheric Science, Date of Publication: 05/11/2025, Impact Factor: 8.4

Geosciences Division [03]

1. S. Prasad, P. K. Mishra, M. Stebich, S. Pinkerneil, S. Khan, P. Pattanchari, A. Jehangir, A. Ambili, T. Utescher, R. Krishnan, Amzad Laskar, Birgit Gaye, 2025, The differential impact of global temperature trends on prolonged droughts in the Indian Monsoon realm during the past five millennia, Global and Planetary Change, Date of Publication: 26/11/2025, Impact Factor: 4.0
2. Kirankumar, P., P. Nayak, M.G. Yadava , 2025, Isotopic composition (18O and D) of ambient atmospheric water vapor in a semi-arid region: variabilities and controlling factors, Physics and Chemistry of the Earth, Parts A/B/C, Date of Publication: 24/11/2025, Impact Factor: 4.1
3. Amit Pandey, Virendra Padhya, Swagatika Chakra, Akash Ganguly, Harsh Oza, Ruchir Patidar, R.D. Deshpande, 2025, Deciphering Groundwater Dynamics and Recharge Sources Across India Using Stable Isotopes: Implications for Sustainable Water Management, Groundwater for Sustainable Development, Date of Publication: 10/11/2025, Impact Factor: 5.6

Udaipur Solar Observatory [01]

1. P. Zucca, P. Zhang, K. Kozarev, M. Nedal, S. Dey, M. Mancini, Anshu Kumari, D. E. Morosan, B. Dabrowski, P. T. Gallagher, A. Krankowski and C. Vocks, 2025, Source location and evolution of a multilane type II radio burst, Astronomy & Astrophysics, Date of Publication: 19/11/2025, Impact Factor: 6.1

Theoretical Physics [01]

1. Pal, S., S. Seth, 2025, Universality at next-to-leading power for jet associated processes, Physical Review D (Letter), Date of Publication: 24/11/2025, Impact Factor: 5.3

Awards & Honours

(1) Mr. Sandeep Dubey, Senior Research Fellow, PRL's Udaipur Solar Observatory, has received the Best Poster Award in the International Workshop the Variable Sun: Past, Present and Future Perspectives, held at IIST, Thiruvananthapuram, during 13-17 October 2025.

(2) Ms. Aishwarya Singh, Senior Research Fellow, Geosciences Division, has received the Best Poster Award in the International Symposium on Tropical Meteorology (INTROMET 2025), organized by the Indian Meteorological Society at the Indian Institute of Tropical Meteorology (IITM) Pune during 18-20 November 2025.

Visitors

1. Fifty (50) students and Four (4) teachers from various tribal schools of the Rajasthan Government (nominated by Divisional Commissioner's Office, Udaipur in collaboration with Traibal Area Development Office have visited Udaipur Solar Observatory (USO), PRL, Udaipur on 14.11.2025 to see various scientific facilities at USO.

2. Dr. Ajit C. Balram, Reader-F from Institute of Mathematical Sciences (IMSc), Chennai visited Physical Research Laboratory, Ahmedabad from 17.11.2025 to 19.11.2025 for collaborative work and to deliver a seminar.

3. Dr. Peter Jozef De Cat & Scientific Researcher, from Royal Observatory of Belgium, Brussels, Belgium visited Physical Research Laboratory, Ahmedabad, and Infra-Red Observatory, Mount Abu from 18.11.2025 to 23.11.2025 for scientific discussion with PRL Scientists and interaction with Research Scholars.

4. Forty (40) members of The Institution of Engineers (India), Udaipur Local Centre, Udaipur have visited Udaipur Solar Observatory, Udaipur on 20.11.2025 to see various scientific facilities at USO.

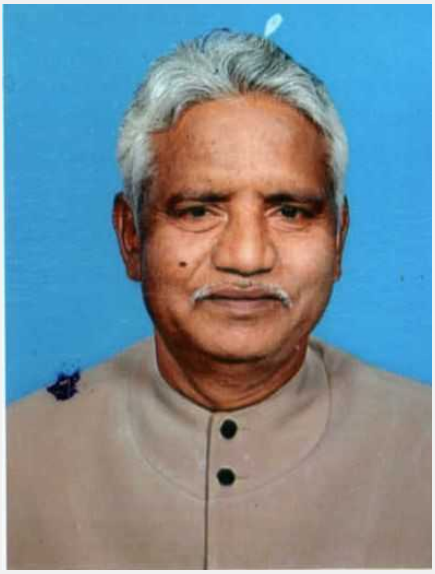
5. Prof. G.S. Vaitheeswaran, Professor, University of Hyderabad visited Physical Research Laboratory, Ahmedabad on 27.11.2025 to give a seminar.

6. Prof. Hiranmaya Mishra (Retired Sr. Professor of PRL) from NISER, Bhubaneswar visited Physical Research Laboratory, Ahmedabad from 25.11.2025 to 28.11.2025 for interaction with PRL Scientists and Research scholars as well as to deliver a talk.

7. Eight (8) participants of PRL-CSSTEAP PG Course on Space and Atmospheric Science have visited Udaipur Solar Observatory, Udaipur on 28.11.2025 to see various scientific facilities at USO

8. During November 2025, forty one (41) Defense Personnel, four (4) students and Seventeen (17) General Public have visited Infra-Red Observatory (IRO), PRL, Mount Abu to see various facilities at IRO.

OBITUARY



स्वर्गीय श्री बी. डी. वाघेला
Late Shri B.D. Vaghela
सफाईवाला-सी Safaiwala-C

Date of Birth	31.05.1953
Date of Joining	26.12.1973
Date of retirement	31.05.2013
Date of Death	11.11.2025

Teary Eyes for our Departed Member

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