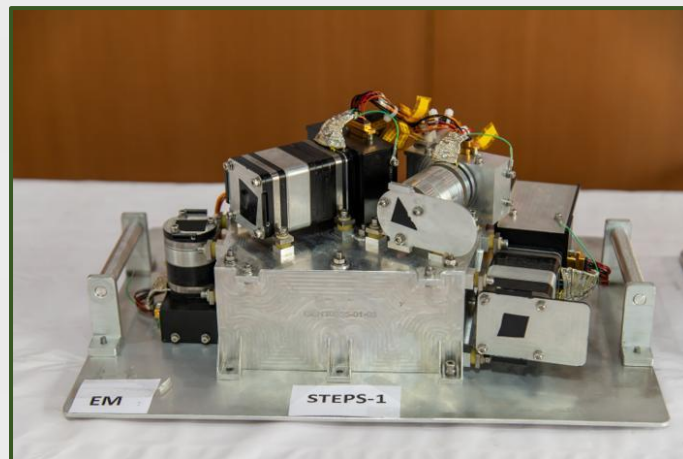




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**Picture of the month: STEPS Payload**

Isotope Shifts as Sensitive Probes for Physics Beyond the Standard Model

(B Ohayon, S Hofsäss, J E Padilla-Castillo, S C Wright, G Meijer, S Truppe, K Gibble and B K Sahoo)

The Author

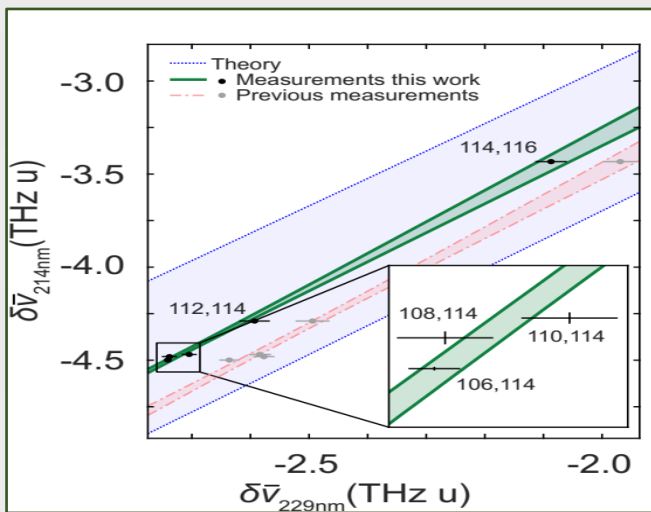


B.K. Sahoo

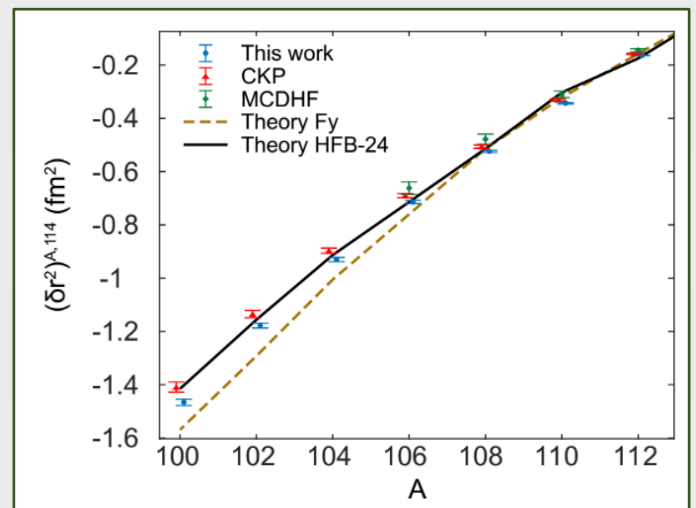
Today the most accurately determined quantities are optical clock transition frequencies, which are measured to better than  $10^{-18}$  precision level. This superb spectroscopic precision enables stringent searches for new physics. One such approach compares the isotope shifts (ISs) of two or more transitions in a King plot, in which a deviation from a linear behaviour can be a signature for beyond the Standard Model (BSM) physics, such as a new boson mediating a force between electrons and neutrons. King Plot searches are applicable to systems possessing narrow optical transitions for which ISs can be measured with high precision, even with extraordinary sub-Hz accuracy using common-mode noise rejection. Searches for deviations from linearity with KPs require a minimum of four stable (or long-lived) even-even isotopes, which severely restricts the number of candidate elements.

In a recent joint collaborative work between experimentalists and theoreticians, we investigated ISs of a long chain of short-lived cadmium (Cd) ions and extracted accurate charge radii differences by overcoming limitations from muonic atom measurements. This was the first extraction of root mean square (RMS) charge radii differences for a chain of isotopes with an accuracy better than 1%, which opened up an opportunity to improve our knowledge of nuclear sizes far from stability. Beyond benchmarking nuclear models, these are important to identify the patterns of non-linearities in future high-precision measurements. This work sets the stage for new physics searches using generalized KPs in the Cd system. Our results suggest that precise future Cd IS measurements can improve, by as much as two orders of magnitude, the current best bounds on new electron-neutron interactions, obtained from a KP for Ca II transitions.

Reference: <https://doi.org/10.1088/1367-2630/acacbb>



King Plots of two selected Cd transitions. The vertical axis data are the isotope shifts of the 214 nm line.



Squared RMS charge radii of even-even proton rich Cd isotopes relative to  $^{114}\text{Cd}$ .

## Mare filled craters on the Moon

(K.B. Kimi, Harish, S. Vijayan)

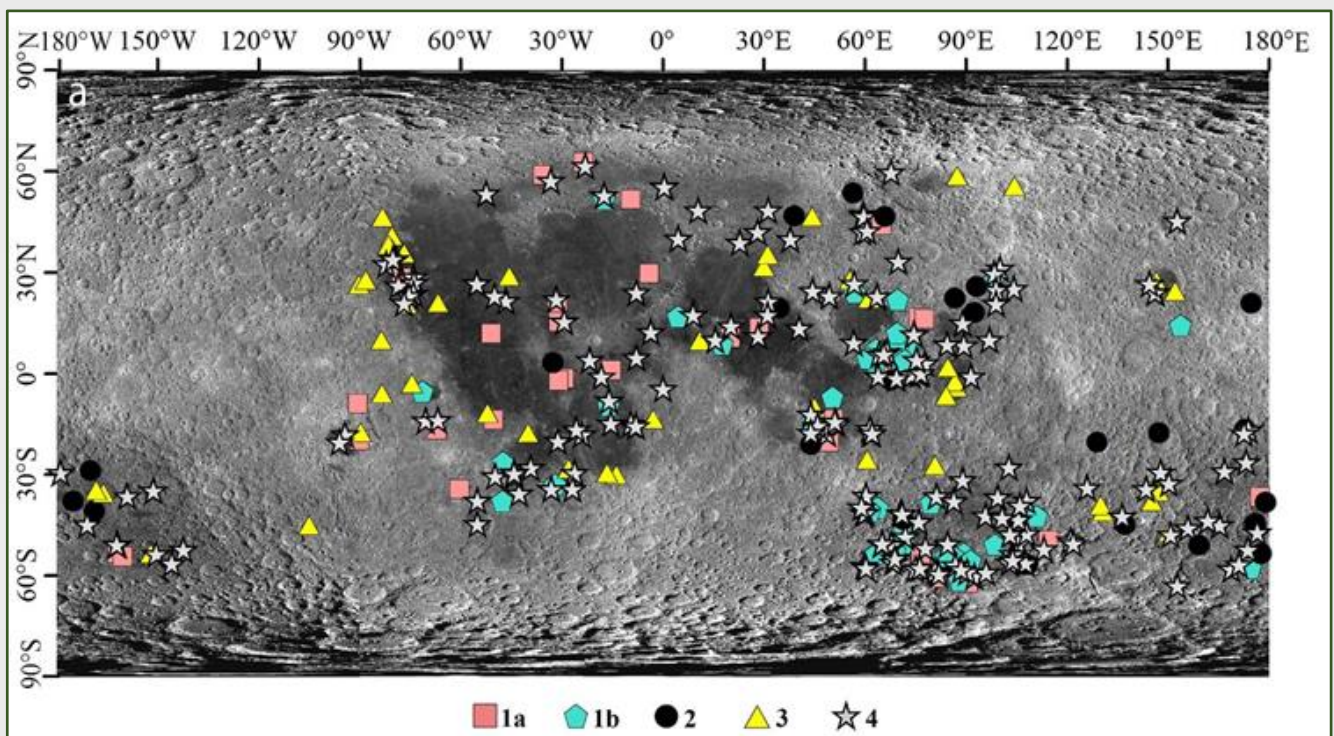
### The Author



Kimi Khungree  
Basumatary

The lunar craters filled with lava materials represent direct evidence of post-modification processes. This study mapped such craters and analysed their diagnostic characteristics. We identified 324 mare-filled craters with diameters ranging from ~4 km to ~270 km. We considered mare-filled craters with unbreached rims to investigate the infilling process and categorised mare-filled craters into five classes (1a, 1b, 2, 3 and 4). We observed that these craters are predominantly located at the periphery of the mare region and at the rims of impact basins, while only a few are found in the highlands and within the mare regions. These craters' infilling age spans from ~4 to ~1.7 Ga, which is compatible with our current models of mare chronology. We observed lava filling in several simple craters, which ought to be sourced from relatively shallower recent magma reservoirs. Our study reveals that 54% of floor fractured craters (FFCs) are resurfaced and modified to different degrees by lava emplacement. Therefore, such craters have witnessed multiple events and are referred to as Mare Modified-FFCs (MM-FFCs). Overall, this study provides an understanding of the global distribution and characteristics of craters modified by lava infilling and how they vary globally, suggesting heterogeneous sources.

Reference: <https://doi.org/10.1016/j.icarus.2022.115298>



The distribution of five different classes of mare-filled craters on the Moon. The classes indicated diverse activities post impact.

**Shallow subsurface basalt layer along Cerberus Fossae, Mars: Insights from SHARAD, HiRISE, and CRISM analysis**

*(Harish, K.B. Kimi, S. Tuhi, S. Baliyan, N. Mangold, S. Vijayan, M.R. El-Maarry)*

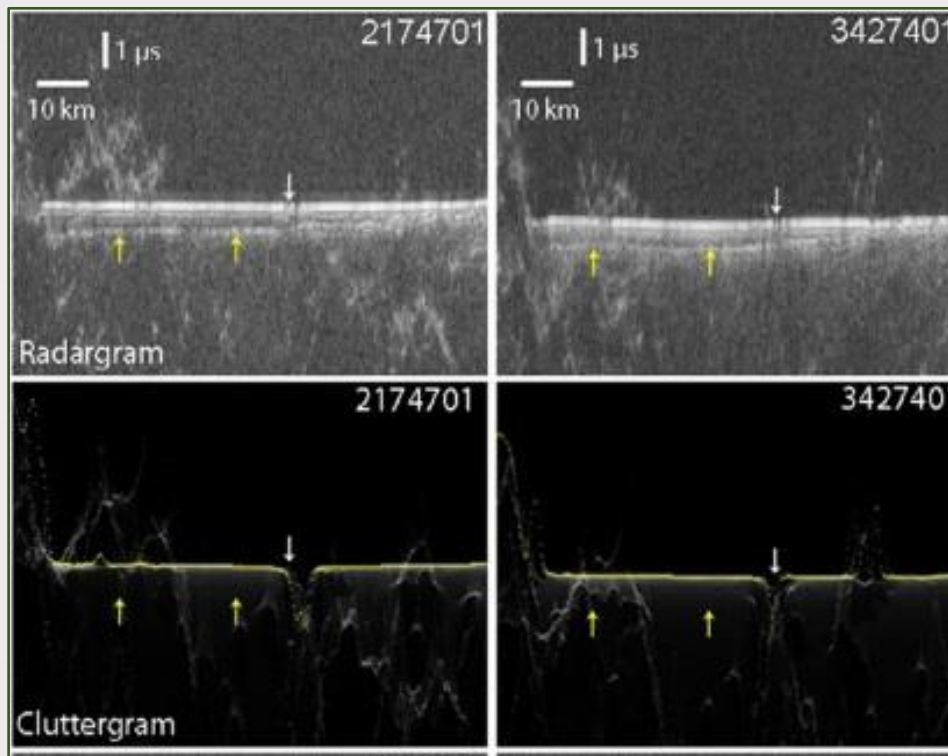
**The Author**



Harish

We surveyed the subsurface structure along Cerberus Fossae, where we identified meter-scale stratigraphy of three distinct vertical units 1) ~3-5 m thick regolith cover, 2) ~30 m thick layered unit, and 3) ~260 m thick massive unit dominated by boulders. Using SHARAD radargrams, we identified a subsurface reflector at the interface between units 2 and 3, located ~34 m deep. Our analysis suggests a real dielectric permittivity of  $9.34 \pm 1.01$  ( $1\sigma$ ), and a mean loss tangent of  $0.027 \pm 0.01$  for the shallow subsurface material indicating thick, dense shergottite-type basaltic material. Using the dielectric permittivity mixing law, we found that the porosity of the shergottite-type basalt is ~4%. CRISM analysis aids in further constraining the nature of the shergottite-type basalt and suggests the presence of Fe-rich olivine. We derived the age of subsurface material using the CSFD and estimated the crater retention age of ~4 Ma. Overall, this study suggests a ~30 m thick, dense, layered olivine-bearing shergottite-type basalt along the Cerberus Fossae, which is older than 4 Ma. Our results are incompatible with the hypothesis of a sea of frozen water in the shallow subsurface (up to 35 m) along the Cerberus Fossae.

Reference: <https://doi.org/10.1016/j.icarus.2022.115343>



Radargrams and their corresponding cluttergrams with a reflector (in all radargrams) highlighted with yellow arrows across the Cerberus Fossae. The white arrow shows the location of Cerberus Fossae.

## Ma'adim Vallis, Mars: Insights into episodic and late-stage water activity from an impact crater

(S. Tuhi, Harish, K.B. Kimi, K. Vigneshwaran, K.S. Sharini, R.K.S. Priya, S.Vijayan)

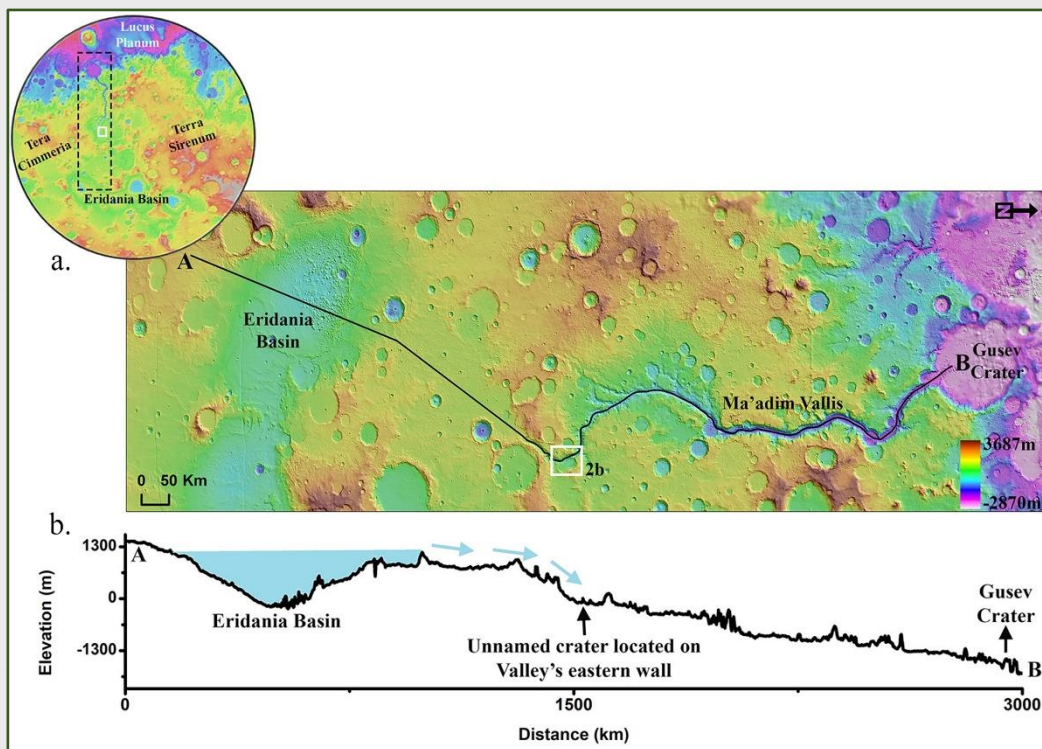
### The Author



Tuhi Saumya

Alluvial fans offer insight into the evolution and nature of the fluvial activity. In this context, we discuss the diverse geomorphology and mineralogy of an unnamed crater formed on the eastern wall of Ma'adim Vallis, Mars. Ma'adim Vallis is an irregular-shaped, flat-floored valley incised due to the outflow of water from the Eridania basin. The rim of the unnamed crater is breached at multiple locations and hosts an alluvial fan of an area of ~50 km<sup>2</sup>. The CRISM spectral signatures show Mg-rich olivine and Mg-rich smectite. Mg-smectite was plausibly transported through water or formed in situ, while the underneath terrain was rich in Mg olivine. The crater retention age on the ejecta of the unnamed crater (3.7 Ga) suggests that the crater likely formed during the Noachian-Hesperian period boundary or earlier. This unnamed crater probably witnessed the last episode of water activity in the Vallis, most likely fed by water overflowing from a resurged early Hesperian water activity in Eridania Basin. This study substantiates episodic, late-stage water activity in Ma'adim Vallis, and the unnamed crater formed on the floodplains of the Vallis provides an excellent opportunity for future landing missions to explore the astrobiological significance of the region.

Reference: <https://doi.org/10.1016/j.icarus.2022.115214>



a) Regional digital elevation map of the study area. The unnamed crater of interest is indicated by the white box. b) The outflow of water from the Eridania basin breached the unnamed crater rim at multiple.

**Aerosol characteristics over a global hot spot: Observations vs. Models**

(Kamran Ansari, S. Ramachandran)

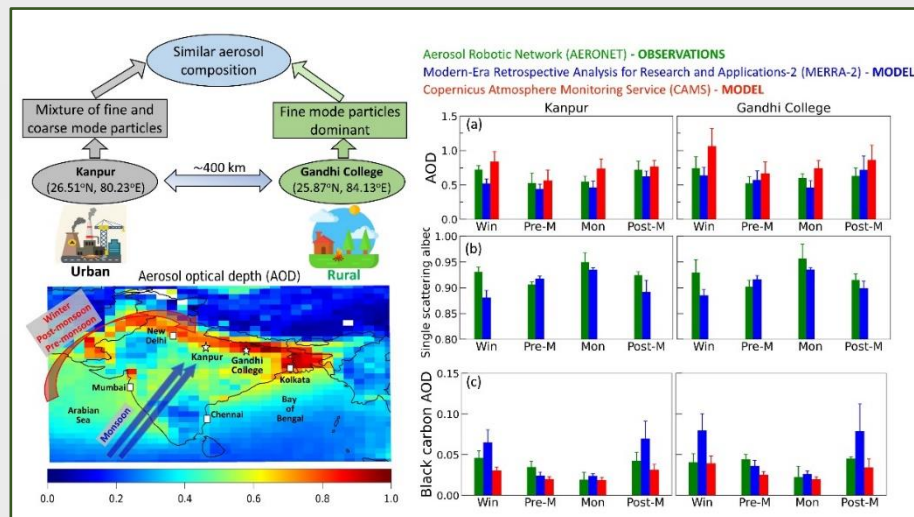
**The Author**



*Kamran Ansari*

Indo-Gangetic Plain (IGP) is one of the most polluted regions, and is a global aerosol hotspot because of high anthropogenic aerosol emissions, and mineral dust. These emissions and meteorological conditions significantly influence both columnar aerosol loading (aerosol optical depth (AOD)) and composition (single scattering albedo (SSA)), which are the most important and sensitive aerosol parameters for determining aerosol radiative effects. Two highly spatially resolved models, Modern-Era Retrospective Analysis for Research and Applications-2 (MERRA-2) and Copernicus Atmosphere Monitoring Service (CAMS) simulated columnar aerosol parameters are compared and contrasted with accurate observational datasets from Aerosol Robotic Network (AERONET) on a seasonal scale over two environmentally distinct locations (Kanpur (urban) and Gandhi College (rural)) in the IGP. AOD exhibits a significant seasonal and spatial variation due to seasonal changes in aerosol emissions and transport processes. During winter and post-monsoon, AOD is higher with the dominance of fine mode anthropogenic aerosols. The comparison between observed and model (MERRA-2 and CAMS) AODs reveals that CAMS AOD is better correlated and less biased with respect to observations due to the utilization of recent and updated emission inventories of anthropogenic aerosols. MERRA-2 AODs are underestimated with high mean bias error during a high anthropogenic aerosol season like winter, whereas, both models perform better during pre-monsoon and monsoon when total AOD and anthropogenic contributions are relatively lower. MERRA-2 SSA is lower than observations during winter due to overestimation of the highly absorbing black carbon aerosol. This quantitative and comparative analysis on a seasonal scale between the observed and model simulated aerosol characteristics will enable a better estimation of aerosol radiative forcing, and can further help improve aerosol processes and parameterizations in models.

Reference: <https://doi.org/10.1016/j.atmosenv.2022.119434>



(Left panel) Annual mean aerosol optical depth (AOD) (data obtained from Moderate Resolution Imaging Spectroradiometer (MODIS) onboard the Terra satellite) and wind direction in different seasons over India along with details of the study locations, dominant aerosol size and composition. (Right panel) Comparison between collocated AERONET observations and model (MERRA-2 and CAMS) simulations of (a) AOD, (b) SSA, and (c) black carbon AOD over Kanpur (urban) and Gandhi College (rural) during winter (Win, DJF), pre-monsoon (Pre-M, MAM), monsoon (Mon, JJAS) and post-monsoon (Post-M, ON).

## A Parametric Study of Performance of Two Solar Wind Velocity Forecasting Models During 2006–2011

(Sandeep Kumar and Nandita Srivastava)

### The Author



*Sandeep Kumar*

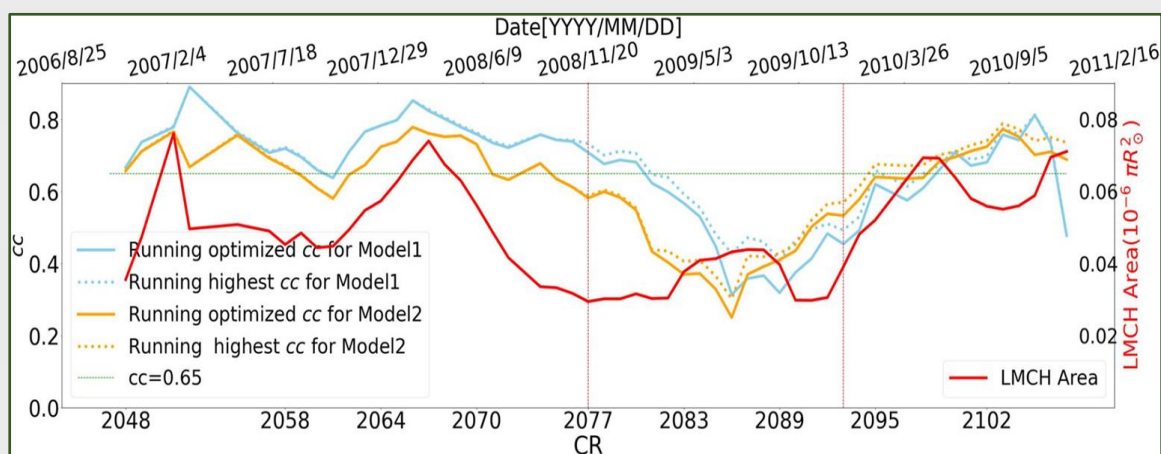
There is an increasing need for the development of a robust space weather forecasting framework. State-of-the-art MHD space weather forecasting frameworks are based upon the Potential Field Source Surface (PFSS) and Schatten Current Sheet (SCS) extrapolation models for the magnetic field using synoptic magnetograms. These models create a solar wind (SW) background for the simulations using empirical relations of Wang, Sheeley and Arge (WSA), at the inner boundary of heliosphere and have been used to simulate coronal mass ejections for specific cases in previous studies. Besides these MHD frameworks, the Heliospheric Upwind eXtrapolation (HUX) technique can extrapolate SW from inner heliospheric boundaries to L1 and can give a reliable estimate of the SW velocity at L1 comparable to MHD models but in a short computational time.

We developed a framework for forecasting solar wind parameters at L1 point using two different models, Model1 (PFSS+WSA+HUX) and Model2 (PFSS+SCS+WSA+HUX). We applied this framework to 60 Carrington Rotations from CR2047 to CR2107 during 2006–2011, spanning the declining and deep minimum phase of solar cycle 23 and the ascending phase of the solar cycle 24. These models use synoptic magnetograms of the GONG network to create the background solar wind. The solar wind velocities estimated using the two models have been compared with observed solar wind velocities by in-situ spacecraft like ACE and Wind at L1. The performance of this framework has been found to be consistently good in general, except in the deep solar minimum. The decreased performance of the framework in the solar minimum has been explained in terms of lower coronal hole area observed during that period. As SC 24 began, this decreasing trend vanished due to an increase in the coronal hole (CH) area at the low and mid-latitudes, suggesting a good correlation between the performance of the framework and the variation in the CH area.

The developed framework in the paper is quite promising as it will provide the background solar wind to simulate CMEs. It will help to develop a space weather forecasting model which can be used to compare with the in-situ observations that will be available from ISRO’s solar mission i.e., Aditya-L1. The computations for this work have been carried out on HPC Vikram-100 of PRL.

Reference: : <https://doi.org/10.1016/j.icarus.2022.115214>

Running average of latitudes coronal hole (LMCH) area of six Carrington Rotations (CRs), derived from SOHO/EIT 19.5 nm channel synoptic maps (shown in red) and running average of cc, of simulated solar wind velocity with the observed solar wind velocity, for Model1 (sky blue) and Model2 (orange).



# Events

## Council Chairman Visit & Flagging off Aditya L1 Payload

On November 23rd, 2022, the PRL Council Chairman (Shri A S Kiran Kumar) visited the Physical Research Laboratory (PRL) and had the honour of flagging off the STEPS payload for ADITYA L1 mission. This visit was a significant milestone for the PRL team, as they were able to showcase their progress and receive valuable feedback from the Council Chairman.

The ADITYA L1 mission aims to study the sun's corona and its influence on the Earth's upper atmosphere. The mission will be launched on-board a satellite, which will be placed in a unique halo orbit around the Lagrangian point L1, where the gravitational pull of the sun and the Earth balance each other. This will enable the satellite to continuously observe the sun without any interruption from the Earth's shadow.

The ADITYA L1 mission is the first of its kind and will provide new insights into the various processes that occur in the sun's corona, such as the acceleration of solar winds and the origin of solar flares. This information will help scientists understand how the sun affects the Earth's upper atmosphere, including the ionosphere and the thermosphere.



The Chairman of the PRL Council ceremoniously initiates the Flagging OFF Aditya L1 payload.



**NATIONAL UNITY DAY**

National Unity Day or Rashtriya Ekta Diwas was celebrated 31<sup>st</sup> October 2022 to mark the birth anniversary of the Iron Man of India– Sardar Vallabhbhai Patel. To celebrate the birth anniversary of Sardar Patel and National Unity Day, the Committee for Azadi ka Amrit Mahotsav, PRL organized the "Cycling, Running, Prabhat Pheri - For UNITY" on 30<sup>th</sup> October 2022 (Sunday). All members of PRL (Permanent staff members, Research Scholars, Project Associates, Post-Doctoral Fellows, Trainees, contractual manpower) and family members were invited to join the campaign as per their preference/convenience. The Team of Students of PRL led this campaign under CAKAM.

Cycling (~ 10 Km) and running (~ 5.5 Km) started from the PRL Thaltej campus and finished at PRL main campus. After that members present there started Padyatra from PRL main campus, walking towards Gujarat University, Panjarapole, IIM, and back to the Main campus (~3 Km). This significant program engraved the spirit of “Ekta” amongst all the participants.



Glimpses of National Unity Day.

## Venus Science Conference 2022

Researchers have been working in the area of planetary sciences for many decades and explore various planets like Venus, Mars, Jupiter, Saturn etc. However, Venus, the sister planet of Earth, has been of interest to space scientists for different reasons. There are some open research problems like evolution of Venusian surface, unknown UV absorber, lightning, super-rotation and space weather on Venus. The observations on Venusian science has been from the time of Venera in 1960s and many missions like Mariner, Pioneer Venus, Vega, Magellan, Venus Express, Akatsuki, IKAROS have provided lots of data to the community. In addition, other unintended missions like Galileo, Cassini, MESSENGER, Parker Solar Probe, BepiColombo and Solar Orbiter have also given flyby observations of Venus. The data analysis from the missions bring different scientific outcomes related to planet Venus and appear in the literature. Some conferences are organized over the globe to discuss the Venusian science, either within a planetary conference or as a dedicated conference.

Recently, the Physical Research Laboratory (PRL) has organised the second conference on Venus Science, Venus-SC-2022 (online) during 29-30 September 2022 IST. It focused on modelling, observations, data analysis, conceptual instrument design and scientific experiments for Venus exploration. The major research areas covered in the conference were surface, atmosphere, clouds, GCM, lightning, airglow, habitability, ionosphere, interplanetary dust, and solar wind interaction with the planet. Such gathering provides an opportunity to interact among the community over the globe and also, collaborate with people working in similar fields over a period of time.

More than 172 delegates had registered for the conference, which included speakers for oral presentations, short oral presentations and other attendees. The oral presentations had 24 talks from universities/institutes outside India and 15 talks from Indian institutions. The short oral presentations have 18 talks from India institutions. A few examples of the talks are Great Climate Transition, Cloud Particle Sample Return, Balloon and In-Situ Missions, Akatsuki Results, Lightning and whistler waves, Venusian GCM, Atmospheric Escape, Radio Occultation Experiments and Interplanetary dust inside 1 AU. This year, we have included a dedicated session on Venusian data analysis for those, who are interested to carry out the data analysis in future.

The outside India included universities/institutes from places like US, UK, Japan, Sweden, South Korea, Taiwan, Germany, France and Norway. The centres/institutes from within India covered SAC, IIRS, SPL, PRL, CHARUSAT, Amity Uni., NARL, St. Xavier’s College, IITB, IISER, NISER, Uni. Allahabad and Panjab Uni. The Venus Science Conference included speakers spanning 4 time zones.

Honourable Shri A. S. Kiran Kumar (Council Chair, PRL) and Honourable Prof. Anil Bhardwaj (Director, PRL) had graced the inaugural session. There were 7 sessions covering all mentioned research areas. The session chairs were well experienced in the domain and they were from various ISRO/Non-ISRO centres. There was a concluding session at the end of the conference. Many people including Prof. Anil Bhardwaj (Director, PRL), Prof. D. Pallamraju (Dean, PRL), the SOC and LOC members, extended LOC members, Dr. Bhushit Vaishnav (Head, Academic Services), Shri Dinesh Mehta, IT team, electrical team and other members had helped as and when needed for the conference



Snapshot of the inauguration session of the Venus Science Conference 2022.

### Covid Vaccination Amrit Mahotsav

As a part of celebration of Azadi Ka Amrit Mahotav and as per the Directives of Department of Space, the COVID Vaccination camp was organised by Dispensary & Medical Cell PRL in association with Ahmedabad Municipal Corporation at Dispensary, Navrangpura Campus on 16th August, 2022.

A total of 163 eligible employees and their dependents were given precautionary dose of Covid Vaccine.

Dispensary & Medical Cell PRL wishes thanks to all to make this camp activity successful



Pictures from vaccination camp.

### World Blood Donor Day

Was celebrated every year throughout the world on 14th of June. With view of this Physical Research Laboratory had organized Blood Donation Drive on 14th June, 2022. Shree Jalaram Abhyudaya Sadbhavna Trust in collaboration with Prathama Blood Bank had successfully conducted Blood Donation Camp at PRL Dispensary Navrangpura Campus. The Blood Donation Drive was arranged at Navrangpura dispensary PRL. A total of 68 units of blood were collected on the Blood Donation Drive.

On the occasion of the WORLD BLOOD DONOR DAY – 14.06.2022, Dispensary PRL extends its heartfelt thanks to all those who had volunteered, contributed & donated their blood for the benefit of Children suffering from Thalassaemia



Pictures from world blood donor celebration at PRL.

### Celebration of Dr. B.R. Ambedkar Jayanti at PRL

The celebration of Dr. B. R. Ambedkar Jayanti was organized at all campuses of PRL on 9th June 2022. Dr. Bodhiraj Vishwas, an eminent scholar and social worker spreading Ambedkar's work and message, was invited to give this address on the occasion of the celebration of Ambedkar Jayanti. Dr. Viswas delivered an excellent lecture on "Why Dr. B. R. Ambedkar chose Buddhism as a Social Movement". The event was live telecast through online Mode for the PRL members at Mt. Abu. On the eve of Dr. B.R. Ambedkar Jayanti Complimentary lunch were also provided at all four PRL campuses



Glimpses of Celebration of Dr. B.R. Ambedkar Jayanti at PRL.

### Garba Celebration at PRL

Navratri is one of the major and important festivals, celebrated to worship the Goddess Durga. Navratri celebration was organized at PRL Thaltej Campus on 01.10.2022. The PRL staff members including trainees, research scholars and students participated enthusiastically. The event started with the Aarti by the Director, PRL and other PRL members. Category wise prize distribution was done at the end.



Glimpses of Garba Celebration at PRL.

## हिंदी माह – एक सिंहावलोकन

प्रति वर्षानुसार हिंदी दिवस के महत्व एवं गंभीरता को ध्यान में रखते हुए, गृह मंत्रालय, राजभाषा विभाग एवं अंतरिक्ष विभाग के निर्देशानुसार, भौतिक अनुसंधान प्रयोगशाला, अहमदाबाद के मुख्य परिसर सहित अन्य तीनों परिसरों थलतेज, माउंट आबू अवरक्त वेधशाला, उदयपुर सौर वेधशाला में, सितंबर माह के दौरान, हिंदी के प्रचार-प्रसार हेतु हिंदी माह के आयोजन के लिए निदेशक महोदय द्वारा एक समिति का गठन किया गया था। इस समिति में विभिन्न वैज्ञानिक प्रभागों एवं सामान्य प्रशासनिक अनुभागों तथा विभिन्न परिसरों से सदस्यों को सम्मिलित किया गया। इस वर्ष 16 सितंबर 2022 से 14 अक्टूबर 2022 के दौरान हिंदी माह मनाया गया तथा हिंदी माह कार्यक्रमों/प्रतियोगिताओं का आयोजन किया गया। हिंदी माह कार्यक्रमों/प्रतियोगिताओं में भारत की स्वतंत्रता के गौरवपूर्ण 75 वर्ष समारोह को भी सम्मिलित किया गया।

इस वर्ष हिंदी दिवस की शुरुआत सूरत गुजरात से द्वितीय अखिल भारतीय राजभाषा सम्मेलन के माध्यम से हुई है, एवं इस सम्मेलन की अध्यक्षता स्वयं गृहमंत्री महोदय ने की।

हिंदी माह समारोह का उद्घाटन कार्यक्रम 16 सितम्बर, 2022 को किया गया। इस कार्यक्रम में डॉ. आर.जे. सुराणी, विशेष अतिथि के रूप में उपस्थित रहे। उन्होंने “प्रतिक्रिया का कारोबार” विषय पर हिंदी में व्याख्यान दिया।

हिंदी माह के दौरान आयोजित कार्यक्रम:-

- शुक्रवार, 16 सितम्बर, 2022 :- उद्घाटन कार्यक्रम एवं हिंदी पुस्तक प्रदर्शनी - हिंदी माह
- सोमवार, 19 सितम्बर, 2022 - हिंदी टंकण प्रतियोगिता
- मंगलवार, 20 सितम्बर, 2022 - सुलेख प्रतियोगिता
- शुक्रवार, 23 सितम्बर, 2022 - कविता पाठ प्रतियोगिता
- मंगलवार, 27 सितम्बर, 2022 - आशुलेखन प्रतियोगिता :- उदयपुर सौर वेधशाला, भौतिक अनुसन्धान प्रयोगशाला, उदयपुर द्वारा आयोजित एक व्याख्यान "जावर : जिंक उत्पादन का प्राचीनतम केंद्र"  
वक्ता : प्रो. जे. एस. खड़कवाल,, विभागाध्यक्ष, पुरातत्व विभाग, जनार्दन राय नगर राजस्थान विद्यापीठ, उदयपुर
- सोमवार, 03 अक्टूबर, 2022 - वर्ग पहेली, टिप्पण, आलेखन
- शुक्रवार, 07 अक्टूबर, 2022- 'हमारा कार्य' प्रतियोगिता, अंतरिक्ष विज्ञान" पर एक विशेष व्याख्यान
- सोमवार, 10 अक्टूबर, 2022 -शब्द प्रश्नोत्तरी प्रतियोगिता



पीआरएल में हिंदी माह कार्यक्रमों की झलकियां.

## Celebration of International Day of Yoga

The 8th International Day of Yoga (IDY-2022) was celebrated on 21 June 2022 (Tuesday) at PRL. The event was organized by the Committee Azadi Ka Amrut Mahotsav (AKAM). The Yoga Day programme was organized at PRL Library Lawn.

The practice session was conducted by Mr. Gyan Acharya by delivering the instructions on doing various types of Asanas and explaining the benefit of each pose in the Asanas. Ms. Priti Iyengar gave stepwise practical demo of each Asanas. Mr. V Ranganathan observed each participant and updated them on making the correct postures.

At the end of the Yoga session, A Surya-Namaskar Competition under AKAM was organized. The competition was categorized into three groups. i.e. Below 16 years, 16 to 29 years and 30 & above. Total 30 number of participants have participated in the said Competition.

The winners of the Surya-Namaskar Competition were awarded with Trophies.



Pictures from Celebration of International Day of Yoga.

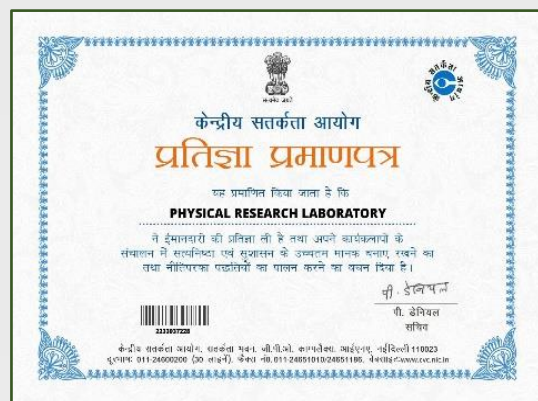
### Vigilance Awareness Week

Based on the Circular of Central Vigilance Commission (CVC) dated 08.09.2022 and endorsement of DOS thereon dated 13.09.2022, the Vigilance Awareness Week (VAW) – 2022 was observed in PRL from 31st October 2022 to 6th November 2022. The theme of the VAW-2022 was “भ्रष्टाचार मुक्त भारत-विकसित भारत” / “Corruption free India for a developed nation”. All the staff Members of PRL took Integrity Pledge at their respective work places on 31.10.2022. Few of the Photographs of PRL staffs taking Integrity Pledge are placed alongside.

Apart from Integrity Pledge, all staff members were encouraged to take Integrity E-pledge in CVC portal (<https://pledge.cvc.nic.in>). A total of 51 PRL Staff have taken E-pledge for which online Certificates are downloadable from CVC portal. Integrity E-Pledge as an organisation has also been taken for PRL and the certificate so received is placed alongside.

An online quiz on the occasion of VAW-2022 was also conducted on 04.11.2022 in which 21 PRLites had participated. The winners of this quiz will be announced and awarded during the Republic Day celebration on 26.01.2023.

An online awareness lecture on this year theme “भ्रष्टाचार मुक्त भारत-विकसित भारत” / “Corruption free India for a developed nation” was planned to be conducted during the awareness week of 31.10.2022 to 04.11.2022. However, due to non-availability of speakers during the above period, the same could not be conducted as planned.



Pictures from Vigilance Awareness Week 2022.

## Har Ghar Tiranga

Har Ghar Tiranga’ is an initiative to invoke a sense of ownership in the people and to celebrate Azadi ka Amrit Mahotsav in the spirit of Jan Bhagidari.

Har Ghar Tiranga’ is a campaign under the aegis of Azadi Ka Amrit Mahotsav to encourage people to bring the Tiranga to home and to hoist it to mark the 75th year of India’s independence. Bringing the flag home collectively as a nation in the 75th year of independence thus becomes symbolic of not only an act of personal connection but also an embodiment of the commitment to nation building. The idea behind the initiative is to invoke the feeling of patriotism in the hearts of the people and to promote awareness about the Indian National Flag.

In adherence to Home Home Secretary, GoI D.O. letter No. 2/01/2020-Public(Part-III) dated 20.07.2022 and vide DOS Endorsement No. A.27012/8/2021-V dated 28.07.2022 and an appeal dated 27.07.2022 from Secretary, DOS/ Chairman, ISRO for “Implementing Har Ghar Tiranga Programme”, the event of ‘Har Ghar Tiranga’ organized at PRL. It was a part of Azadi Ka Amrit Mahotsav.

Around 750 National flags and wooden sticks were distributed to the Staffs, research scholars, trainees, contractual workers etc. To boost the patriotism among the PRL members, a walkathon was also led by the Director and Dean PRL through the main campus.

PRL Members were encouraged to click and upload selfies with Tiranga on [www.harghartiranga.com](http://www.harghartiranga.com) and to download certificate.certificate



Glimpses of Har Ghar Tiranga Event.



## Independence Day celebration at PRL

The 76th Independence Day was celebrated at PRL on 15th August 2022 (Monday) under the ‘Azadi Ka Amrit Mahotsav’.

The day started by hoisting the National flag by Dr. Anil Bhardwaj, Director, PRL which was followed by the National Anthem. As per protocol, a Parade was done by CISF, PRL which signifies methodology and perseverance. Dr. Anil Bhardwaj had delivered an enriching and patriotic speech to the audience, showcasing PRL’s Scientific & other activities undertaken during the year. This was followed by merit and service awards to CISF Cadets.

In the remembrance of our heroes and freedom fighters who sacrificed their lives for the nation, bringing us the freedom, peace, and joy, a fancy dress programme for kids of PRL members was organized. The age group was 2-17 years, wherein several kids had dressed as Mahatma Gandhiji, Rani Lakshmi Bai, Subhash Chandra Bose, Dr. B R Ambedkar, Bhagat Singh, Rani Velu Nachiyar, Sardar Vallabhbai Patel, Pandit Jawaharlal Nehru etc. These kids delivered a short speech about the national heroes portrayed by them. Dr. Anil Bhardwaj, Director, PRL encouraged them all by awarding them trophies and chocolates.

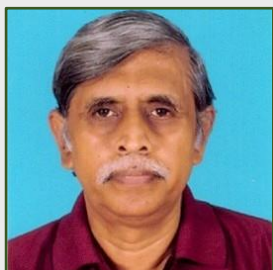
Post this, solo singing, solo dance, poem recitation and group dances were performed by the PRL members and their family members. Their performances were dedicated to the martyrs who spend their lives, in their service to the nation. It enriched the feeling of patriotism in everyone’s heart.

Tri-color balloons were also released by the children to mark the day of Independence. To contribute towards the environment, tree plantation was done by the Kids of PRL members and their family.



Glimpses of Independence Day celebration at PRL.

## PRL Ka Amrut Vyakhyan



**PKAV-71** Prof. K. S. Viswanathan, Visiting Professor, Krea University, SriCity.

**Vakhyan Title:** Hydrogen bonded interactions: Pawns in the Game of Molecular Chess

**Date:** 08 December 2022.



**PKAV-72** Prof. Tarun Souradeep, Director, Raman Research Institute, Bangalore

**Vakhyan Title:** Propelled by quests: Gravitational wave science

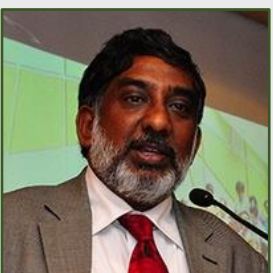
**Date:** 14 December 2022.



**PKAV-73** Prof. Jayaram Chengalur, Distinguished Professor & Director, Tata Institute of Fundamental Research, Mumbai

**Vakhyan Title:** Galaxy evolution: The atomic hydrogen perspective

**Date:** 21 December 2022.



**PKAV-74** Prof. Siva Umaphathy, Indian Institute of Science, Education and Research, Bhopal

**Vakhyan Title:** Raman spectroscopy: from Physics to Medicine

**Date:** 28 December 2022.

## PRL Ka Amrut Vyakhyan



**PKAV-75** Shri A S Kiran Kumar, Chairman, PRL Council of Management, Vikram Sarabhai Professor, ISRO, Bengaluru, Member, Space Commission, Govt. of India

**Vakhyan Title:** Vikram Sarabhai and Indian space programme

**Date:** 05 January 2023.



The PRL Amrut Vyakhyan Lecture Series comes to 75th lecture as the speakers, organizers, and attendees pose for a group photo to commemorate a successful series of enlightening lectures.

**PRL Monthly Publications Digest (December 2022)**
Planetary Sciences Division [5]

1. Vrinda Mukundan, Paul Withers, Francisco González-Galindo, Smitha V. Thampi, Anil Bhardwaj, and Marianna Felici, 2022, Atypically Intense and Delayed Response of the Martian Ionosphere to the Regional Dust Storm of 2016: A Study Using MAVEN Observations and Models, <https://doi.org/10.1029/2022JE007645>, Journal of Geophysical Research: Planets, Date of Publication: 23/12/2022
2. S.K. Goyal, A.P. Naik, P. Sharma, 2022, Characterization of Silicon Photomultipliers (SiPMs) for Space Exploration, <https://www.sciencedirect.com/science/article/pii/S0273117722007839>, Advances in Space Research, Date of Publication: 11/12/2022.
3. Yash Srivastava, Amit Basu Sarbadhikari, James M. D. Day, Akira Yamaguchi & Atsushi Takenouchi, 2022, A changing thermal regime revealed from shallow to deep basalt source melting in the Moon, <https://www.nature.com/articles/s41467-022-35260-y>, Nature Communications, Date of Publication: 09/12/2022.
4. K. Durga Prasad, Vinai K. Rai, S.V.S. Murty, 2022, A Comprehensive 3D Thermophysical Model of the Lunar Surface, <https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/2021EA001968>, Journal of Earth and Space Science, Date of Publication: 07/12/2022.
5. J. P. Pabari, S. N. Nambiar, Rashmi and S. Jitarwal, 2022, Metallic ion layers in planetary atmosphere: Boundary conditions and IDP flux, <https://doi.org/10.1016/j.pss.2022.105617>, Planetary and Space Science, Date of Publication: 01/12/2022.

Space and Atmospheric Sciences Division [1]

1. Jinee Gogoi, Kalyan Bhuyan, Som Kumar Sharma, Bitap Raj Kalita, Rajesh Vaishnav, 2022, A comprehensive investigation of Sudden Stratospheric Warming (SSW) events and upper atmospheric signatures associated with them, <https://doi.org/10.1016/j.asr.2022.12.003>, Advances in Space Research, Date of Publication: 01/12/2022.

Theoretical Physics [2]

1. Anupam Ghosh, Partha Konara, Rishav Roshan, 2022, Top-philic dark matter in a hybrid KSVZ axion framework, [https://doi.org/10.1007/JHEP12\(2022\)167](https://doi.org/10.1007/JHEP12(2022)167), Journal of High Energy Physics (JHEP) 2022, 167 (2022), Date of Publication: 29/12/2022.
2. Pratik D Patel, Akariti Sharma, Bharathiganesh Devanarayanan, Paramita Dutta and Navinder Singh, 2022, Tunable phase transitions in half-Heusler TbPtBi compound, <https://doi.org/10.1088/1361-648X/aca0d6>, J. Phys.: Condens. Matter, Date of Publication: 07/12/2022.

Atomic, Molecular and Optical Physics Division [3]

1. B Ohayon, S Hofsäss, J E Padilla-Castillo, S C Wright, G Meijer, S Truppe, K Gibble and B K Sahoo, 2022, Isotope shifts in cadmium as a sensitive probe for physics beyond the standard model, <https://iopscience.iop.org/article/10.1088/1367-2630/acacbb>, New J. Phys. 24, 123040 (2022), Date of Publication: 30/12/2022.
2. V. Badhan, S. Kaur, B. Arora and B. K. Sahoo, 2022, Assessing slowdown times due to blackbody friction forces for high-precision experiments, <https://link.springer.com/article/10.1140/epjd/s10053-022-00585-2>, Eur. Phys. J. D 76, 252 (2022), Date of Publication: 26/12/2022.
3. Saptarshi Dey, Naveen Chauhan, Milan Kumar Mahala, Pritha Chakravarti, Anushka Vashistha, Vikrant Jain and Jyotiranjana S. Ray, 2022, Dominant role of deglaciation in Late Pleistocene–Early Holocene sediment aggradation in the Upper Chenab valley, NW Himalaya, <http://dx.doi.org/10.1017/qua.2022.57>, Quaternary Research, Date of Publication: 01/12/2022.

Astronomy & Astrophysics Division [1]

1. Sushant Dutta, Veeresh Singh, C. H. Ishwara Chandra, Yogesh Wadadekar, Abhijit Kayal , 2022, Characteristics of remnant radio galaxies detected in deep radio continuum observations from SKA pathfinders, <https://link.springer.com/article/10.1007/s12036-022-09883-y>, Journal of Astrophysics and Astronomy, 43. 96, Date of Publication: 08/12/2022

Geosciences Division [4]

1. D. Behera, S. Bhattacharya, A. Rahman, S. Kumar, A. Anoop, 2022, Molecular tracers for characterization and distribution of organic matter in a freshwater lake system from the Lesser Himalaya, Biogeochemistry, <http://dx.doi.org/10.1007/s10533-022-00984-y>, Date of Publication: 24/12/2022.
2. M. Devaprasad, N. Rastogi, R. Satish, A. Patel, A. Singh, A. Dabhi, A. Shivam, R. Bhushan, R. Meena, 2022, Characterization of paddy-residue burning derived carbonaceous aerosols using dual carbon isotopes, <https://doi.org/10.1016/j.scitotenv.2022.161044>, Science of The Total Environment, 864, 161044, Date of Publication: 23/12/2022
3. Sati, SP, Sharma, S., Kothayari, GC et al., 2022, Mountain highway stability threading on the fragile terrain of upper Ganga catchment (Uttarakhand Himalaya), India, Journal of Mountain Science, <https://link.springer.com/article/10.1007/s11629-022-7496-1>, Date of Publication: 15/12/2022.
4. Shubhra Sharma, SP Sati, 2022, Dayara Bugyal (pasture): a sensitive ecosystem requiring critical care, <https://www.currentscience.ac.in/Volumes/123/11/1302.pdf>, Current Science, Date of Publication: 10/12/2022.

## Awards & Honours

1. Prof. Anil Bhardwaj, Director, PRL has been bestowed with Distinguished Alumni Award by Lucknow University for his "*Outstanding Scholarship and Exemplary Contributions to Science and Technology*".
2. Ms. Meghna Soni, Senior Research Fellow, Space and Atmospheric Sciences Division of PRL has been awarded with *2nd prize in the Students Paper Competition (SPC) in the URSI- Regional Conference on Radio Science (URSI-RCRS 2022)*, held at IIT Indore during 01-04 December, 2022.
3. Dr. Bijaya K Sahoo, Professor, Atomic Molecular and Optical Physics Division is listed in the top 2% scientists in the world (3rd year in a row) in his respective fields as per the version 5 published on 3 November 2022 compiled by Stanford University for the year 2021 (Calculation were performed using all Scopus author profiles as of November 3, 2022).
4. Mr. Yash Srivastava, Senior Research Fellow, Planetary Sciences Division of PRL has received the *Early Researcher Award in the 2nd MetMeSS symposium* organized by PSDN, PRL during 25-26 November 2022.
5. Prof. D. Pallam Raju, Senior Professor, Space and Atmospheric Sciences Division and Dean, PRL, has been elected as a Fellow of the *Indian Academy of Sciences, Bangalore*.
6. Dr. Kinsuk Acharyya, Associate Professor, Planetary Sciences Division of PRL, has been selected for support by *Department of Science & Technology (DST) Core Research Grant for "A comprehensive study of the physical and chemical evolution of volatiles and formation of organics in the comets: From reprocessing of primordial ices in cometary nuclei to the formation of cometary atmosphere during perihelion passage"*
7. Dr. Srubabati Goswami, Senior Professor, Theoretical Physics Division of PRL has been elected as *Vice-President of Indian Physics Association* for period 2023-2024.
8. Dr. Kuljeet Kaur Marhas, Professor, Planetary Sciences Division of PRL, has been recommended by *Department of Science & Technology (DST) Core Research Grant* to the Science and Engineering Research Board (SERB) for "*Organics in meteorites: Understanding the parent body processes in the early solar system*"
9. Dr. Nandita Srivastava, Senior Professor has been selected as National Coordinator, International Space Weather Initiative (ISWI), since January 2022, Associate Editor of the Stellar and Solar Physics section of *Frontiers in Astronomy and Space Sciences*, since May 2022 and Associate Editor, of *Journal of Space Weather and Space Climate (JSWSC)* since November 2022.
10. Prof. S. Ramachandran & Prof. Manmohan M. Sarin,, Senior Professor, are listed in the top 2% scientists in the world in their respective fields as compiled by Stanford University for the year 2021 (Calculation were performed using all Scopus author profiles as of September 1, 2022)
11. Ms. Mansi Gupta, Senior Research Fellow, Space and Atmospheric Sciences Division of PRL has been awarded the Best Online Poster prize at the Surface Ocean – Lower Atmosphere Study (SOLAS)-Open Science Conference (OSC)-2022 held in hybrid mode at Cape Town, South Africa, during 25-29 September 2022.
12. Dr. Jayesh P Pabari, Associate Professor, Planetary Sciences Division of PRL has been nominated as a Member (External) of the Board of Studies in EC department at Charotar University of Science and Technology (CHARUSAT), Changa for a period of three years (June 2022 to May 2025).
13. Dr. Ketan M Patel, Associate Professor, Theoretical Physics Division of PRL has been selected as a Regular Associate of the Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy. The appointment is for six years starting from January 1, 2023.
14. Dr. Archita Rai, Post Doctoral Fellow, Astronomy and Astrophysics Division, PRL, has received an Honourable Mention for her thesis presentation, entitled, "*Infrared Astronomical Instrumentation and Polarisation Studies*" at the recently concluded Astronomical Society of India meeting at IIT-Roorkee.
15. Prof. D. Pallamraju, Senior Professor Space and Atmospheric Sciences Division, and Dean, PRL, has been invited by the Editor in Chief to be the Editor for *Earth, Planets and Space* for another 4 year term i.e. 2022-2025.
16. Mr. Bijoy Dalal, SRF, Space and Atmospheric Sciences Division, of PRL has won the Best Poster Award in the 21st National Space Science Symposium (NSSS-2022) hosted by IISER Kolkata, during 31 January - 4 February 2022.

17. Mr. Jigarbhai A. Raval, Scientist/Engineer-SF, Head, Computer Centre & Computational Services, PRL, has been nominated as an external "Expert for the Board of Studies of Department of Computer Science and Engineering of Indus Institute of Technology and Engineering" a constituent unit of Indus University, Ahmedabad.
18. Prof. Anil Bhardwaj, Director, PRL has been appointed as a Member of Senate of National Institute of Design (NID), Ahmedabad for a period of two years.

# Hearty Welcome to New Members



Name : **MISS SOUMYA KOHLI**  
Designation : **SCIENTIST/ENGINEER-SC**  
Date of Joining : **04.11.2022**  
Division/Area : **ASTRONOMY & ASTROPHYSICS DIVISION**



Name : **MR. RUTUJ GHARATE**  
Designation : **SCIENTIST/ENGINEER-SC**  
Date of Joining : **07.11.2022**  
Division/Area : **ATOMIC, MOLECULAR & OPTICAL PHYSICS  
DIVISION (AMOPH)**



Name : **MR. ANIKET**  
Designation : **SCIENTIST/ENGINEER-SC**  
Date of Joining : **09.11.2022**  
Division/Area : **SPACE & ATMOSPHERIC SCIENCES DIVISION**



Name : **MR. ABHISHEK KUMAR**  
Designation : **SCIENTIST/ENGINEER-SC**  
Date of Joining : **09.11.2022**  
Division/Area : **SPACE & ATMOSPHERIC SCIENCES DIVISION**





Name : **DR. MS. SHUBHRA SHARMA**  
Designation : ASSISTANT PROFESSOR  
Date of Joining : 01.09.2022  
Division/Area : **GEOSCIENCES DIVISION**



Name : **DR. MS. YOGITA KADLAG**  
Designation : ASSISTANT PROFESSOR  
Date of Joining : 30.08.2022  
Division/Area : **GEOSCIENCES DIVISION**



Name : **Mrs. CHANDRAMMA A**  
Designation : HEAD, ACCOUNTS/IFA DEPUTATION  
Date of Joining : 01.07.2022  
Division/Area : **ACCOUNTS DIVISION**



Name : **MR. SACHIN GAVHARE**  
Designation : TECHNICAL ASSISTANT  
Date of Joining : 31.05.2022  
Division/Area : **CONSTRUCTION & MAINTENANCE GROUP**



Name : **MR. MISTRY BHAVESHKUMAR VINODBHAI**  
Designation : TECHNICAL ASSISTANT  
Date of Joining : 10.03.2022  
Division/Area : ***ASTRONOMY & ASTROPHYSICS DIVISION***



Name : **DR. MS. PARAMITA DUTTA**  
Designation : ASSISTANT PROFESSOR  
Date of Joining : 02.02.2022  
Division/Area : ***THEORETICAL PHYSICS DIVISION***

## Warm Farewell for the Retired Members



Name : **MR. K.R. NAMBIAR**  
Designation : Senior Personal Secretary  
Date of Joining : 15.07.1985  
Date of Superannuation : 30.04.2022



Name : **DR. HIRANMAYA MISHRA**  
Designation : Senior Professor  
Date of Joining : 01.07.1997  
Date of Superannuation : 31.07.2022



Name : **WG. CDR. VIBHAS SINGH GUPTA**  
Designation : Registrar  
Date of Joining : 07.11.2014  
Date of Superannuation : 30.11.2022



Name : **MR. A.B. SHAH**  
Designation : Scientist/Engineer-SG  
Date of Joining : 28.09.1984  
Date of Superannuation : 31.12.2022

## Teary Eyes for the Departed Members



**Late Shri A.M. Puthawala**  
**Sr. Technical Assistant-C**

Date of Joining : 11.03.1974  
Date of Superannuation : 30.09.2012  
Date of Death : 01.02.2022



**Late Shri J.D. Vasavada**  
**Accounts Officer**

Date of Joining : 15.06.1970  
Date of Superannuation : 30.11.2005  
Date of Death : 25.08.2022



**Late Shri P.R. Patel**  
**Administrative Officer**

Date of Joining : 05.03.1973  
Date of Superannuation : 30.06.2009  
Date of Death : 20.09.2022

## PRL Newsletter Committee

Prof. Navindar Singh	Chair
Dr. Amitava Guharay	Co-Chair

## Data Collection and Proof Reading Team

Dr.Satyendra Nath Gupta	Member
Dr.Yogita Uttam Kadlag	Member
Dr. Sanjay Kumar Mishra	Member
Dr. Rohan Eugene Louis	Member
Dr.Paramita Dutta	Member
Mr.Senthil Babu T J	Member
Dr.Manash Ranjan Samal	Member

## Formatting and Editing Team

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Dr.Pragya Pandey	Member
Ms.Shreya Pandey	Member
Mr.Kushagra Upadhyay	Member
Mr.BS Bharath Saiguhan	Member
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Mr.Shivansh Verma	Member
Ms.Shreya Mishra	Member
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Mr.Rutuj Gharate	Member
Ms.Srishti Sharma	Member
Mr.Abhishek Kumar	Member

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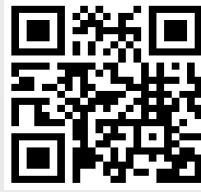
## PRL Contact



<https://www.prl.res.in/prl-eng/home>



website-Hindi



website-English



PRL-Contact

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