



Newsletter of the Physical Research Laboratory

THE SPECTRUM

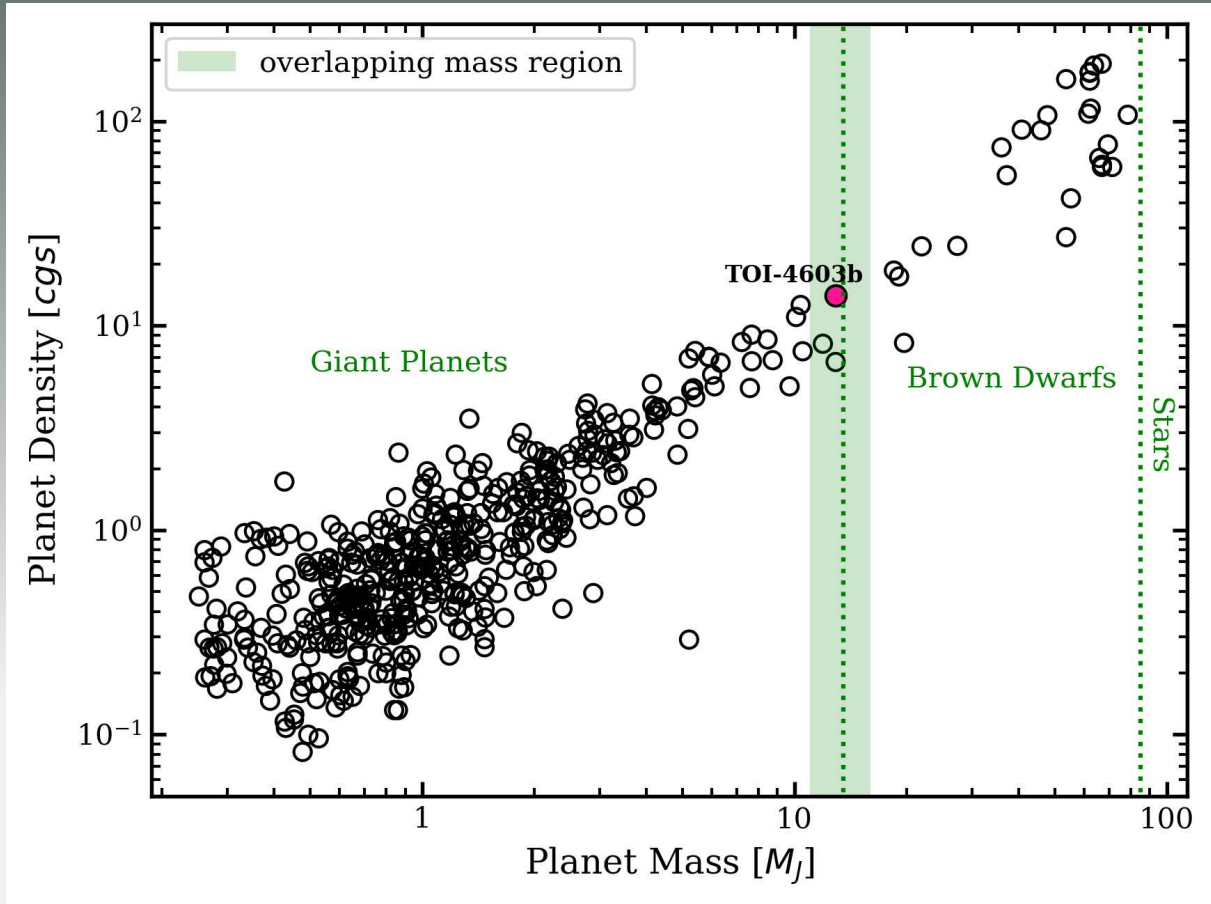


Image of the Month

TOI 4603b: A New Massive Giant Exoplanet Discovered using PRL's PARAS Spectrograph attached to 1.2m telescope at Mount Abu Observatory, PRL



June 2023 Issue

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The Kopergaon Chondrite Fall: A Piece of S-type Asteroid from Space

(D. Ray, A.D. Shukla, Anil Bhardwaj)

The Author



Dwijesh
Ray

The Indian subcontinent witnesses an exceptional record of meteorite falls (> 700 numbers reported falls and finds). Any new meteorite fall has potential scientific merit due to its pristine essence and dynamic data set. A fresh meteorite fall is reported in Bhojade Chauki in the Kopergaon taluka in Ahmednagar district, Maharashtra on the early morning (06:50 IST) of January 24, 2023. A team of scientists from PRL visited the site and collected the unique space rock for laboratory study. The meteorite is pierced through the metal roof of Kiran Babanrao Thakre's house and fragmented into several pieces upon hitting the floor. The recovered mass of the fragments weighs approximately 1 kg.

Preliminary examination of the object suggested that the meteorite appears a variety of stony meteorite covered with thin fusion crust. Further studies in the laboratory suggested that the specimen appears amalgamation of several fragments and clasts. Based on quantitative analyses of mineral phases, the meteorite is classified as LL chondrite (petrologic type 5) fragmental breccia. The Kopergaon LL chondrite is likely to be the fragmental pieces of S type asteroid (in the Main Asteroid belt), similar what was probed by the Asteroid sample return mission of the Hayabusa-1 during 2003-2010.

Source/Reference of the Work: CURRENT SCIENCE, VOL. 124, NO. 10, P. 1138-1139, 25 MAY 2023

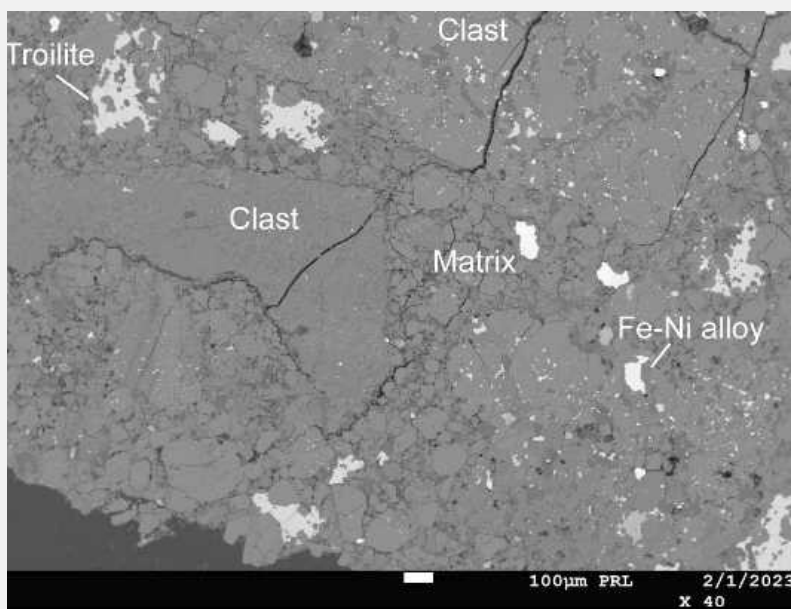


Figure Caption: (Left) Back Scattered Electron (BSE) image of Kopergaon fragmental breccia; clasts and other mineral phases are shown. (Right) This research was featured on the front cover of *CURRENT SCIENCE*, Vol. 124, Issue No. 10.

A Case Study of Mesospheric Frontal Interaction and Associated Processes Over the Western Himalaya

(Subarna Mondal, Amitava Guharay, Sumanta Sarkhel, M.V. Sunil Krishna, Martin G. Mlynczak)

The Author



Subarna Mondal

Atmospheric gravity waves play an important role in energy and momentum budget in the upper atmosphere. Among the different manifestations of gravity waves in the mesosphere and lower thermosphere region (Alt:80–105 km), the mesospheric bore is quite fascinating. The mesospheric bore is characterized by a sharp propagating mesospheric wavefront with a large horizontal extension in the airglow images. Bore could generate a trail of waves behind its leading front, unlike a typical mesospheric front. Sometimes, it divides the sky into dark and bright areas, showing out-of-phase intensity variation between adjacent airglow emission layers.

The present report deals with unique observational evidence of a mesospheric bore interaction with a typical mesospheric front in $O(^1S)$ 557.7 nm airglow emission (Peak height ~97 km) and underlying physicochemical processes on the night of 25th April 2022 from a Himalayan station at Hanle (32.78°N, 78.97°E), Ladakh, India. In this study, we investigate the mesospheric bore in the presence of another frontal structure using a ground-based all-sky imager and the SABER instrument onboard the TIMED satellite. The results highlight the presence of a stable thermal duct that acts as a “channel” for propagating the mesospheric bore. Chemical heating is believed to be a causative mechanism in generating the thermal duct. The bore front shows an anti-clockwise rotation with time which is attributed to the differential phase speed between the extreme parts of the bore due to variations in duct depth. The bore propagation in the duct layer is suggested to push the underlying OH airglow emission layer downward.

Source/Reference of the Work: <https://doi.org/10.1016/j.asr.2023.05.019>

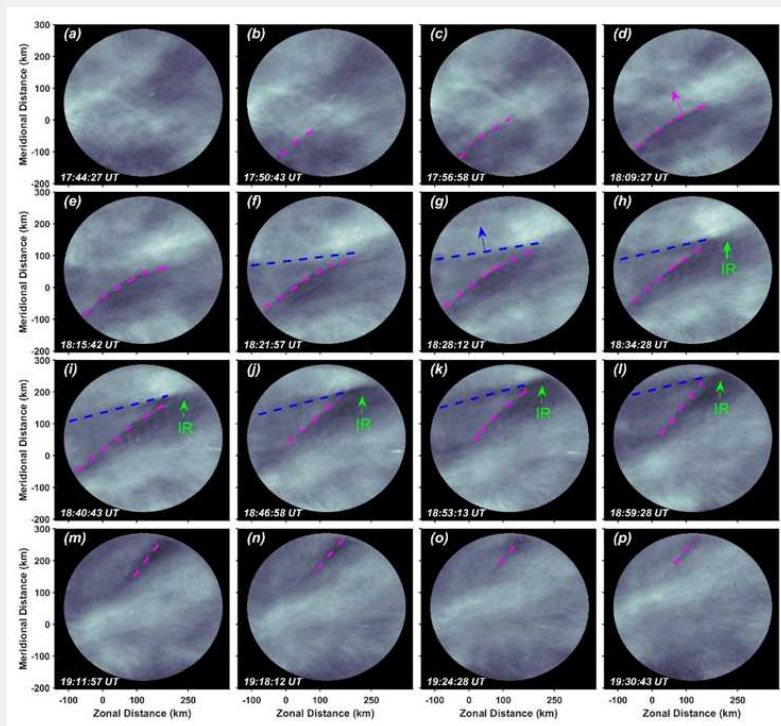


Figure Caption: Sequence of $O(^1S)$ 557.7 nm airglow images on 25 April 2022 over the western Himalayan region at Hanle, Leh Ladakh (32.78°N, 78.97°E). The images depict the evolution of the dark mesospheric bore structure (magenta) and its interaction with a dark mesospheric front (blue). Green arrows indicate the dark patchy interaction region (IR) on the eastern end of the fronts.

The Author



Prachi Prajapati

Near Infrared Background at Mount Abu

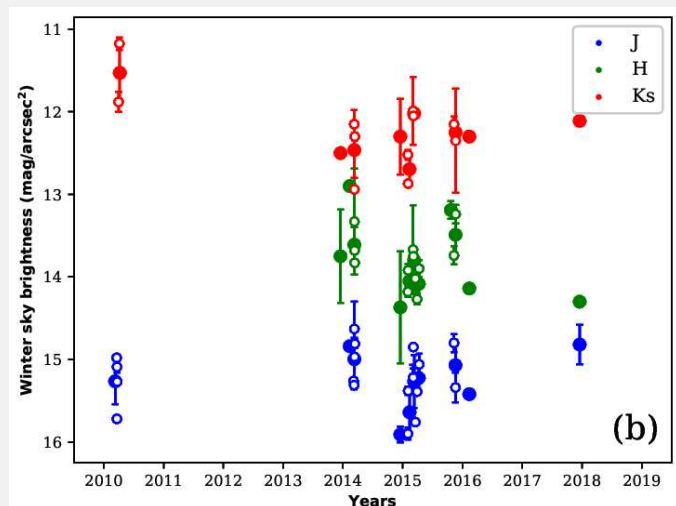
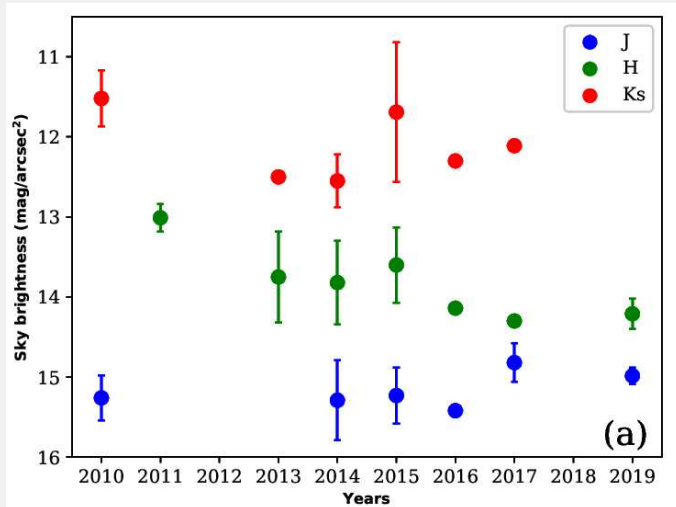
(Prachi Prajapati, Anwesh Mishra, Ananya Rawat, Shashikiran Ganesh, Vishal Joshi, Navpreet Kaur, Neeraj Kumari, Sachindra Naik, Sunil Chandra)

The quality of any astronomical site is characterized by its location, geographical factors, and also the atmospheric conditions (parameters, such as wind, humidity, sky brightness, etc.). Especially, for ground-based infrared and optical astronomical observations, sites with low humidity, minimum cloud coverage, shorter monsoon period (availability of a large number of cloud-free nights), high atmospheric transparency, good seeing and low-sky brightness are preferred.

Earth's atmosphere is known for scattering various terrestrial and extraterrestrial lights, thereby contributing to the night sky glow. Apart from these natural processes contributing to the night sky brightness, anthropogenic light pollution also affects the night sky quite severely. However, atmospheric scattering processes have less effect on the infrared background unlike the optical domain. Noticeable contributors for the Near Infrared (NIR) background include the thermal radiation from the sky, OH emission occurring in higher atmospheric layers and zodiacal light. Apart from these, the thermal radiation from the telescope support structure also contributes to the overall NIR background as observed by the ground-based instruments, especially towards the longer wavelengths.

In this work, we have characterized the Near Infrared (NIR) background for the site of Mount Abu Observatory. Mount Abu Observatory (altitude: 1680 m) which is situated at Gurushikhar, Rajasthan, India

and is operated by the Physical Research Laboratory. Data obtained from the NIR observations of various astronomical objects like stars, blazars, and galaxies using the Near Infrared Camera/Spectrograph (NICS) on the 1.2 m telescope were used to derive estimates of the NIR (J-H-Ks bands: 1.17 – 2.31 μm) sky background. We found seasonal variations in these values, with the summer months showing brighter background compared to the winter season. We also compared synthetic atmospheric transmission at Mount Abu with other Indian observatories at various altitudes in this paper. We identified the plausible contributors to the NIR background in our observations and discussed the potential ones that can contribute to the noticed seasonal variations. Overall, we found that the near infrared sky has remained stable over the period of observations from 2010 to 2019 (see Figure) and that the site remains an excellent location for near-infrared astronomical observations as compared to sites at lower altitudes.



Source/Reference of the Work: <https://doi.org/10.1007/s12036-023-09933-z>

Figure Caption: (a) The NIR background values (in mag per sq. arcsec.) averaged over the nine months (October–June), for given years. (b) The NIR background values (in mag per sq. arcsec.) for all the available winter (November–February) nights of given years are illustrated using empty circles, whereas the filled circles show an averaged value of sky brightness in that year for the winter season. These plots indicate that the NIR background at Mount Abu seems to have remained stable over the last decade.

TOI 4603b: A New Massive Giant Exoplanet Discovered with PARAS Spectrograph

The Author

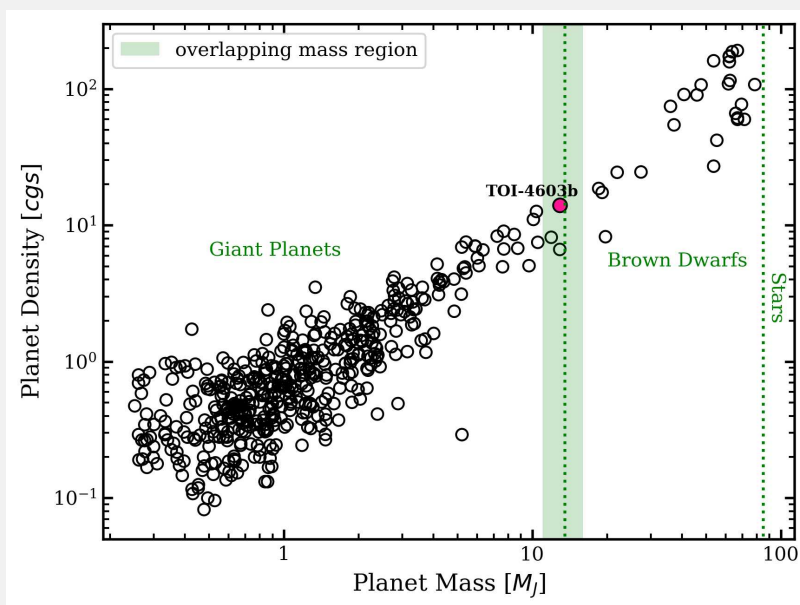


Akanksha Khandelwal

(**Akanksha Khandelwal**, Rishikesh Sharma, Abhijit Chakraborty, Priyanka Chaturvedi, Solène Ulmer-Moll, David R. Ciardi, Andrew W. Boyle, Sanjay Baliwal, Allyson Bieryla, David W. Latham, Neelam J. S. S. V. Prasad, Ashirbad Nayak, Monika Lendl, Christoph Mordasini)

Exoplanets are planets orbiting stars other than the Sun, raising questions about our origins and place in the Universe. Increasing discoveries of exoplanets will refine our understanding of planetary system formation and evolution. As of June 14, 2023, there are 5438 exoplanetary candidates in 4056 systems, with only about 1300 masses determined. These fundamental questions still remain largely unanswered. The Doppler radial velocity technique has proven to be the most reliable method for detecting exoplanets and determining their masses, relying on long-term, high-precision observations. In order to contribute to this field, a long-term program has begun at PRL using the PARAS spectrograph attached to a 1.2 m telescope at Mt. Abu, India. This program focuses on the search for sub-Neptune to Jupiter mass planets around late F, G, and K-type stars using highly precise Doppler spectroscopy.

Recently, we have made an exciting discovery of a new, massive giant exoplanet, TOI-4603b, with a mass ~ 13 times that of Jupiter and a similar size. Massive giant exoplanets are those that have a mass greater than four times that of Jupiter. It orbits a subgiant F-type star every 7.24 days and is located ~ 731 light years away from us. Initially, NASA's TESS mission recognized the star TOI-4603 as a potential exoplanet host, but no information about the nature of the astrophysical body and its mass was available. The discovery was made possible through the use of the PARAS spectrograph. All the measurements were taken in 2022, and also additional RV data from the TRES spectrograph in Arizona was used to determine the mass. This discovery is significant because the planet falls into the transition mass range between massive giant planets and low-mass brown dwarfs, i.e., $11 < M_p < 16$ Jupiter mass, of which fewer than five are currently known. Moreover, it is one of the most massive giant planets with an extreme density and orbits very close to its host star (< 0.09 AU). Furthermore, it is also found that



the planet is likely undergoing high-eccentricity tidal migration. The detection of such systems will provide valuable insights into the formation, migration, and evolution mechanisms of massive planets.

On the 26th of May 2023, ISRO issued a remarkable press release, unveiling this momentous discovery that has captured global attention. To explore the details and implications, access the press release at: <https://www.isro.gov.in/ScientistsDiscover.html>. Numerous other media platforms also reported on this pivotal breakthrough, underscoring its widespread significance.

Source/Reference of the Work: <https://doi.org/10.1051/0004-6361/202245608>

Figure Caption: The figure shows planetary density as a function of planetary mass for transiting giant planets and Brown Dwarfs. The shaded area represents the overlapping mass region of massive giant planets and BDs based on the deuterium burning limit, and the dotted lines are at $M_p = 13M_J$ and $M_p = 85M_J$. The position of TOI-4603b is denoted by the magenta dot.

Suspended matter and associated organic carbon and total nitrogen in three large Asian rivers – Ganges, Mekong, and Yellow

(Siddhartha Sarkar, Sangeeta Verma, Most Shirina Begum, Ji-Hyung Park, Sanjeev Kumar)

The Author



Siddhartha Sarkar

Asian rivers transports a disproportionately large flux (~70% of the global) of total suspended matter (TSM) to the oceans. TSM associated carbon (C) and nitrogen (N) plays crucial role in river biogeochemistry, and in modulating coastal processes. The transport of C and N in the river continuum is the heart of global C and N budgets and therefore it becomes crucial to constrain their fluxes and elemental signatures. This study explores the seasonal changes (high flow vs low flow) in the TSM associated organic C (OC) and total N in three large Asian rivers (Ganges, Mekong and Yellow). A distinct seasonality in the sources of OM was observed where allochthonous sources dominated the OM pool during the high flow condition and autochthonous OM derived from enhanced phytoplankton production appeared to have dominated during low flow. The relationship between C/N ratio and altitude reversed (+ to -) from wet to dry period indicating a transition of sediment laden high flow river to a relatively clear and productive low flow system with isotopic evidences of N₂ fixation as well. Fluxes and yields of TSM indicated manifold decrease in TSM load and associated C and N fluxes over decades in the three river systems largely attributed to reduction in river discharge.

Source/Reference of the Work: <https://doi.org/10.3389/feart.2023.1067744>

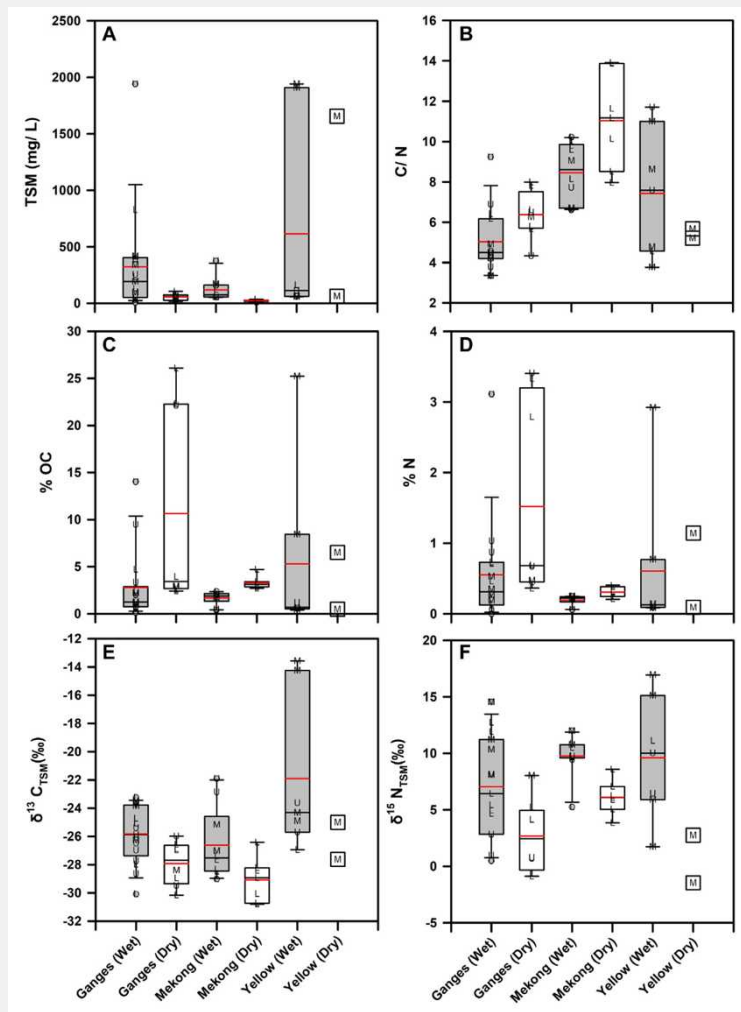
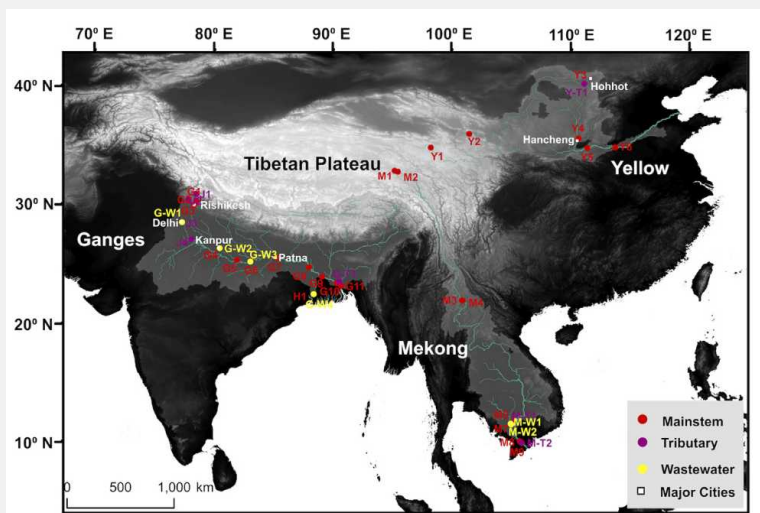


Figure Caption: 1. (Left) Map showing sampling locations on the Ganges, Mekong, and Yellow River Basins (shaded). 2. (Right) Box-whiskers plots showing seasonal variation in: (a) TSM, (b) C/N ratios, (c) % OC, (d) % N, (e) $\delta^{13}C_{TSM}$, and (f) $\delta^{15}N_{TSM}$.

On the propagation of gravity waves in the lower solar atmosphere in different magnetic configurations

(Hirdesh Kumar, Brajesh Kumar, S.P. Rajaguru)

The Author



**Hirdesh
Kumar**

Gravity waves are generated by turbulent subsurface convection overshooting or penetrating locally into a stably stratified medium. While propagating energy upwards, their characteristic negative phase shift over height is a well-recognized observational signature. These gravity waves are considered to play an important role in the heating of the lower solar atmosphere. In this work, we have studied the atmospheric gravity wave dispersion diagrams utilizing intensity observations that cover photospheric to chromospheric heights over different magnetic configurations of quiet-Sun (magnetic network regions), a plage, and a sunspot (c.f. Figure 1) as well as velocity observations within the photospheric layer over a quiet and a sunspot region. In order to investigate the propagation characteristics, we construct two-height intensity-intensity and velocity-velocity cross-spectra and study phase and coherence signals in the wavenumber - frequency dispersion diagrams and their association with background magnetic fields. We observe signatures of association between magnetic fields and much reduced coherence and phase shifts over height from intensity-intensity (c.f. Figure 2) and velocity-velocity phase and coherence diagrams, both indicating suppression/scattering of gravity waves by the magnetic fields. Our results are consistent with the earlier numerical simulations, which indicate that gravity waves are suppressed or scattered and reflected back into the lower solar atmosphere in the presence of magnetic fields.

Source/Reference of the Work: <https://doi.org/10.1016/j.asr.2023.04.054>

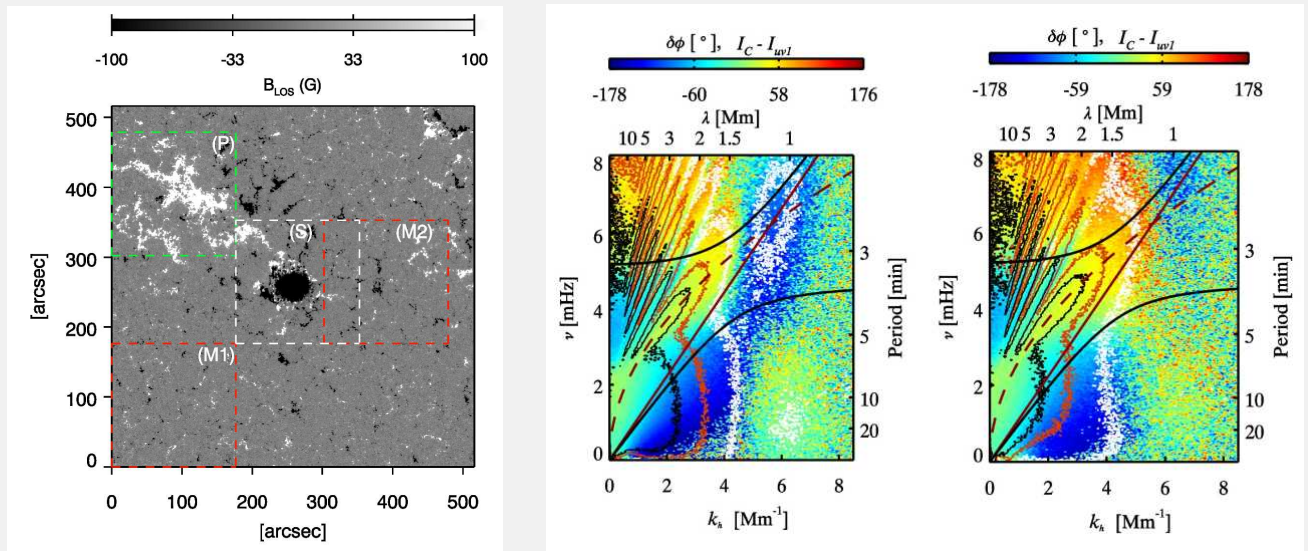


Figure Caption: 1. (Left) HMI/SDO line-of-sight magnetic field of a large region observed on August 3, 2010 corresponding to the start time of data used in this work. The colored dashed regions mark the boundaries of sub -regions studied in this work. The regions enclosed in red (M1 & M2), white (S) and green (P) colored boxes mark the quiet magnetic network, sunspot and plage regions, respectively.. 2. (Right) Cross-spectral phase difference, $\delta\phi(k_x, \nu)$, diagrams of quiet-region M1 (left panel) and sunspot region S (right panel), respectively, constructed from $I_C - I_{UV1}$ pair of photospheric continuum intensity from HMI/SDO and UV 1700 Å channel of AIA/SDO, which correspond to 20 - 360 km above $z = 0$ in the solar atmosphere. The solid black lines separate vertically propagating waves ($k_z^2 > 0$) from the evanescent ones ($k_z^2 < 0$) at upper height. The dashed red line is the f-mode dispersion curve and solid red line is the Lamb mode. The overplotted black, red and white contours represent the coherence at 0.5, 0.3 and 0.1 levels, respectively.

A Special Lecture on Health & Sanitation under SwPC

As a yearlong activity under Swachhta Pakhwada-2023, a Lecture was arranged for contractual staff members of PRL and their family members to make them aware of the routine “Health and Sanitation”. The Lecture was delivered by PRL Medical Officer Dr. Shital Patel on 10.05.2023 (Wednesday) at the PRL Main Campus and on 12.05.2023 (Friday) at PRL Thaltej.

The main focus of the talk was on “Hygiene and Sanitation” and giving up bad habits like Tobacco etc. Medical Officer initially informed contractual workers about the importance of the hygiene and cleanliness required in their routine work and how it affects one’s health. They were sensitized about the advantages of a clean, safe and green environment.

Further, they were made aware of the consequences for not maintaining hygiene like spreading of various diseases and viral infections at the workplace as well as at home. They were given knowledge of on how to keep our surrounding clean by segregating waste. Further, workers were sensitized about the consequences to health for having junk and stale food. The lecture was interactive and helpful for them. Importance of personal hygiene was also emphasized during the lecture to them. The programme ended by taking Swachhta Pledge.

Prof. S Ramachandran, Chair, SwPC addressed the gathering, Co-chairs & members, SwPC were also present. Dr. Pragya Pandey, Co-convener compered the programme and vote of thanks was given by Ms. Harsha Parmar.



Glimpses from the Event

National Fire Service Week

Considering the vitality of sensitizing PRL members and as a part of Fire Service Week and, a mock drill simulated training on Fire incident/accident scenario was conducted at PRL Thaltej campus on Wednesday, 3rd May, 2023.

Shri. Ramesh Kumar, Inspector, CISF enlightened about different types of fire, causes and prevention factors related to fire. He has further narrated about the types of extinguishers used in the premises their applicability as per the type of fire. The practical demonstration was also given by the CISF team on how to use these extinguishers to control the fire and save the human and materials nearby. Total 58 PRL members participated in the said programme. The overall programme was interactive and informative.



Glimpses from the Event

First GBM of Indian Planetary Science Association (IPSA)

The first general body meeting (GBM) of the Indian Planetary Science Association (IPSA) was held on 23rd March 2023 during the fourth Indian Planetary Science Conference (IPSC-2023) at Physical Research Laboratory, Ahmedabad. IPSA was formally inaugurated on 22-3-2023 by Shri. S. Somnath, Secretary, DoS & Chairman, ISRO and Shri. A. S. Kiran Kumar, Chairman, PRL, Council.

The GBM included a brief description of the objectives of IPSA, its current and planned activities, introduction of the executive council and new members. Prof. Anil Bhardwaj, President, greeted all the members present at the first GBM and delivered his welcome address providing introduction of IPSA. Prof. Varun Sheel, Secretary provided a complete overview of IPSA that includes its registration and acts, Aims and Objectives, Bye-laws. He introduced the members of the first executive council of IPSA. He also introduced the newly joined members. Later, the current and planned activities for future were discussed. Four different committees were also formed during the GBM to enhance the visibility of IPSA, to induct new members PAN India and to plan and execute future meetings of IPSA. The president thanked all the members for very active participation, fruitful deliberations, and useful suggestions.



Figure Caption: Glimpses of the first general body meeting of IPSA held on 23rd March 2023 at PRL, Ahmedabad

Online CSSTEAP Short Courses

PRL conducted two online short courses on :

- (1) Planetary Science (May 15 - 19, 2023), and
- (2) Solar Physics (May 22 - 26, 2023)

under the auspices of Center for Space Science and Technology Education in Asia and the Pacific (CSSTEAP), affiliated to the United Nations. The objective was to create an understanding of the basics and current research trends in these fields. In each course, around 70-80 participants from more than 10 Asia-Pacific countries attended regularly.

Along with theory lectures, there were also online practicals and home assignments. The lectures were in-depth and yet, lucid. There was a good rapport between the speakers and the students. There were many queries through the chat box. The speakers answered them diligently even going beyond their assigned time slots. Feedback was excellent for each course.

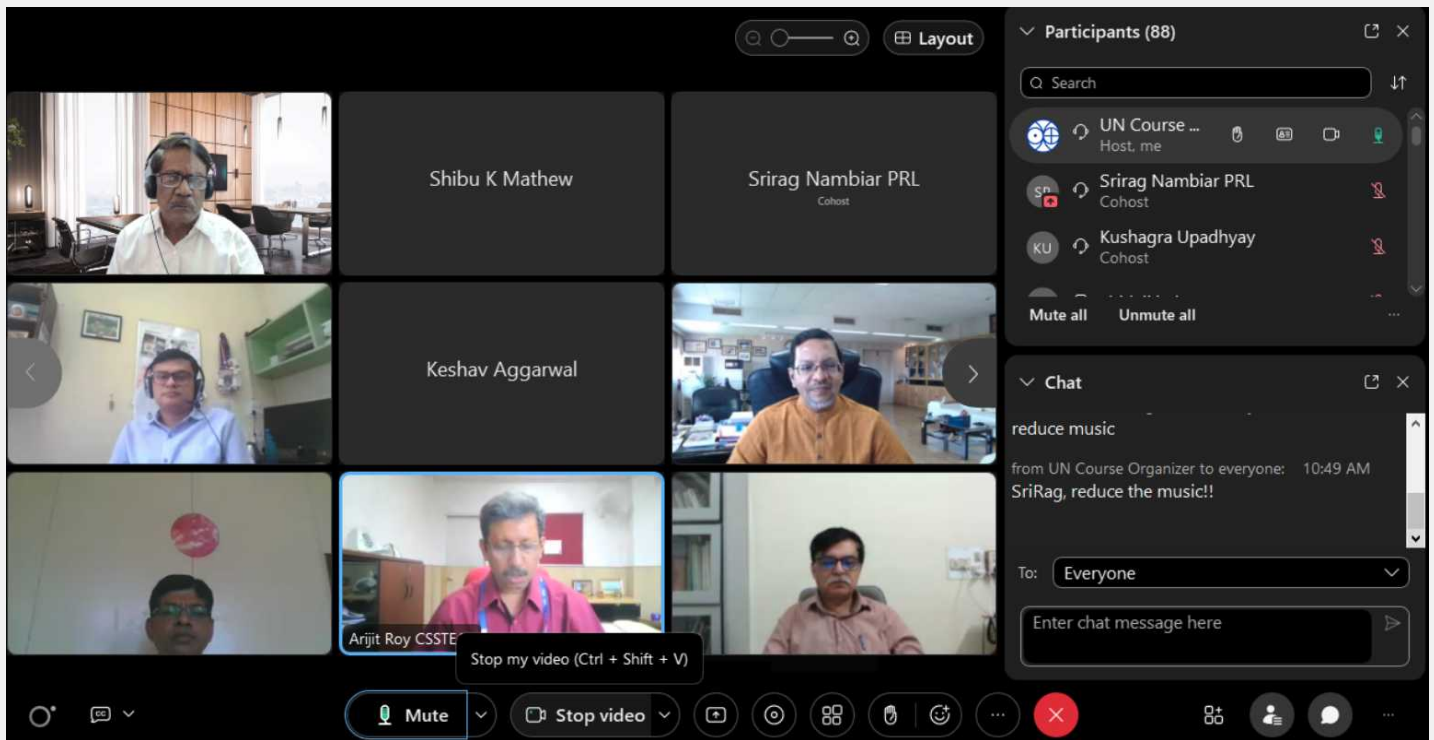


Figure Caption: Inaugural Function of the Solar Physics course

Young Scientists/Engineers Conclave

On May 26, 2023, an exciting and intellectually stimulating event took place at the K R Ramanathan Auditorium at the Physical Research Laboratory (PRL). The One-Day Young Scientist/Engineer Conclave brought together a group of talented individuals who have joined PRL as Scientist/Engineer-SC and Scientist/Engineer-SD in the last decade, starting from 2013 onward.

The conclave, which lasted from 09:00 AM to 06:00 PM, provided a platform for these young scientists and engineers to showcase their research, share their findings, and discuss their future plans. It served as an opportunity for them to interact with each other, exchange knowledge, and foster collaboration within the scientific community at PRL.

Throughout the day, a series of presentations were delivered by the participants, highlighting the remarkable work they have carried out, the ongoing projects they are involved in, and the innovative ideas they plan to pursue. The presentations covered a diverse range of scientific and engineering disciplines, including but not limited to astronomy and astrophysics, atomic, molecular and optical physics, planetary sciences, geosciences, space and atmospheric sciences, instrumentation and observations from udaipur solar observatory, and remote sensing.

The conclave not only allowed the young scientists and engineers to present their research but also facilitated valuable discussions and feedback from their peers and senior members of PRL. The event encouraged an atmosphere of learning, where ideas were exchanged, methodologies were discussed, and constructive criticism was provided, ultimately contributing to the overall growth and development of the participants.

The Young Scientist/Engineer Conclave at PRL served as a testament to the institution's commitment to nurturing young talent and fostering a culture of scientific excellence. By providing a platform for young researchers to showcase their work, PRL aimed to encourage innovation, inspire future generations, and pave the way for groundbreaking discoveries in the field of science and engineering.

Overall, the conclave was a resounding success, leaving the participants with a renewed sense of motivation, a broader perspective on scientific research, and a strengthened network within the scientific community. It provided a glimpse into the promising future of scientific exploration and innovation at PRL and served as a reminder of the remarkable potential held by young scientists and engineers in shaping the world of tomorrow.

PRL at Antarctica: Siddhartha's Antarctic Expedition

The Antarctica houses numerous lakes in distinct hydrogeological settings, with a wide range of physio-chemical characteristics. Lakes in polar environments experience drastic shifts in their hydrological regimes across seasons along with concurrent changes in the rates of microbially mediated biogeochemical processes, making it challenging to track direction and magnitude of these processes.

PRL proposed to explore the carbon and nitrogen biogeochemistry in the lakes of the Schirmacher Oasis, East Antarctica in collaboration with the National Center for Polar and Ocean Research and the Manipal Institute of Higher Education under the ongoing project STAPLES (Spatio-Temporal Investigations of Polar Lacustrine Ecosystems). The specific objectives of the project were to (i) understand the CH_4 , CO_2 and N_2O dynamics in the lakes and estimate their fluxes to the atmosphere, (ii) decipher the sources of organic matter to the lakes and the factors controlling its transformation, and (iii) to quantify the organic carbon and nitrogen stocks in the soils of the Schirmacher Oasis.



Siddhartha Sarkar participated in the 42nd Indian Scientific Expedition to Antarctica after passing the medical examinations at AIIMS, New Delhi, and the mandatory Pre-Antarctic Snow-Ice Acclimatization training at the Mountaineering and Skiing Institute, ITBP, Auli. The journey to Antarctica started from Mumbai with a brief isolation at Cape Town and ultimately to Novo, Antarctica. During the stay at the Indian Scientific Station 'Maitri' from 24th Nov, 2022 to 13th Jan, 2023, spatial sampling was conducted in all three lake types: Proglacial = 7, land-locked = 16, and Epishelf = 3; with additional bi-hourly sampling in three representative lakes to decipher possible diel variability in these lakes even during the austral summer.



The cold and windy Antarctic weather that made sampling fun and adventurous was complimented with the frequent warm get together at the station. The Indian cuisine served by the chefs made Maitri feel just like home and added a few extra pounds to all expeditioners.



School Bag and Compass Box distribution to School Students at Behrampura Primary School No.22

As part of celebration of Ambedkar Jayanti (2022) and with kind guidance and support of the Director, PRL, an event of distribution of School Bags and Compass Boxes to the Students of class 6th to 8th standards of Behrampura Primary School No.22 which runs by Ahmedabad Municipal Corporation Board was organized on 25.01.2023. During the event, School Bags and Compass Boxes were distributed to a total 309 students of the school.

Dr. Anil Bhardwaj, Director, PRL, Dr. D Pallam Raju, Dean, PRL, Dr. R. D. Deshpande, Registrar, PRL, Head, P&GA and PRL Reserved Class Employees' Association Members attended the above event and distributed the school bag and Compass Box to the School Students.



Glimpses from the Event

Outreach: Students Visits to PRL

A group of students along with faculty from the Department of Physics and Electronics, St. Xavier's college, Ahmedabad, visited Udaipur Solar Observatory (USO) on 21st March 2023. The group included students of B. Sc. & M. Sc Physics and Faculty members. The group visited different facilities of USO, vz. MAST, GONG, and eCALLISTO. They were informed about different aspects of solar observations and solar activity.

In a captivating event on the 17th of May 2023, 53 bright and aspiring students visited PRL under the esteemed Yuva Vigyani Karyakram (YUVIKA) 2023, aimed to foster scientific curiosity and provide young minds with an opportunity to delve into the world of research. Guided by PRL's accomplished scientists and researchers, the students were immersed in a world of interactive sessions, informative demonstrations, and engaging discussions. They were treated to firsthand experiences of experimental setups, state-of-the-art instruments, and advanced technologies employed within the laboratories. PRL's experts generously shared their knowledge, igniting the students' curiosity and inspiring them with their unwavering passion for scientific inquiry.



Glimpses from the Event

PRL Ka Amrut Vyakhyaan



PKAV-80

The Physical Research Laboratory (PRL) hosted **Wg. Cdr. Rakesh Sharma**, Ashoka Chakra (Retd.), to deliver the 80th PRL ka Amrut Vyakhyaan on May 24th, 2023. The event was attended by a diverse audience, including scientists, engineers, students, and young participants of ISRO's Yuvika programme.

During his visit, Wg. Cdr. Rakesh Sharma interacted with various groups and delivered an engaging talk titled **"Future Space Exploration - A Perspective"**. The talk was attended by approximately 350 individuals, including the PRL fraternity, young students, college and university students, scientists from SAC, and the general public. In addition, over 600 viewers watched the vyakhyaan live on PRL's YouTube Channel.

PRL expressed gratitude to Wg. Cdr. Rakesh Sharma for sparing his valuable time and having interactions with several groups. The experience was quite memorable, motivational, and inspiring. The event provided a platform for individuals from various backgrounds to come together and learn from a distinguished speaker in the field of space exploration.



Abstract

The Human civilization is poised to recommence space exploration; this time, not to explore but to inhabit, first the Moon and later, perhaps, Mars.

How should we plan for this fundamental shift in our space activity? Do we adopt the same paradigm as we have done thus far i.e., the initial explorer takes it all? Should our approach be exclusive or inclusive? Should we be going out there while continuing to retain our national identities or, as explorers from Planet Earth? Do we go forth by leveraging the advantage one or the other nation has by virtue of its better technological base or, do we go out as a civilization from Planet Earth that recognizes that Space is not the domain of any one nation, that all human activity in outer space must benefit humankind resident on Planet Earth, as has been mandated by the United Nations?



Available online at: <https://www.youtube.com/watch?v=2E5UDgJpwpE&t=1s>

PRL Monthly Publications Digest (May 2023)

Astronomy & Astrophysics Division [3]

1. Namita Uppal, Shashikiran Ganesh, Mathias Schultheis, 2023, The Outer spiral arm of the Milky Way using red clump stars. Tracing the asymmetry across the disc, *Astronomy & Astrophysics*, Date of Publication: 15/05/2023
2. Mallick, K., Sharma, Saurabh, Dewangan, Lokesh Kumar, Ojha, Devendra K. ; Panwar, Neelam ; Baug, Tapas, 2023, Investigating the morphology and CO gas kinematics of Sh2-112 region, *Journal of Astrophysics and Astronomy (JApA)*, 44, 34, Date of Publication: 13/05/2023
3. Sharma, Saurabh, Dewangan, Lokesh Kumar, Panwar, Neelam ; Kaur, Harmeen ; Ojha, Devendra K. ; Yadav, Ramkesh ; Verma, Aayushi ; Baug, Tapas ; Sinha, Tirthendu ; Pandey, Rakesh ; Ghosh, Arpan ; Chand, Tarak, 2023, Teutsch 76: a Deep Near-Infrared Study, *Journal of Astrophysics and Astronomy (JApA)*, 44, 46, Date of Publication: 13/05/2023

Atomic Molecular and Optical Physics Division [2]

1. Zhi-Ming Tang, Yan-mei Yu, B. K. Sahoo, Chen-Zhong Dong, Yang Yang, and Yaming Zou, 2023, Simultaneous magic trapping conditions for three additional clock transitions in Yb to search for variation of the fine-structure constant, *Phys. Rev. A* 107, 053111 (2023); <https://doi.org/10.1103/PhysRevA.107.053111>, Date of Publication: 15/05/2023
2. Kavil Mehta, Swetapuspa Soumyashree, Jalaja Pandya, Parul Singh, Rajesh K. Kushawaha, Prashant Kumar, Satyam Shinde, Jhuma Saha and Prahlad K. Baruah, 2023, Impact of viscosity of liquid on nanoparticles synthesized by laser ablation in liquid: An experimental and theoretical investigation, *Applied Physics A*, Date of Publication: 02/05/2023

Geosciences Division [1]

1. Siddhartha Sarkar, Mohammad Atif Khan, Niharika Sharma, Abdur Rahman, Ravi Bhushan, A. K. Sudheer & Sanjeev Kumar, 2023, Lake desiccation drives carbon and nitrogen biogeochemistry of a sub-tropical hypersaline lake, *Hydrobiologia*, Date of Publication: 05/04/2023

Planetary Sciences Division [3]

1. D. Ray, A.D. Shukla and Anil Bhardwaj, 2023, Meteorite fall in Bhojade village, Kopargaon taluk, Ahmednagar district, Maharashtra, India, Current Science, Date of Publication: 25/05/2023
2. Rishitosh K. Sinha, Alka Rani, Trishit Ruj, Anil Bhardwaj, 2023, Geologic investigation of lobate scarps in the vicinity of Chandrayaan-3 landing site in the southern high latitudes of the moon, Icarus, Date of Publication: 17/05/2023
3. S. Misra, P. Srivastava, S. Ghosh, A.K. Das, S. Dey and D. Ray , 2023, An alternative view on size and impact history of Ramgarh Crater, India: Evidence from high-resolution remote sensing imagery and gravity data, Journal of Earth System Science, Date of Publication: 05/05/2023

Space & Atmospheric Sciences Division [1]

1. Subarna Mondal, Amitava Guharay, Sumanta Sarkhel, M.V. Sunil Krishna, Martin G. Mlynczak, 2023, A case study of mesospheric frontal interaction and associated processes over the western Himalayan region, Advances in Space Research, Date of Publication: 18/05/2023

Udaipur Solar Observatory [3]

1. Nandita Srivastava, Zavkiddin Mirtoshev and Wageesh Mishra, 2023, Investigating the variations in the composition and heating of interacting ICMEs, Front. Astron. Space Sci., Date of Publication: 30/05/2023
2. Kamlesh Bora, Satyam Agarwal, Sanjay Kumar, Ramit Bhattacharyya, 2023, Hall effect on the magnetic reconnections during the evolution of a three-dimensional magnetic flux rope, Physica Scripta, Date of Publication: 19/05/2023
3. Hirdesh Kumar, Brajesh Kumar, and S.P. Rajaguru, 2023, On the propagation of gravity waves in the lower solar atmosphere in different magnetic configurations, Advances in Space Research, Date of Publication: 08/05/2023

Awards & Honours

- (1) **Mr. Kshitiz Upadhyay**, SRF, Space and Atmospheric Sciences Division of PRL has **received the Young Polar Scientist Award** for the best poster presentation under the theme '**Space Weather and Meteorology**' in the "**National Conference on Polar Sciences**" organised by the National Center for Polar and Ocean Research, held at Goa during 16 - 19 May 2023.
- (2) **Mr. Siddhartha Sarkar**, SRF, Geosciences Division of PRL has **received the Young Polar Scientist Award** for the best poster presentation under the theme '**Environment and Ecology**' in the "**National Conference on Polar Sciences**" organised by the National Center for Polar and Ocean Research, held at Goa during 16 - 19 May 2023.
- (3) **Prof. Anil Bhardwaj**, Director, PRL, has been **chosen for the Asia Oceania Geosciences Society (AOGS) Fellows award**. He will be honoured during the forthcoming AOGS's 20th Annual Meeting (AOGS2023) scheduled during 30 July to 04 Aug 2023 in Singapore.

Grant of External Funds

- (1) The proposal by **Dr. Shashikiran Ganesh**, Professor, Astronomy and Astrophysics Division of PRL on "Belgo-Indian projects on Precision Astronomical spectroscopy for stellar & Solar system bodies BIPASS" has been approved for a **BIPASS Grant** by the **Department of Science & Technology (DST)**, for a term of 3 years.
- (2) The proposal by **Dr. Varun Sheel**, Senior Professor and Head, Planetary Sciences Division of PRL on "Study of the Venusian climate through Radio Occultation experiments from orbiting spacecraft and modelling" has been approved for a **Travel Grant** by the **Department of Science & Technology (DST)**, for a term of 2 years.

HEARTY WELCOME TO NEW MEMBER



NAME: Dr. Sarwar Nizam

DESIGNATION: INSPIRE Faculty-DST

DATE OF JOINING: 08.05.2023

DIVISION/AREA: Geosciences Division

VISITORS

1. Around **75 students** have joined PRL for **Summer Internship Programme 2023**. These includes students selected from three National Science Academies, students from DST of some states and students of IIST.
2. **28 participants of Advanced B.Sc. programme** visited PRL on 16th May 2023.
3. **53 Students** visited PRL on 17th May 2023 under **YUVIKA 2023** programme.
4. Following **Faculty members** visited PRL as an expert for a meeting to prepare **Physics Glossary in Gujarati**, hosted by PRL during 29th May - 02nd June 2023. The meeting was organized by the Commission for Scientific and Technical Terminology (CSTT), Ministry of Education, Govt. of India. The following members visited PRL:
 - i. Dr. B K Singh, Asst. Director, CSTT
 - ii. Prof. P N Gajjar, Director School of Sciences and HoD Physics Dept. Gujarat University
 - iii. Prof. Utpal Joshi, Physics Dept., Gujarat University
 - iv. Prof. Kritida Shah (Retd.), Gujarati Dept., Gujarat University
 - v. Prof. Nilotpala Gandhi (Retd.), Linguistic Dept., Gujarat University,
 - vi. Shri Dinesh Agrawal, SAC (ISRO), Ahmedabad
 - vii. Dr. Baldev Anand Sagar, Retd. officer, Aakashwani, New Delhi

SUPERANNUATION



Name of the employee	Prof. Ravi Bhushan
Designation at the time of superannuation	Senior Professor
Date of Birth	05.05.1963
Date of Joining PRL	28.10.1988
Date of Superannuation	31.05.2023

Good Luck for your future endeavours

OBITUARY



Late Shri C.P. Suthar
Assistant Administrative Officer

Date of Birth 15.11.1945

Date of Joining PRL 12.12.1973

Date of Superannuation 30.11.2005

Date of Death 09.04.2023

Tearful Eyes for our Departed Member



Cyber Security Awareness – Unknown Message or Call



Jigar Raval, Head, CNIT, PRL



Unknown Message or Call



Shows Greed



Immediate or Within Time



Suspicious



Shows Fear or Negative Consequences



Never Panic or Never Get Distracted



STOP



THINK



Click



How to safeguard from this?



- ✓ Never trust any unknown call or message and never share your OTP or Password or UPI PIN or ATM PIN or Credit Card PIN or CVV number/code.
- ✓ Never answer missed video calls received from any unknown number. Fraudsters blackmail by recording video calls and ask for money.
- ✓ Check the short URL (link) and do not download, install any unknown app.
- ✓ Don't be afraid of any such message or call. Take help of cybercrime police.



Be Vigilant, Be Cyber Safe



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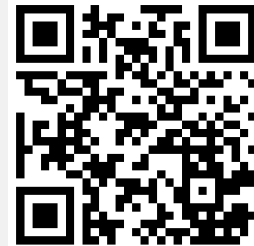
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