THE SPECTRUM

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The Author

Gourav Mitra

Impact of the September 2019 minor sudden stratospheric warming on the low latitude middle atmospheric planetary wave dynamics

(Gourav Mitra, Amitava Guharay, Paulo Prado Batista, Ricardo Arlen Buriti)

Planetary wave (PW) associated dynamical variability in the equatorial and extratropical middle atmosphere during the September 2019 Southern hemisphere minor sudden stratospheric warming (SSW) is investigated utilizing meteor radar wind observations from São João do Cariri (7.4°S, 36.5°W) and Cachoeira Paulista (22.7°S, 45°W) and reanalysis data. Signature of the mesospheric warming in conjunction with the stratospheric cooling is found at low latitudes. The strong westerly wind at low latitudes decelerates notably near 65 km at the onset of the warming episode, although no wind reversal is observed. The wind spectra reveal a prevalent quasi-16-day wave (Q16DW) prior to the SSW and existence of a quasi-6-day (Q6DW) wave after the warming event. Possible existence of barotropic/baroclinic instability in the low and mid latitude middle atmosphere may be responsible for exciting the Q6DW. Both traveling and stationary waves exhibit notable activities during the warming event. Although involvement of both zonal wavenumbers 1 and 2 PWs are found in the event, planetary wave with zonal wave number 1 seems to play a vital role in preconditioning the same. Furthermore, significant latitudinal mixing of airmass between the tropics and high latitudes is evident in the potential vorticity map. The Eliassen-Palm (EP) flux diagnosis shows the propagation of the Q6DW and Q16DW from mid to low latitudes during the warming event.

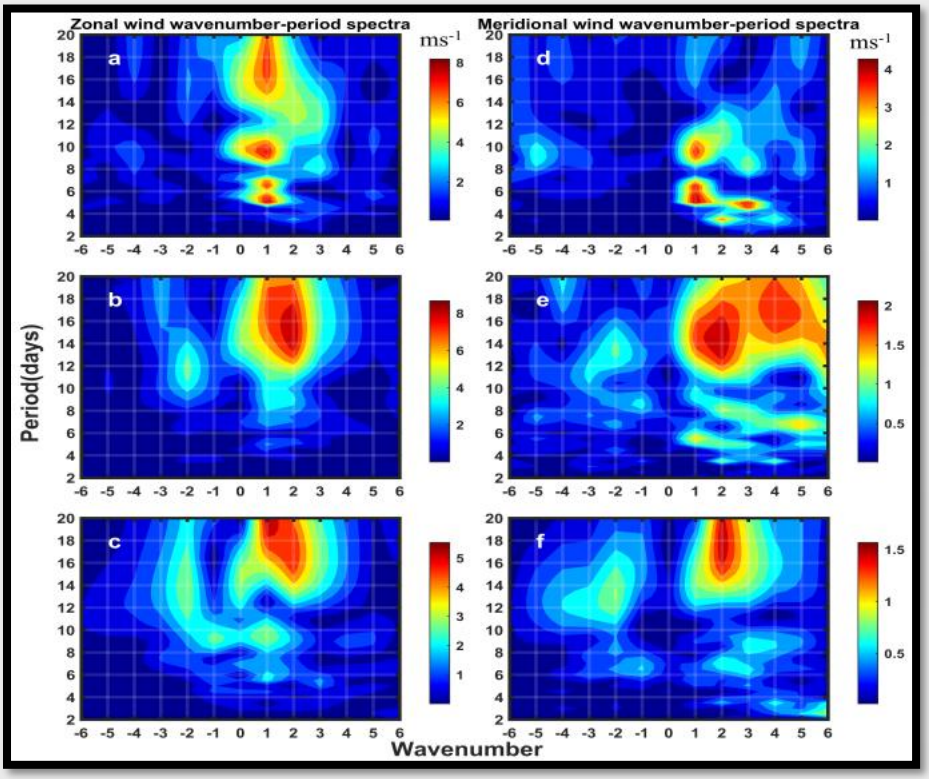


***Figure**: Period vs wavenumber spectra in the zonal wind at (a) 0.02 hPa (b) 1 hPa, (c) 10 hPa and meridional wind at (d) 0.02 hPa (e) 1 hPa, (f) 10 hPa at CP latitude (22.7°S) using ERA5.*

Please note the change of scale in the colorbars corresponding to each subplot while comparing.

Source/Reference of the Work:

DOI: https://10.1029/2021JD035538

The Author

A. Guharay

Signature of a mesospheric bore in 557.7 nm airglow emission using all-sky imager at Hanle (32.7N, 78.9E)

(A. Guharay, S. Mondal, S. Sarkhel, M. Sivakandan, M. V. Sunil Krishna)

A prominent signature of dark bore front in the mesospheric O(^{1}S) airglow emission was observed on a night in the late winter at Hanle (32.7^{o}N, 78.9^{o}E) located in the western Himalaya. The leading front was followed by a series of evident trailing waves and the event lasts for more than two hours. The characteristic features of the bore indicate it to be linear undular type. Instantaneous temperature profile shows presence of stable region through formation of thermal duct in the upper mesosphere possibly supported by chemistry and/or dynamics. With time, the bore fronts became faint in presence of ripples as they reach other side of imager field of view (FOV). During the initial period around 3-4 waves h^{-1} appeared to enter the imager FOV. The observed average phase speed, period and horizontal wavelength are found to be 40 m/s, 12 min and 29 km, respectively. The bore fronts exhibited a clockwise rotation at a rate of around 5^o h^{-1}. The front edge perpendicular to the direction of propagation showed small-amplitude undulation indicating nonuniform duct structure. The tropospheric meteorological conditions may indicate plausible contribution from jet stream, weather front (linked with the Himalayan orography), and nonmigrating tides to excite and sustain the mesospheric bore event although further investigations in this direction are being sought to understand the actual underlying physical processes.

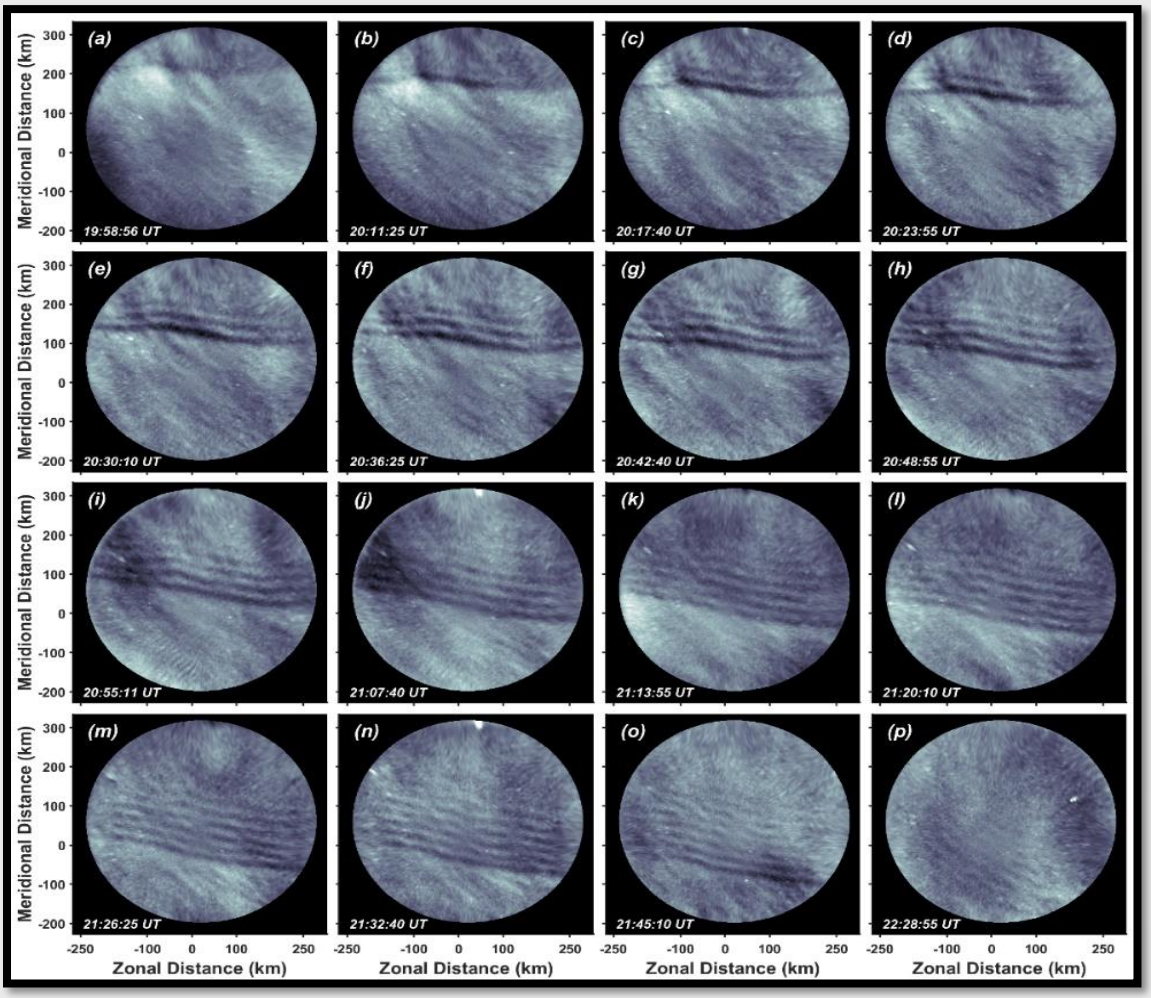


Figure:

Sequence of O(1S) 557.7 nm airglow images on 02 February 2020. A dark front structure appears in the extreme north side of the image around 19:58:55 UT, and it propagates SW direction in the consecutive images followed by the trailing waves.

Source/Reference of the Work: DOI: https://doi.org/10.1016/j.asr.2021.12.006

The Author

Sushant Datta

Remnant Radio Galaxy Candidates of Small Angular Sizes

(Veeresh Singh, Sushant Dutta, Yogesh Wadadekar, C.H. Ishwara-Chandra)

Radio galaxies, a subclass of Active Galactic Nuclei (AGN), emit copiously at radio wavelengths and exhibit well defined radio structures - a radio core, highly collimated outflowing bipolar jets eventually terminating into radio lobes. During the active phase, radio galaxies grow via sustained supply of plasma through jets that can remain active for tens of millions of years and result a large-size radio galaxy with typical size of a few hundreds of kiloparsec to even a megaparsec. Remnant phase begins after the cessation of AGN activity during which jets are no longer sustained and lobes start to fade away. In the remnant phase, radio core and jets disappear but the radio lobes can still be detected for a time-scale of a few tens of million years before they disappear due to radiative and dynamical losses. The short-lived remnant phase makes remnant radio galaxies (RRGs) rare objects to be detected. Hitherto, searches for RRGs, using mainly morphological criteria, identified large angular size sources resulting into a bias towards the remnants of powerful large radio galaxies. In this study, we make the first attempt to perform a systematic search for RRGs of small angular sizes (<30 arcsec). By using 325 MHz GMRT, 150 MHz LOFAR and 1.4 GHz JVLA radio observations, we discover 48 remnant candidates exhibiting strong spectral curvature. Our study unveils, hitherto unexplored, a new population of small-size (< 200 kpc) remnant candidates that are often found to reside in less dense environments and at higher redshifts (z > 1). We suggest that a relatively shorter active phase and/or low jet power can be plausible reasons for the small size of remnant candidates.

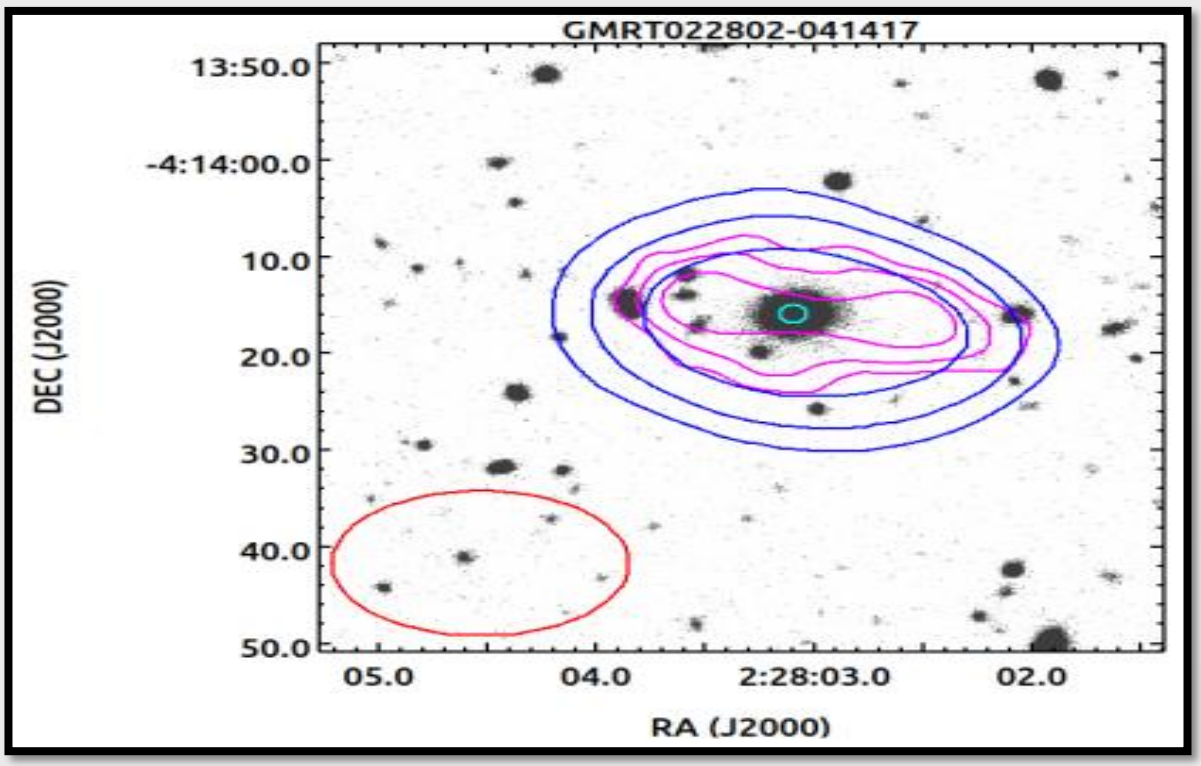


Figure:

Image of a remnant candidate showing radio contours at 325 MHz GMRT (in Blue) and 1.4 GHz JVLA (in Magenta) overlaid on the corresponding i-band HSC-SSP optical image.

Source/Reference of the Work: http://doi.org/10.3390/galaxies9040121

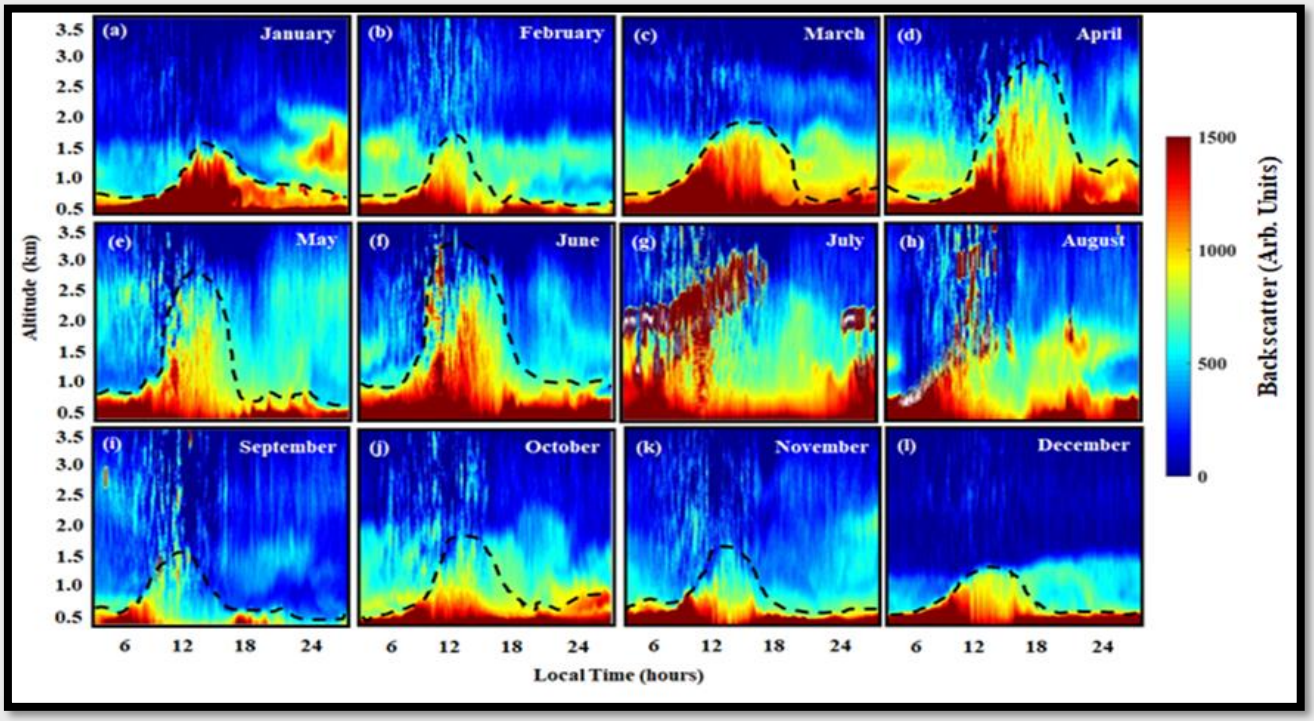
Investigation of Atmospheric Boundary Layer characteristics using Ceilometer Lidar, COSMIC GPS RO satellite, Radiosonde and ERA-5 reanalysis dataset over Western Indian Region

(Sourita Saha, Som Sharma, Niranjan Kondapalli, Prashant Kumar, Shyam Lal, Dharmendra Kamat)

Atmospheric Boundary Layer (ABL) is the lowermost layer of the atmosphere in contact with the Earth's surface. It plays a major role in heat circulation and pollutant dissipation. ABL is an important parameter that goes into the numerical models. Thus, an accurate estimation of the ABL is of utmost importance for bridging important uncertainties in the model predictions. In this study, we have investigated the characteristics of the ABL over a western Indian semi-arid urban region, Ahmedabad, using a ground-based Ceilometer Lidar, in conjunction with radiosonde, ERA-5 reanalysis and COSMIC GPS RO satellite. Strong diurnal variations of ABL are observed during 2019, the observation period. There is a stark winter-summer difference in ABL, with summer Boundary Layer Height (BLH) exceeding winter BLH by 1-1.5 km. ABL usually collapses during monsoon and is ambiguous due to the presence of thick clouds on top of ABL. The ABL is thicker during the onset of monsoon in contrast to active monsoon, rises again during the withdrawal of monsoon. Lidar observed ABL have been compared with satellite, radiosonde, and ERA5 datasets. ERA5 shows good agreement with differences within 500 m; radiosonde observations have under-estimated ground-based measurements, especially during summer. Satellite observations highly overestimated BLH. This comparative study reveals the importance of ground-based lidars in continuous monitoring of ABL at high resolution because radiosonde, satellite, and reanalysis datasets have coarser resolutions and sparse observations. Such quantitative evaluation of ABL is formerly unavailable over this region, which can now be used to improve the representation in numerical models and thereby estimates of radiative and climate effects due to ABL.

The Author

Sourita Saha



Ahmedabad during 2019. A representative day has been chosen from each Typical examples of monthly variations of ABL over Ahmedabad during 2019. A representative day has been chosen from each month to illustrate the variation of boundary layer (a) 27January (b) 1February (c) 1March (d) 1April (e) 2May (f) 8June (g) 15July (h) 21August (i) 19September (j) 25October (k) 1November (l) 29Decembermonth to illustrate the variation of boundary layer (a) 27January (b) 1February (c) 1March (d) 1April (e) 2May (f) 8June (g) 15July (h) 21August (i) 19September (j) 25October (k) 1No

Source/Reference of the Work:https://doi.org/10.1016/j.atmosres.2021.105999

PRL@75

SCOP 2021

The sixth edition of the Student Conference on Optics and Photonics (SCOP) was organized from 24th to 26th November 2021 by the OPTICA (previously OSA) Student Chapter of Physical Research Laboratory (PRL). The PRL-OPTICA student chapter has been organizing this conference since 2016. SCOP-2021 was organized as a three-day conference with six technical sessions in a webinar considering the prevailing pandemic. In the last five SCOPs, we have hosted 20 international speakers, 60 Indian speakers, and 130 Indian student speakers. However, taking the opportunity of the webinar mode, we managed thirty-three invited speakers, including nineteen faculty and fourteen students. Among the nineteen invited dignitaries, we had twelve speakers from nine countries spanning three continents (Asia, Europe, and America) and seven from India.

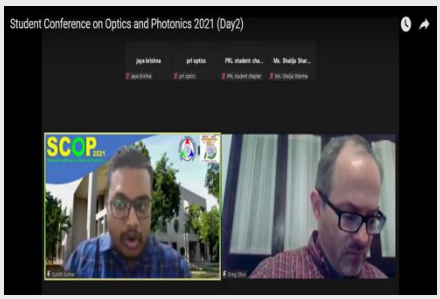
On the other hand, we accommodated 14 student talks, four international students, and twelve Indian students. The conference was open for all attendees, and we were happy to have 129 registrations for SCOP 2021, making it a mega International student conference.

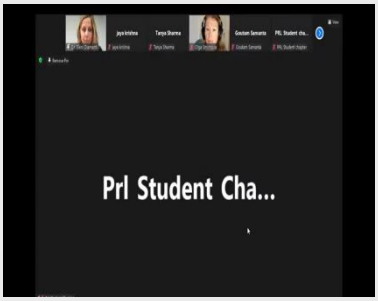
The conference highlighted the recent research and advancements in the numerous fields of optics, including Ultrafast Spectroscopy and Molecular Dynamics, Quantum optics and Quantum Information, Nonlinear Optics and Structured beams, Quantum Metrology, and Sensing. Furthermore, SCOP-2021 has included researchers from the interdisciplinary fields actively using light.

As always, we started the conference with an inaugural session. Director PRL, Prof. Anil Bhardwaj, offered generous support and encouragement to organize the SCOP, gave a motivational speech, and officially opened the SCOP 2021. We started the technical session of SCOP 2021 with an invited talk by Dr. Varun Makhija (University of Maryland, Washington) on *Ultrafast Spectroscopy and Molecular Dynamics.* Subsequently, Dr. Anindya Banerji (PDF, National University of Singapore) talked on Entanglement distribution through telecom fibres and Dr. Allan Johnson (The Hebrew University of Jerusalem) talked on Ultrafast soft X-ray science. Dr. Eleni Diamanti (Pierre and Marie Curie University, France), Prof. Olga Smirnova (Max Born Institute for Nonlinear Optics and Short Pulse Spectroscopy, Germany), and Prof. Xiongfeng Ma (Tsinghua University, China) were the speakers for the second session on *Quantum optics and Quantum Information*. We had Prof. Greg Gbur (University of North Carolina at Charlotte), Dr. Wagner Tavares Buono (PDF, University of the Witwatersrand, Johannesburg), Prof. Basudev N. Roy (IIT-Madras), and Prof. Miguel A. Alonso (University of Rochester, New York) as the speakers for the third technical session on *Nonlinear Optics and Structured Beam*.

Similarly, Prof. Daniele Faccio (University of Glasgow, UK), Prof. Robert Fickler (Tampere University, Finland), and Prof. Joyee Ghosh (IIT-Delhi) delivered their talks in the fourth technical session on *Quantum Metrology and Quantum Sensing*. The fifth technical session on interdisciplinary fields, named *Let there be Light*, covered the speakers Prof. Sudipta Maiti (TIFR, Mumbai), Prof. Mudit K Srivastava (PRL, Ahmedabad), and Dr. Alfredo Sanchez (PDF, ICFO - The Institute of Photonic Sciences). The sixth or the last technical session of SCOP covered *Nonlinear Optics and Structured Beam* with Prof. Prem Bisht (IIT-Madras) and Prof. Ravi Hedge (IIT-Gandhinagar) as invited speakers.

A vote of thanks concluded the three-day-long conference.





PRL Ka Amrut Vyakhyan

- **PKAV-18** Prof Paul Ho, Director, James Clerk Maxwell Telescope, East Asian Observatory, USA delivered a vyakhyaan entitled “THE DEVELOPMENT OF THE EAST ASIAN OBSERVATORY” on 01 December 2021.

- **PKAV-19** Prof. Rohini Godbole, Indian Institute of Science, Bangalore delivered a vyakhyaan entitled “Shedding light on the Dark Matter in the Universe” on 08 December 2021.

- **PKAV-20** Prof. Sreerup Raychaudhuri, Professor, Tata Institute of Fundamental Research, Mumbai, delivered a vyakhyaan entitled “Future Colliders” on 15 December 2021

- **PKAV-21** Prof. Dipankar Saha, Chair Professor, Manav Rachna International Institute for Research and Studies, Faridabad, delivered a vyakhyan entitled Sustainable groundwater resource use in India-Achievable or a mirage?” on 21 December 2021

- **PKAV-22** Prof. V. Chandrasekhar, Centre Director, TIFR Centre for Interdisciplinary Sciences, Hyderabad, and Department of Chemistry, Indian Institute of Technology Kanpur, Kanpur, delivered a vyakhyaan entitled "From P. C. Ray to the present: Chemistry in Action” on 28 December 2021.

Geosciences Division [5]

1. Harsh Oza, Virendra Padhya, Akash Ganguly, Rajendrakumar Dattatraya Deshpande, 2021, Investigating hydrometeorology of the Western Himalayas: Insights from stable isotopes of water and meteorological parameters, Atmospheric Research, Date of Publication: 29/12/2021
2. Anupam Samanta, Gyana Ranjan Tripathy, B Nagender Nath, Ravi Bhushan, Rajani Panchang, Nisha Bharti, Ankush Shrivastava, 2021, Holocene variability in chemical weathering and ocean redox state: A reconstruction using sediment geochemistry of the Arabian Sea, Journal of Asian Earth Sciences, Date of Publication: 21/12/2021
3. Romi Nambiar, Ravi Bhushan, Harsh Raj, 2021, Paleoredox conditions of bottom water in the northern Indian Ocean since 39 ka, Palaeogeography, Palaeoclimatology, Palaeoecology, Date of Publication: 21/12/2021
4. Lalchandani, V., Srivastava, D., Dave, J., Mishra, S., Tripathi, N., Shukla, A. K, Sahu, R., Thamban, N. M., Gaddamidi, S., Dixit, K., Ganguly, D., Tiwari, S., Srivastava, A. K, Sahu, L., Rastogi, N., Gargava, P., Tripathi, S. N., 2021, Effect of biomass burning on PM2.5 composition and secondary aerosol formation during post-monsoon and winter haze episodes in Delhi, Journal of Geophysical Research: Atmospheres, 126, e2021JD035232, Date of Publication: 20/12/2021
5. V.R.Kumari, V.V.S.S.Sarma, G. Mahesh, A. K. Sudheer, 2021, Temporal variations in the chemical composition of aerosols over the coastal Bay of Bengal, Atmospheric Pollution Research, Date of Publication: 17/12/2021

Udaipur Solar Observatory(USO) [2]

1. Nandita Srivastava, Marilena Mierla and Jie Zhang, 2021, Editorial: Space Weather Prediction: Challenges and Prospects, Frontiers in Astronomy and Space Sciences, Date of Publication: 17/12/2021
2. Syed Ibrahim, Wahab Uddin, Bhuwan Joshi, Ramesh Chandra, Arun Kumar Awasthi, 2021, Investigation of two coronal mass ejections from circular ribbon source region: Origin, Sun-Earth propagation and Geoeffectiveness, Research in Astronomy and Astrophysics (RAA) , Date of Publication: 16/12/2021

Space and Atmospheric Sciences Division [3]

1. Sourita Saha, Som Sharma, Kondapalli Niranjan Kumar, Prashant Kumar, Shyam Lal, Dharmendra Kamat, 2021, Investigation of Atmospheric Boundary Layer characteristics using Ceilometer Lidar, COSMIC GPS RO satellite, Radiosonde and ERA-5 reanalysis dataset over Western Indian Region, Atmospheric Research, Date of Publication: 29/12/2021
2. G. Mitra, A. Guharay, P. P. Batista, R. A. Buriti, 2021, Impact of the September 2019 minor sudden stratospheric warming on the low-latitude middle atmospheric planetary wave dynamics, Journal of Geophysical Research: Atmospheres, Date of Publication: 21/12/2021

3. A. Guharay, S. Mondal, S. Sarkhel, M. Sivakandan, M. V. Sunil Krishna, 2021, Signature of a mesospheric bore in 557.7 nm airglow emission using all-sky imager at Hanle (32.7N, 78.9E), Advances in Space Research, Date of Publication: 09/12/2021

Atomic, Molecular and Optical Physics [1]

1. R. Mitra, V. S. Prasannaa, R. F. Garcia Ruiz, T. K. Sato, M. Abe, Y. Sakemi, B. P. Das, and B. K. Sahoo, 2021, Towards CP-violation studies on superheavy molecules: Theoretical and experimental perspectives, Phys. Rev. A 104, 062801 (2021), Date of Publication: 01/12/2021

Theoretical Physics [1]

1. V. Suryanarayana Mummidi, Ketan M. Patel, 2021, Leptogenesis and fermion mass fit in a renormalizable SO(10) model, JHEP 12 (2021) 042, Date of Publication: 07/12/2021

Planetary Sciences Division [4]

1. S. Vijayan, Harish, K.B. Kimi, S. Tuhi, K. Vigneshwaran, R.K. Sinha, S.J. Conway, B. Sivaraman, Anil Bhardwaj, 2021, Boulder Fall Ejecta: Present day activity on Mars, GRL, Date of Publication: 17/12/2021
2. Sanjeev Kumar Mishra, K. Durga Prasad, Pranav Nath, Deepak Agarwal, S. Sunil Kumar, Anil Bhardwaj, 2021, Effect of lunar landing on its surface, surrounding environment and hardware: A numerical perspective, Planetary and Space Science, Date of Publication: 15/12/2021
3. Sana Ahmed and Kinsuk Acharyya, 2021, Gas-phase Modeling of the Cometary Coma of Interstellar Comet 2I/Borisov, Astrophysical Journal, Date of Publication: 10/12/2021
4. Rani, A., Basu Sarbadhikari, A., Sinha, R. K., Karunatillake, S., Komatsu, G., & Bates, A., 2021, Evidence of regionally distributed tectono-volcanism in a floor fractured crater of North-Central Arabia Terra, Mars, Journal of Geophysical Research: Planets, Date of Publication: 02/12/2021

Astronony & Astrophysics Division [3]

1. Vipin Kumar, Mudit K Srivastava, Dipankar P K Banerjee, C E Woodward, Ulisse Munari, Aneurin Evans, Vishal Joshi, Sergio Dallaporta, and Kim L Page, 2021, Optical and near-infrared spectroscopy of Nova V2891 Cygni: Evidence for shock-induced dust formation, Monthly Notices of the Royal Astronomical Society, Date of Publication: 29/12/2021
2. Vivek Kumar Jha, Hum Chand, Vineet Ojha, Amitesh Omar, Shantanu Rastogi, 2021, A comparative study of the physical properties for a representative sample of Narrow and Broad-line Seyfert galaxies, Monthly Notices of the Royal Astronomical Society, stab3700, Date of Publication: 21/12/2021
3. Veeresh Singh, Sushant Dutta, Yogesh Wadadekar, C. H. Ishwara-Chandra, 2021, Remnant radio galaxy candidates of small angular sizes, Galaxies, 9(4), 121, Date of Publication: 16/12/2021

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Date of Joining : *30.12.2021*

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Designation : *SCIENTIST/ENGINEER-SC*

Date of Joining 30.12.2021

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Name : *MISS SHIVANSHI GUPTA*

Designation : *SCIENTIST/ENGINEER-SC*

Date of Joining : *30.12.2021*

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Hearty Welcome to new members

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Designation : SCIENTIST/ENGINEER-SC

Date of Joining : 30.12.2021

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Date of Joining : 30.12.2021

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Name : MR. JACOB SEBASTIAN

Designation : SCIENTIST/ENGINEER-SC

Date of Joining : 30.12.2021

Division/Area : SPACE & ATMOSPHERIC SCIENCES (SPASC)

Name : MR. JAYANTH R.

Designation : SCIENTIST/ENGINEER-SC

Date of Joining : 30.12.2021

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