

32ND MID YEAR MEETING OF THE INDIAN ACADEMY OF SCIENCES

VIRTUAL / CISCO WEBEX EVENT 4, 11, 18 & 25 JUNE | 16:00–18:30 h 2 JULY | 14:00–19.30 h

EVENT SCHEDULE

MATHEMATICS/ EARTH & PLANETARY SCIENCES/ PHYSICS

Inaugural Lectures by Fellows/Associates

16:00–16:20	Conservation Laws with a Flux Function Discontinuous in the Space Variable G D Veerappa Gowda <i>TIFR-CAM,Bengaluru</i>
16:25—16:45	Unique Continuation for Sublinear Parabolic Equations Agnid Banerjee TIFR-CAM, Bengaluru
16:50—17;10	Partial Differential Equations on Long Cylinders Prosenjit Roy <i>IIT, Kanpur</i>
17:15—17:35	Variability of the Sun and its Impact Dipankar Banerjee ARIES, Nainital
17:40–18:00	Isostasy and Strength of Continental Lithosphere — Insights from Studies over Indian Plate Virendra M Tiwari NGRI, Hyderabad
18:05–18:25	Quantum Photonics with Plasmonic Cavity Coupled Quantum Dots: Emergence of Long zange Polariton Transport and Spin-Momentum Locking Jaydeep K Basu IISc, Bengaluru

Link for Webex attendees: <u>bit.ly/MYM2021_Day1</u> YouTube Live Stream: <u>youtu.be/3SZldSk32yU</u>



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EVENT SCHEDULE

PLANT SCIENCES/ MEDICINE/ GENERAL BIOLOGY

Inaugural Lectures by Fellows/Associates

	11
16:00–16:20	Wild Ginger and Banana Families of India: An Overview M. Sabu <i>MBGIPS, Calicut</i> JUNE 202 (FRIDAY
16:25–16:45	The Fcs-like Zinc Finger Proteins Fine- Tune the Nutrient Signaling and Growth and Stress-Response Trade-Offs In Plants Ashverya Laxmi NIPGR, New Delhi
16:50—17:10	Plasmonic Nanocapsules for Photothermal Therapy Amit Jaiswal IIT, Mandi
17:15—17:35	Heterogeneities in Neural Circuits: Origins and Implications Rishikesh Narayanan <i>IISc, Bengaluru</i>
17:40–18:00	Structure, Function and Modulation of G Protein-Coupled Receptors Arun K Shukla <i>IIT, Kanpur</i>
18:05–18:25	Highly Sensitive and Specific Panel of Diagnostic Biomarkers for Differentiating Sarcoidosis from Tuberculosis Identified using NMR-Based Serum Metabolomics Approach Dinesh Kumar CBMR, Lucknow

Link for Webex attendees: <u>bit.ly/MYM2021_Day2</u> YouTube Live Stream:<u>youtu.be/YRHGL-8ynBU</u>



32ND MID YEAR MEETING OF THE INDIAN ACADEMY OF SCIENCES

VIRTUAL / CISCO WEBEX EVENT 4, 11, 18 & 25 JUNE | 16:00-18:30 h 2 JULY | 14:00-19.30 h

EVENT SCHEDULE

CHEMISTRY/ ENGINEERING

Inaugural Lectures by Fellows/Associates

16:00–16:20	Porous Framework Materials: What are they good for? Rahul Banerjee <i>IISER, Kolkata</i>
16:25–16:45	Coherent Processes and other Emerging Trends in Molecular Semiconductors Satish A Patil <i>IISc, Bengaluru</i>
16:50–17:10	A facile Chemical Approach to Design Functional & Durable Nature-Inspired Wettability Uttam Manna IIT, Guwahati
17:15–17:35	Engineering to Science & Science to Engineering A Journey Over The Last 25 Years Debatosh Guha University of Calcutta, Kolkata
17:40–18:00	Extreme Classification: A New Paradigm for Search and Recommendation Manik Varma Microsoft Research India, Bengaluru
18:05–18:25	Disruptive Approaches in Emerging Semiconductor Technologies Mayank Shrivastava

IISc, Bengaluru

Link for Webex attendees: bit.ly/MYM2021_Day3 YouTube Live Stream: youtu.be/ZYVTpLCW7UU



32ND MID YEAR MEETING OF THE INDIAN ACADEMY OF SCIENCES

VIRTUAL / CISCO WEBEX EVENT 4, 11, 18 & 25 JUNE | 16:00-18:30 h 2 JULY | 14:00-19.30 h

EVENT SCHEDULE

EARTH & PLANETARY SCIENCES/ PHYSICS

Inaugural Lectures by Fellows/Associates

16:00–16:20	Dominant Rain Microphysical Processes in Monsoon Clouds T Narayana Rao NARL, Tirupati	5 202 DAY)
16:25–16:45	Implications of Shrinking Cryosphere under Changing Climate Shakil Ahmad Romshoo University of Kashmir, Srinagar	
16:50–17:10	Origin of Time Asymmetry and Friction in Multiscale Systems M K Verma <i>IIT, Kanpur</i>	
17:15–17:35	Can Carbon Capture and Storage in India Accelerate the Efforts towards Net-Zero Emissions? Vikram Vishal IIT, Mumbai	
17:40–18:00	Chemistry-Climate Interaction over the Eastern Himalayan Foothills Region Binita Pathak Dibrugarh University, Dibrugarh	
18:05–18:25	Aerosol Radiative Forcing Over India and Regional Climate S Suresh Babu VSSC, Thiruvananthapuram	

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Link for Webex attendees: bit.ly/MYM2021_Day4 YouTube Live Stream: voutu.be/vkldLpxjCBc

32 MID YEAR MEETING OF THE INDIAN ACADEMY OF SCIENCES A CISCO WEBEX EVENT | 4, 11, 18, 25 JUNE & 2 JULY

JUNE JUNE 2021 16:00 -18:30 h

Abstract e-Book

Inaugural Lectures by Fellows/ Associates



G D VEERAPPA GOWDA

TIFR Centre for Applicable Mathematics, Bengaluru

FELLOW 2019 *Mathematics* 4 June 2021 16:00 -16:20 h



Conservation Laws with A Flux Function Discontinuous in the Space Variable

The speaker will discuss conservation laws with a flux function F(x, u) discontinuous in the space variable x arises in several models in physics and engineering and in particular, in modeling of two phase flow in a heterogeneous porous medium, in the modeling of the ideal Clarifier-Thickner unit and traffic flows. In this talk the existence, interface entropy condition, uniqueness and the explicit formula for the solution when F(x, u) is convex in u will be discussed. Approximation of the solution by Godunov type numerical schemes and their convergence analysis with applications to oil reservoir simulations will be presented.

Inaugural Lectures by Fellows/ Associates



AGNID BANERJEE TIFR-CAM, Bengaluru

ASSOCIATE 2018 *Mathematics* 4 June 2021 16:25 -16:45 h



Unique Continuation for Sublinear Parabolic Equations

The speaker will talk about some recent results on strong unique continuation and backward uniqueness results for sublinear parabolic equations. This is based on some recent joint work with Ramesh Manna and Vedansh Arya.

Inaugural Lectures by Fellows/ Associates



PROSENJIT ROY *IIT, Kanpur*

ASSOCIATE 2020 Mathematics 4 June 2021 16:50 -17:10 h



Partial Differential Equations on Long Cylinders

In this talk, the speaker will discuss some properties of the solutions of some partial differential equations that are set on cylindrical domains. In particular, he will analyze asymptotic behaviour of the solutions of such problems when the length of the cylinder tends to infinity

Inaugural Lectures by Fellows/ Associates



DIPANKAR BANERJEE ARIES, Nainital

FELLOW 2020 Physics 4 June 2021 17:15-17:35 h



Variability of the Sun and its Impact

Solar variability refers to the changes in the solar activity in different time scales. In this presentation the speaker will give examples of variabilities with short time scale of hours to years time scale. How multi-wavelength long term solar observations from ground and space based platform is changing our understanding of this nearest star will be the focus of discussion. ADITYA-L1 is the first Indian mission that is dedicated to study solar atmosphere with unprecedented spatial and temporal resolution. The speaker will briefly introduce the mission objectives in this context as well.

Inaugural Lectures by Fellows/ Associates



V M TIWARI NGRI, Hyderabad

FELLOW 2020 Earth & Planetary Sciences

4 June 2021 17:40-18:00 h



Isostasy and Strength of Continental Lithosphere – Insights from Studies over Indian Plate

In recent discussions, it has been suggested that the crust alone contributes to the long-term strength of the continental lithosphere - referred as 'Crème Brûlée Model', contrary to the widely accepted 'Jelly Sandwich Model'. Integrated strength or Effective Elastic Thickness (EET) of the lithosphere is often determined through isostatic analyses, employing gravity anomalies. However, estimates of EET are sometime biased to the utilized methodologies. To address these two issues - estimation of EET and model of strength of continental lithosphere, we have methodically recorded and analysed gravity and topographic data using physics based model in conjunction with other geophysical observations over different geological terrains of Indian Tectonic Plate. We argue with our studies that both the mentioned models compete to each other, depending upon the underlying lithospheric properties. This has added a novel perception on the global debate over the model of continental lithospheric strength and isostatic compensation mechanism.

Inaugural Lectures by Fellows/ Associates



JAYDEEP K BASU IISc, Bengaluru

FELLOW 2020 *Physics* 4 June 2021 18:05-18:25 h



Quantum Photonics with Plasmonic Cavity Coupled Quantum Dots: Emergence of Long Range Polariton Transport & Spin-Momentum Locking

The speaker will discuss his recent results on coupling of colloidal quantum dots (QD), from single to compact assemblies, to plasmonic nanocavity arrays and metamaterials. With single isolated QDs his group was able to distinguish quantum coupling to localised surface plasmon and surface lattice resonances modes in plasmonic nanocavity arrays. He will discuss ultra-long-range optical energy propagation in these hybrid quantum photonic devices. He will also talk about the observation of photonic spin-momentum locking in the form of directional and chiral emission from achiral QDs evanescently coupled to achiral hyperbolic metamaterials. Efficient coupling between QDs and the metamaterial leads to emergence of these photonic topological modes that can be theoretically explained in terms of rigorous modelling based on photon Green's function where pseudo spin of light arises from coupling of QDs to evanescent modes of HMM.

32MID YEAR MEETING OF THE INDIAN ACADEMY OF SCIENCES A CISCO WEBEX EVENT 4, 11, 18, 25 JUNE & 2 JULY

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Abstract e-Book

Inaugural Lectures by Fellows/ Associates



MAMIYIL SABU Malabar Botanical Garden and IPS, Calicut, Kerala

FELLOW 2020 Plant Sciences 11 June 2021 16:00 -16:20 h



Wild Ginger and Banana Families of India: An Overview

The talk is a comprehensive presentation on the taxonomy, uses, IUCN status of wild gingers and banana in India. The gingers include the members of the family Zingiberaceae, which consist of about 21 genera and about 200 species in India. Of these, one genus and 35% of the taxa are endemic to India. The Calicut University Botanical Garden holds the largest collection of gingers in India.

Banana family or Musaceae form the second largest family of the order Zingiberales in India. A live germplasm of Indian Musaceae is established in the Calicut University Botanical Garden and Malabar Botanical Garden. Recently 14 new species have been discovered from India. We could rediscover five species after a lapse of 57 to 121 years. This present work includes all wild bananas from India, endemism, IUCN status, ecology etc.

Inaugural Lectures by Fellows/ Associates



ASHVERYA LAXMI NIPGR, New Delhi

FELLOW 2021 Plant Sciences 11 June 2021 16:25 -16:45 h



The FCS-Like Zinc Finger Proteins Fine-Tune the Nutrient Signaling and Growth and Stress-Response Trade-Offs in Plants

The antagonistic interaction of The Target Of Rapamycin (TOR) and SNF1-related protein kinase 1 (SnRK1), which are two serinethreonine kinases that originated in eukaryotes, is crucial for the survival of the organisms. These kinases have highly conserved functions across the eukaryotes, but did undergo significant evolutionary innovations for optimization according to the lifestyle of different eukaryotic lineages. The speaker and team have identified a novel class of C2-C2 zinc fingers, which they named FCS-Like Zinc fingers (FLZ). These proteins were found to be physically associating with different subunits of SnRK1 and specifically with RAPTOR, the regulatory subunit of TOR. Molecular analysis of various FLZ genes identified that they are involved in the regulation of protein stability of SnRK1α1, the major kinase subunit of SnRK1. Further, they were also found to be working adaptor proteins bridging TOR and SnRK1 complexes in plants.

Inaugural Lectures by Fellows/ Associates



AMIT JAISWAL IIT, Mandi

ASSOCIATE 2020 General Biology 11 June 2021 16:50 -17:10 h



Plasmonic Nanocapsules for Photothermal Therapy

Nano-scale noble metal particles have garnered interest due to its excellent property to generate localized heat upon excitation of its surface plasmon, which if targeted to tumour site can lead to cell death. The speaker and group have developed rattleshaped monometallic and bimetallic nanocapsules having absorption in the Near infrared region (NIR) and demonstrated its (plasmonic photothermal therapy) PPTT activity and stimuli responsive drug delivery. The engineered metal nanorattles structures have a solid Au core and a thin, porous metal shell and possess extinction in both the NIR-I and NIR-II region of the biological window. The unique properties of these plasmonic structures such as porous nature, intrinsic electromagnetic (EM) hotspots and broad absorption in the NIR region were utilized in designing a stimulus responsive nanotheranostic system capable of SERS-based bioimaging drug delivery and PPTT.

Inaugural Lectures by Fellows/ Associates



RISHIKESH NARAYANAN IISc, Bengaluru

FELLOW 2020 General Biology 11 June 2021 17:15 - 17:35 h



Heterogeneities in Neural Circuits: Origins & Implications

In this talk, two case studies will be presented on the origins and implications of different forms of heterogeneities in neural circuits. The first case study relates the dentate gyrus (DG), which has been implicated in memory formation. A case will be made that the expression of heterogeneities not only acts as a substrate for executing response decorrelation (an important function of the DG circuit) but also imparts functional resilience to the DG network in the face of perturbations. In the second case study involving the medial entorhinal cortex, that is implicated in spatial navigation, the introduction of distinct forms of heterogeneities hampers gridpatterned firing of neurons there. Here, the destabilizing impact of heterogeneities on neural circuit function is eliminated by the introduction of an endogenously-expressed neural mechanism that suppresses slow inputs. Together, these analyses emphasize that experimental analyses and computational models should embrace the complexity and heterogeneities that are inherent to biological systems, rather than over-simplifying them to structure-function relationships that ignore biological complexity or the ubiquitous heterogeneities.

Inaugural Lectures by Fellows/ Associates



ARUN K SHUKLA IIT, Kanpur

ASSOCIATE 2019 General Biology

11 June 2021 17:40-18:00 h



Structure, Function and Modulation of G Protein-Coupled Receptors

G Protein-Coupled Receptors (GPCRs) are the main conduit of information transfer across the cell membrane. These receptors and their signaling networks are intricately involved in almost every physiological and pathophysiological processes in human body such as cardiovascular regulation, immune response, neurotransmission, behavior and mood regulation. About half of the currently prescribed drugs target this class of receptors including alpha and beta blockers, angiotensin receptor blockers and anti-histamines. GPCR targeting drugs are used in congestive heart failure, hypertension, asthma, allergies, schizophrenia, Parkinson's disease and cancer. Our long-term goal is to understand the structural basis of GPCR activation and signaling, and leverage this information to design better therapeutics. In this talk, I will present our recent efforts involving a multipronged approach to decipher the activation, signaling and regulation of selected GPCRs.

Inaugural Lectures by Fellows/ Associates



DINESH KUMAR CBMR, Lucknow

ASSOCIATE 2019 *Medicine* 11 June 2021 18:05-18:25 h



Highly Sensitive and Specific Panel of Diagnostic Biomarkers for Differentiating Sarcoidosis from Tuberculosis Identified using NMR-based Serum Metabolomics Approach

Sarcoidosis (SAR) is an uncommon granulomatous disease which shares the similar clinical and radiological features with tuberculosis (TB). Clinical symptoms common in TB are often manifested in sarcoidosis as well. Most of the SAR patients end up receiving anti tubercular therapy erroneously. The diagnosis of SAR poses a great challenge due to its relative rarity, lack of sensitive and specific diagnostic tests and its heterogeneous presentation. Often, SAR is diagnosed based on exclusion of TB. There is a need to identify non-invasive biomarker(s) for differentiating SAR from TB. In this direction, the serum metabolic profiles of SAR and TB patients and healthy subjects were measured using NMR spectroscopy and compared. A significant serum metabolic disparity between SAR and TB patients was observed and a panel of discriminatory metabolites were further tested for statistical significance as well as diagnostic potential. The various results of the study will be presented during the meeting.

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18 CHEMISTRY AND 2021 16:00 - 18:30 h

Abstract e-Book

Inaugural Lectures by Fellows/ Associates



RAHUL BANERJEE IISER, Kolkata

FELLOW 2020 *Chemistry* 18 June 2021 16:00 -16:20 h



Porous Framework Materials: What are They Good For?

The speaker and his research team have successfully overcome the chemical stability problem of Covalent organic frameworks (COFs) by synthesizing β -ketoenamine based frameworks, while processability, synthetic hurdles, and scalability of COFs still remain unexplored. In order to address these key issues, they have developed a very simple, scalable and novel methodology by which COFs can be synthesized by simple mixing and heating of the reactants. Using this method, COF can be processed in to self-standing covalent organic framework membranes (COMs). The resultant COMs display higher porosity and crystallinity over their reported powder form. These selfstanding COMs are flexible, continuous, devoid of any internal defects or cracks, show long-term durability. They have utilized these COMs for separation applications such as waste water treatment and recovery of valuable active pharmaceutical ingredients [APIs] from organic solvents.

Inaugural Lectures by Fellows/ Associates



SATISH A PATIL IISc, Bengaluru

FELLOW 2021 *Chemistry* 18 June 2021 16:25 -16:45 h



Coherent Processes and Other Emerging Trends in Molecular Semiconductors

A rapid improvement in performance of organic solar cells, light-emitting diodes and field-effect transistors largely originate from the successful development of new molecular semiconductors. However, the fundamental question still remains related to the unequal mobility of hole and electron in π -conjugated polymers. A rational design of polymers is necessary to target n-type stable polymers, which can work in ambient processing conditions. Our laboratory employs a molecular engineering approach to develop high charge carrier n-type polymers for enhancing the performance of optoelectronic devices. In this talk, the speaker will present the integrated approach to materials design forcoherent transport in molecular semiconductors. Specific emphasis will be placed on the molecular design principle to rationally develop the molecular semiconductorsfor singlet fission, high performance organic solar cells with coherent transport.

Inaugural Lectures by Fellows/ Associates



UTTAM MANNA IIT, Guwahati

ASSOCIATE 2018 *Chemistry* 18 June 2021 16:50 -17:10 h



A Facile Chemical Approach to Design Functional & Durable Nature-Inspired Wettability

Applications of nature-inspired wettabilities include oil/ water separation, anti-corrosion, underwater robotics, protein crystallization, drug delivery, open microfluidics, water harvesting etc. Generally, essential chemistry and appropriate topography that conferred the special liquid wettability were mostly achieved by associating delicate chemistry, where hydrophilic hierarchical top was decorated with inert chemicals. Eventually, the synthesized materials suffered from poor durability issue. To develop durable and functional bio-inspired wettability, recently, the speaker and group have extended 1,4 conjugate addition reaction between amine and acrylates at ambient condition. Further, porous and chemically reactive interfaces were prepared for tailoring various important and functional liquid wettabilityThe synthesized interfaces were successfully applied to demonstrate some practically relevant out door applications.

Inaugural Lectures by Fellows/ Associates



DEBATOSH GUHA University of Calcutta, Kolkata

FELLOW 2021 Engineering 18 June 2021 17:15 -17:35 h



Engineering to Science & Science to Engineering A JOURNEY OVER THE LAST 25 YEARS

The speaker will describe his scientific ventures of the past 25 years, from the summer of 1996 when he was attending a conference at France, his interaction with Prof. Tatsuo Itoh and his introduction to antenna research. Active antenna was booming in the early 1990s and the available literature was primarily focusing on their applications or engineering developments. He will speak of an integrated antenna in L-band that he designed for a Canadian Government Laboratory. Subsequently, several lucrative proposals also poured in from the industries. He will describe how printed and dielectric resonator antennas operating over a wide range of frequencies and to be deployed on various working platforms were the primary challenges. Finding out their solutions led the speaker and group sometimes from Engineering to Science and vice versa. The journey that embodies several moments of success and failure will be addressed in this presentation.

Inaugural Lectures by Fellows/ Associates



MANIK VARMA Microsoft Research India, Bengaluru

FELLOW 2021 Engineering 18 June 2021 17:40 -18:00 h



Extreme Classification: A New Paradigm for Search and Recommendation

In this talk, the speaker will give a high level overview of extreme classification, which is a new research area in machine learning dealing with classification problems involving an extremely large number of categories. He will also discuss how extreme classification has opened a new paradigm for key industrial applications in web search and recommendation.

Inaugural Lectures by Fellows/ Associates



MAYANK SHRIVASTAVA IISc, Bangalore

ASSOCIATE 2018 Engineering 18 June 2021 18:05 -18:25 h



Disruptive Approaches in Emerging Semiconductor Technologies

In this talk, the speaker will cover his group's work on Gallium Nitride power HEMTs and Graphene based RF transistors. In particular, he will talk about how they realized and demonstrated record high performance power HEMTs and Graphene FETs using disruptive approaches developed from first principle. Besides, he will also briefly touch base on commercial prospects of these technologies and way forward for economies like India.

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Abstract e-Book

Inaugural Lectures by Fellows/ Associates



T NARAYANA RAO NARL, Tirupati

FELLOW 2020 Earth & Planetary Sciences 25 June 2021 16:00 -16:20 h



Dominant Rain Microphysical Processes in Monsoon Clouds

Several dynamical & microphysical processes alter the growth of cloud drop into a rain drop within and below the cloud. These processes dictate the rain amount reaching the ground and heat budget of the atmosphere through latent heat release/ absorption thereby play a crucial role in modulating/generating atmospheric circulations. The dominant microphysical process(es) in any region, however, depend on the ambient environment and climatic conditions of that region. Understanding these processes and deciphering the dominant microphysical process in different climatic zones are imperative for improving parameterization schemes and weather forecasting. This talk primarily focuses on extraction of rain microphysics in monsoon clouds using a variety of instruments, including disdrometers and ground and spaceborne radars and understanding the underlying physical processes. Several intriguing results were obtained on raindrop size and its variation as a function of height, season, rain type and climatic zones and these will be discussed.

Inaugural Lectures by Fellows/ Associates



SHAKIL AHMAD ROMSHOO

University of Kashmir, Srinagar

FELLOW 2021 Earth & Planetary Sciences

25 June 2021 16:25 -16:45 h

Implications of Shrinking Cryosphere Under Changing Climate

The speaker will talk about enhanced glacier-melt in the Himalaya under changing climate and observations on decadal glacier thickness changes and cumulative mass loss which can impact the sustainability of water, food and energy security. He will speak about climate projection studies on annual average temperature and precipitation. The speaker will discuss the multi-model ensemble climate data used to simulate the changes in snow precipitation, snowmelt contribution and streamflow under climate change scenarios. The projections have revealed that both the snow precipitation and snowmelt contribution to streamflows shall significantly decrease ending 21st century. Moreover, early snowmelt predicted would lead to the streamflow peak shifting. The findings are expected to significantly impact the availability of waters for various uses, flood vulnerability and sharing of the Indus waters. The generated knowledge can inform policymaking for mitigating adverse impacts of climate change on various cryosphere-dependent sectors in the region.



Inaugural Lectures by Fellows/ Associates



M K VERMA IIT Kanpur

FELLOW 2020 Physics 25 June 2021 16:50 - 17:10 h



Origin of Time Asymmetry and Friction in Multiscale Systems

Fundamental interactions are either fully or nearly symmetric under time reversal. But macroscopic phenomena typically exhibit a definite arrow of time. From the perspectives of statistical physics, the direction of time is towards increasing entropy. The speaker will describe how multiscale energy flux can also be used to determine arrow of time. In drivendissipative non-equilibrium systems forced at large scale, the energy typically flows from large scales to dissipative scales. This generic and multiscale process breaks time reversal symmetry and principle of detailed balance, thus can yield an arrow of time. He also proposes that conversion of large-scale coherence to small-scales decoherence could be treated as a dissipation mechanism for generic physical systems. In addition, he will discuss the equilibrium and nonequilibrium aspects of hydrodynamic equations. Turbulence will be used as a generic example to illustrate the above ideas.

Inaugural Lectures by Fellows/ Associates



VIKRAM VISHAL IIT, Mumbai

ASSOCIATE 2018 Earth & Planetary Sciences

25 June 2021 17:15- 17:35 h



Can Carbon Capture and Storage in India Accelerate the Efforts towards Net-Zero Emissions?

There is a need to scale up methods of reducing CO₂ emissions in the atmosphere under a stringent climate regime that must strike a balance with development. India's energy and climate goals can be addressed concurrently by incorporating carbon capture, utilization, and storage (CCUS) into its national plan to achieve a 10 trillion economy, sustainably, over the next decade, and a net-zero energy system by 2050. By achieving four of the UN's seventeen Sustainable Development Goals through CCUS, India can join the league of major world economies on the CCUS world map. As per the International Energy Agency and the Global CCS Institute assessments, CCUS shall account for about 14-32% of all efforts to clean energy transitions by 2050. This talk will discuss the various dimensions of CCUS, its relevance to India, and the scale of carbon sequestration in different geological sinks in the country.

Inaugural Lectures by Fellows/ Associates



BINITA PATHAK Dibrugarh University, Dibrugarh

ASSOCIATE 2020 Earth & Planetary Sciences

25 June 2021 17:40 -18:00 h



Chemistry—Climate Interaction Over the Eastern Himalayan Foothills Region

The eastern part of the Eastern Himalayan Foothills region is dominated by biomass burning emissions, while fossil fuel generated trace gases and aerosols override the western part. The columnar aerosols burden exhibits a strong seasonality, a west to east longitudinal (decreasing) and an altitudinal (inverse) gradient. Both columnar aerosol loading and O₂ in the region stand second highest in South Asia next to IGP. Il surface level pollutants: PM, BC, CO and NO, except O, possess similar seasonality. The non-linearity between O, and NOx suggests O, formation in a NO, saturated, VOC sensitive regime. The aerosol radiation interaction. aerosol-cloud interaction, stratosphere-troposphere exchange during normal and extreme weather events, lightning activities producing NO, and O_z, convective activities leading to elevated aerosol layers are critical over the region. Comprehensive research in these areas including the speaker's contributions has enriched the knowledge about South Asian chemistry-climate interaction and understanding of the climate change mechanisms.

Inaugural Lectures by Fellows/ Associates



S SURESH BABU VSSC, Thiruvananthapuram

FELLOW 2021 Earth & Planetary Sciences

25 June 2021 18:05 - 18:25 h



Aerosol Radiative Forcing over India and Regional Climate

Aerosols affects the radiation balance of the earth - atmosphere system through direct (scattering and absorption) and indirect (modifying the cloud properties) radiative forcing and alter regional and global climate. ISRO maintains the largest network of aerosol observatories (ARFINET) over India covering distinct landmass regions in India and marine regions around it. Besides this, several multi- platform field campaigns were conducted onboard research ship, aircraft and high altitude balloons. An integrated approach, where a combination of observations from ground-based and space-based systems with state-of-the-art radiative transfer and climate models, is used for climate impact assessment. This talk is about the important scientific results from the Aerosol Radiative Forcing over India (ARFI) Project of ISRO-GBP, which improved our understanding of the atmospheric aerosols and its climate impacts over Indian region.