



32mym

**32ND MID YEAR MEETING OF THE
INDIAN ACADEMY OF SCIENCES**

A CISCO WEBEX EVENT

4, 11, 18, 25 JUNE & 2 JULY

25

**JUNE
2021**

16:00 – 18:30 h

**EARTH & PLANETARY
SCIENCES AND
PHYSICS**

Abstract e-Book



32MYM

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
- 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
IIT, Kanpur
- 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

25
JUNE 2021
(FRIDAY)

Link for Webex attendees: bit.ly/MYM2021_Day4

YouTube Live Stream: youtu.be/vkldLpxjCBc

32mym

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 space-borne 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.

32mym

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.

32mym

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 driven-dissipative 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.

32mym

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.

32mym

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 O_3 in the region stand second highest in South Asia next to IGP. If surface level pollutants: PM, BC, CO and NO_x , except O_3 possess similar seasonality. The non-linearity between O_3 and NO_x suggests O_3 formation in a NO_x saturated, VOC sensitive regime. The aerosol radiation interaction, aerosol-cloud interaction, stratosphere-troposphere exchange during normal and extreme weather events, lightning activities producing NO_x and O_3 , 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.

32mym

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.