Department of Earth Sciences, IIT Kanpur

# RESEARCH SCHOLARS' DAY 2023

EARTH SCIENCES
IIT KANPUR

Date: **15 April 2023, Saturday**
Time: **9:30 am** onwards
Venue: **Rajeev Motwani Building (RM 101)**

## SCHEDULE

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| Session 1: Inauguration | 9:30-10:05 |
| Session 2: Address by Delegates | 10:30-11:00 |
| Session 3: Oral Presentations | 11:00-13:00 |
| Session 4: Poster Presentations | 14:30-16:30 |
| Session 5: Closing ceremony and Vote of Thanks | 17:00-17:30 |

## INVITED DELEGATES

**Prof. Shyam S. Rai**
Department of Earth & Climate Science
Centre for AI and Data Science
Indian Institute of Science Education and Research Pune

**Dr. Joyesh Bagchi**
Dy. Director General & Head,
State Unit UP Northern Region
Geological Survey of India, Lucknow

## ORAL PRESENTATIONS

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| **Aurobindo Kumar Basantaray** | Integrated geophysical studies to elucidate subsurface configuration and understand the evolution of a non-volcanic geothermal system along Mahanadi rift basin, India |
| **Prabhat Kumar** | Evidence of Strain accumulation and Coupling variation in the Himachal region of NW Himalaya from continuous GPS measurements: Implications for Regional Tectonics & Seismic Hazard |
| **Krishnendu Paul** | Frictional controls on the failure of rainfall-induced landslides |
| **Shashank Narayan Verma** | Velocity depth modelling across the Himalayan Frontal Thrust, Kumaon Himalaya, using active and passive seismic |
| **Shaifullah** | Stable water isotope modelling reveals early onset of snowpack melting in the headwaters of the Ganga River |
| **Garima Sodha** | Re-Thinking OOS (Orthopyroxene, Olivine, Spinel) Occurrences on the Moon: Implications for Lunar Crustal Diversity |
| **Shobhit Singh** | Stage based frequency analysis and its applicability for flood inundation mapping using UAV derived DEM |
| **Pradyut Phukon** | Changes in thermomagnetic and X-ray diffraction properties of Asby dolerite with distance from the Lockne Impact structure, Sweden |
| **Varsha Singh** | Archean crustal evolution of bundelkhand craton |
| **Arbazkhan Nayyum Pathan** | Revisiting Modelling aspect of Rock Surface Exposure Dating |

**Lecture by Prof. Shyam S. Rai on 16 April, Sunday at 11 am; Venue: L10**

### Indian craton and mantle plume interaction: Is anything destroyed?

Low heat flux, mantle xenolith geobarometry, and seismic wave speeds all imply that Archean and Proterozoic lithosphere is thicker and colder than the Phanerozoic lithosphere. To compensate for the low temperature, and resulting thermal contraction, such material must be chemically less dense than mantle material elsewhere at the same depths, an inference corroborated by studies of lithospheric mantle xenoliths. The high viscosity of lithospheric keel and its coupling with the underlying mantle reduces the basal drag force acting on the cratonic root which stabilizes them against erosion by convective stresses and localized deformations leading to its longevity. This continental undertow model was first conceptualized by Alvarez (1982) and explains the motion of a continental plate with a thick root driven by the underlying mantle convection. Though the cratonic cores are protected by Proterozoic mobile belts, they are nevertheless subject to reworking and destruction by various geological processes such as subduction and mantle plumes. The numerical modelling suggests the destruction of a craton by a mantle plume is possible when the craton stays above the plume for a fairly long duration, at least over 100 Myrs. For a fast-moving plate, numerical simulation suggests the formation of small-scale inhomogeneities in the plume-lithosphere boundary layer raising the 12000 C isotherm by up to 30 km, while 8000 C isotherm remains undisturbed. The controversy regarding mantle plumes' ability to erode the lithosphere of the fast-moving overlying plate, such as India, remains unresolved. Using seismological data from a high-density network across the Dharwar craton encompassing the kimberlite xenolith domain suggests that the present-day lithosphere signature is essentially the same as that derived from xenolith data. We discuss further the implications of these results in the context of Deccan volcanism and present the first seismological signature of the magma plumbing system using data from a recently deployed high-resolution seismological experiment from the west coast to a distance over 200 km in the interior.