Indian Institute of Engineering Science and Technology, Shibpur
An Institute of National Importance
भारतीय अभियांत्रिकी विज्ञान एवं प्रौद्योगिकी संस्थान, शिवपुर

Biannual Newsletter

BLUE PLANET

by

DEPARTMENT OF EARTH SCIENCES, IIEST SHIBPUR, HOWRAH, WEST BENGAL

Indian Institute of Engineering Science and Technology, Shibpur
An Institute of National Importance
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Message from HoD's Desk

This is an auspicious moment for me as Head, Department of Earth Sciences to publish the first newsletter the Department, "Blue Planet". An opportunity has come to me to discuss the few words about my department to convey as messages in open platform through this newsletter. The Department is the youngest one in comparison to the other Departments of the Institute. But the subject, Geology, has age-old relationship with the Institute, from the inception, when the Institute was known as Civil Engineering College. In 2005, the Department emerged as Department of Geology being separated from the Department of Mining and Geology. The post graduate course in Applied Geology and undergraduate courses were offered in Civil, Mining and Metallurgy departments before and after the emergence as separate Department. In 2008, the Department was renamed as Department of Earth Sciences to encourage the multidisciplinary research activities in the Department from various branches of Earth Sciences like Geophysics, Oceanography, Meteorology etc. in association with Geology. At present the undergraduate and postgraduate students from different corners of the country are joining in the postgraduate and doctoral program of the Department. The students of the Department are well placed in different Government and non-Government professional organizations like Geological Survey of India, Oil and Natural Gas Commission, Central Ground Water Board, SWID, Essar Oil etc. and also continuing their further studies in abroad and Indian eminent Institutes like IITs, IISC, IISERs. The faculty members, research scholars of the department are rendering their best to develop the department as one of the best Earth Science Department in Indian perspective. The department is trying to develop the curriculum keeping pace with the job opportunities and call of the hour. From the new academic session, the department will be offering new orientation of the curriculum following NEP, 2020 and introducing new subjects like 'Applications of AI-ML in geosciences', 'An introduction to the extraction of Critical Minerals' etc. as interdisciplinary subjects. The aim of the department is to equip the students to serve the interest of the Nation and we believe "Nation First". We gratefully acknowledge the continuous encouragement and inspiration from the Hon'ble Director, IIEST, Shibpur, Prof. V.M.S.R.Murthy, for the advancement and development of the department.

Prof. Bhabani Prasad Mukhopadhyay

Courses offered:

Undergraduate

Geology for Civil Engineering
Fundamentals of Geology for Mining Engineering

Postgraduate

Applied Geology

PhD Program

Hydrogeology, Sedimentology, Experimental Structural Geology, Igneous, Metamorphic Petrology and Geochemistry

Thrust Areas

- **Hydrogeology**
- **Sedimentology**
- **Stratigraphy**
- **Experimental Structural Geology**
- **Igneous Petrology**
- **Metamorphic Petrology**
- **Geochemistry**
- **Studies on Critical Minerals**
- **Paleontology**
- **AI-ML application in Geosciences**

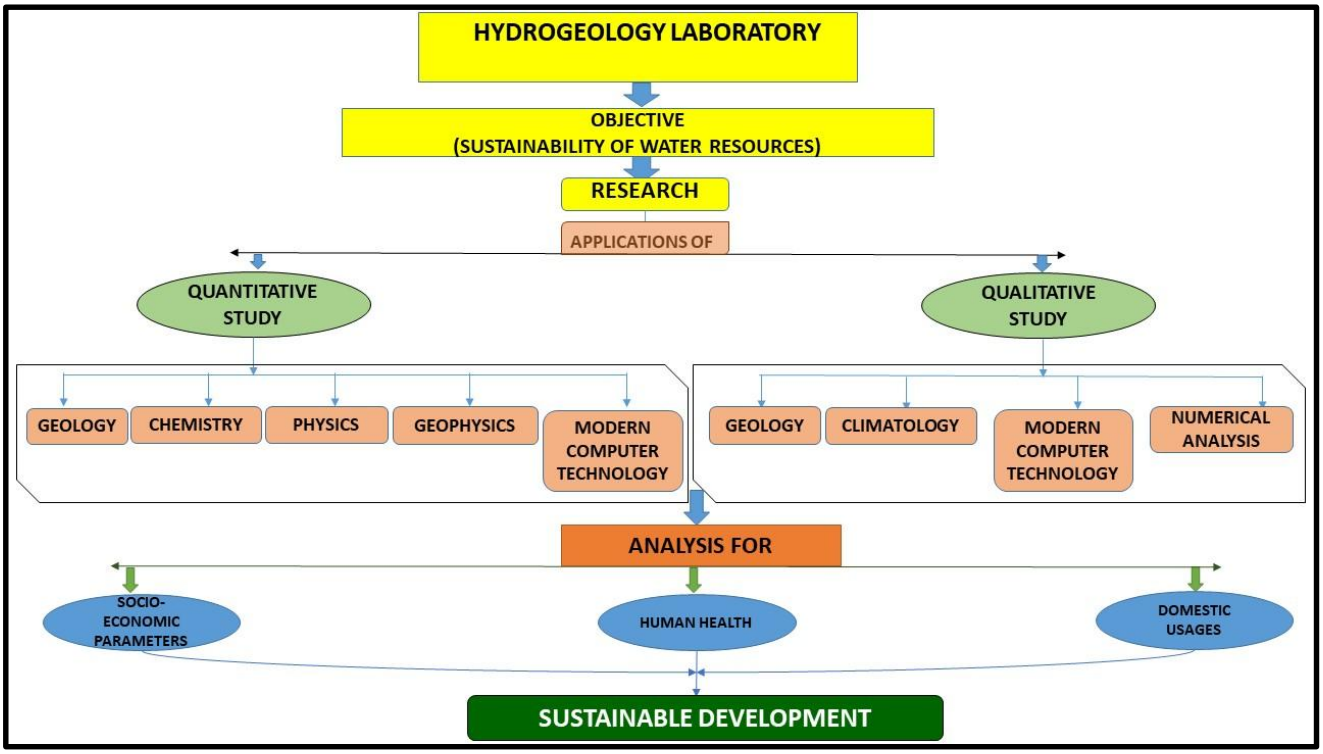
PhD Awarded during 2024 – 25

1. Puja Chowdhury (Hydrogeology)
2. Uddalak Biswas (Structural Geology)
3. Sharmistha Paul (Paleontology)
4. Siperna Nayek (Hydrogeology)

Research Overview

Hydrogeology

Water is inevitable for the survival of biosphere of our planet. But in present scenario, the globe is facing crisis in terms of water. As edible water resources are not infinite, the fresh water is considered as "Finite Natural Resource". The periodic monitoring of quantity and quality of fresh water has become an important commitment for the researchers. The "Hydrogeology Laboratory" of the Department of Earth Sciences carry out the multidisciplinary research towards the quantitative and qualitative assessment of the surface and sub-surface water resources along with its suitability especially for socio-economic parameters and human health in various geological and climatic segments. The research activities of the laboratory are not only confined with the academic objectives but also serving the requirements of different Government and Semi-Government industrial organizations of the Nation towards the " Sustainable Development".



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Research Overview

Sedimentology

My research interest hovers around the study of sedimentary dynamics, basin evolution and paleoclimate of the Proterozoic and Tertiary basins in India. This involves sedimentary facies analysis of the siliciclastics, carbonates and mixed sedimentary systems and application of sequence stratigraphy. The research includes sedimentation modelling, petrography, geochemistry, extensive fieldwork and laboratory experiments. All these observations are made with a motive to assess the economic potentiality of a sedimentary basin.

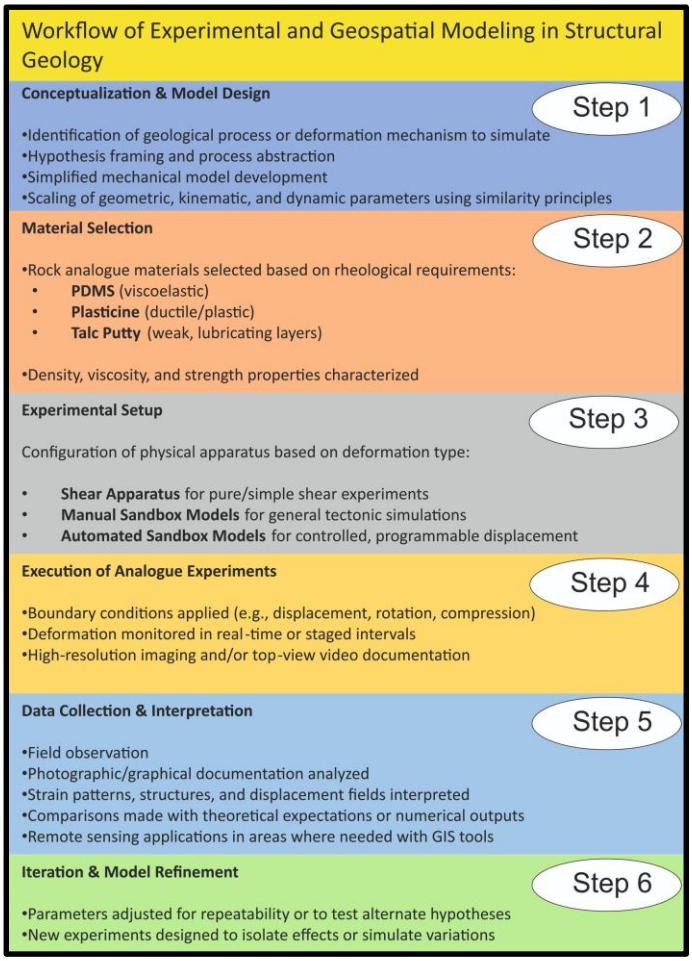
In the last five years I am working the Quaternary fluvial basins of North-Eastern India.




Research Overview

Structural Geology

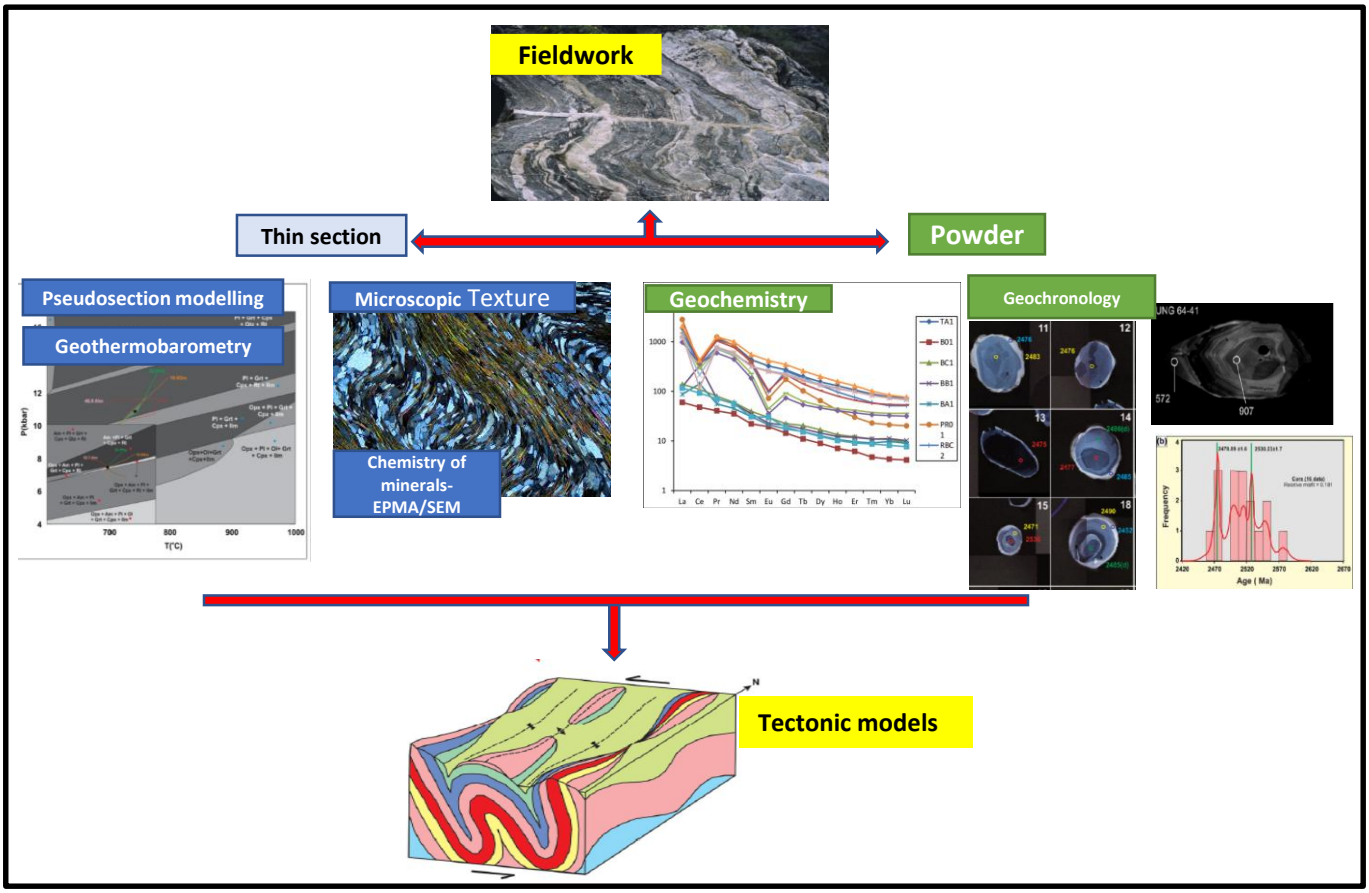
At the Structural Geology Laboratory, research has been focused on the analysis of deformation mechanisms and structural evolution within mobile belts, with particular emphasis on the Proterozoic North Singhbhum Mobile Belt and the Chhotanagpur Gneissic Complex so far. Investigations have been carried out on the development of tectonic fabrics, the kinematics of curvilinear shear zones, and the spatial and temporal variation of strain fields in multi-deformed terrains. A combination of high-resolution field mapping, analogue experiments, and finite element modeling has been employed to study structural features such as pegmatite emplacement, buckle fold development in shear zones, and the formation of shear bands in foliated granitic rocks. In recent years, research has been extended to include neotectonic studies and tectonic geomorphology. Remote sensing and GIS-based analyses have been utilized to evaluate surface deformation patterns and active fault systems, and seismically active regions in India, Bangladesh, China, and New Zealand. Through the integration of field data, experimental modeling, and geospatial techniques, the laboratory continues to contribute toward a deeper understanding of crustal deformation processes and the dynamic behavior of the Earth's interior.



Research Overview

Igneous and Metamorphic Petrology

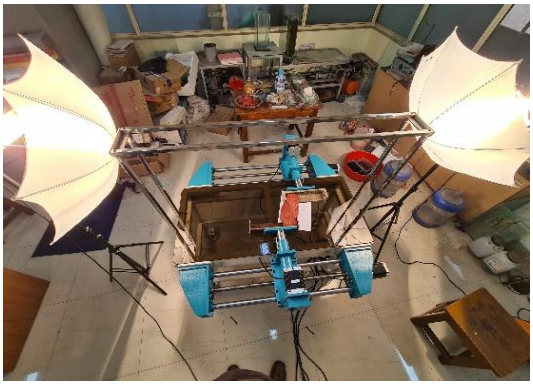
Research in the Igneous and Metamorphic petrology laboratory is majorly focussed on the Granulite terrane of South India (GTSI) from the southern peninsular India covering the state of Tamil Nadu and Kerala. The research focusses on the charnockite, mafic- ultramafic and the meta peltic rocks of the terrane, their emplacement, metamorphism and evolution with time. Hence using the tools of thermodynamic modelling, pseudosection, conventional geothermobarometry, geochemistry and geochronology are used to unravel the history is these rocks. Most of these rocks are Archean, their metamorphism dates from 2.4Ga to 500Ma hence the terrane stores the history more than 2 billion years which is rare and fascinating. The placers deposits in the coastal Tamil Nadu and Kerala thus is explored for the enrichment of minerals like monazite, garnet, zircon, rutile etc. These minerals are abundant in the basement rocks hence with very recent venture on the coastal Tamil Nadu is explored for abundance of critical minerals in the beach and fluvial placer deposits.



Laboratory

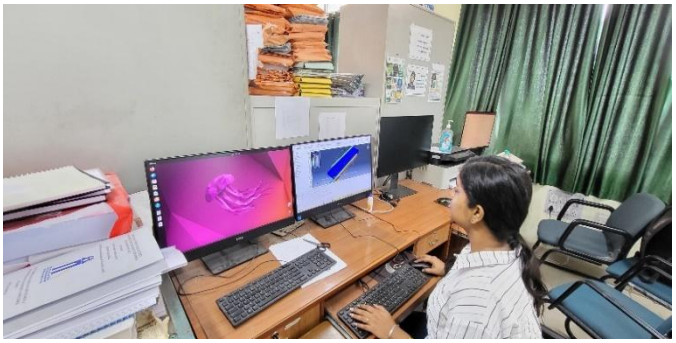
Petrology Laboratory

Sand Box experiment in Structural Geology Laboratory



Shear Apparatus in Structural Geology Laboratory

Shear Apparatus II in Structural Geology Laboratory



Computational Fluid Dynamics Laboratory

Departmental Computer Laboratory

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Recognitions

- Prof. Bhabani Prasd Mukhopadhyay, Fellow of Geological Society of India.
- Prof. Bhabani Prasd Mukhopadhyay, Life Member of Indian Association Sedimentologists.
- Prof. Bhabani Prasd Mukhopadhyay, Ex-Council Member of Indian Geological Congress, Roorkee.
- Prof. Ananya Mukhopadhya, Life Member of Indian Association Sedimentologists.
- Prof. Ananya Mukhopadhya, Indian Science Congress.
- Prof. Ananya Mukhopadhya, Member, International Association of Sedimentologists.
- Dr. Atin Kumar Mitra, Life Member of Indian Association Sedimentologists.
- Dr. Moumita Talukdar, Member, European Association of Geochemistry

Best Paper Award

Hydrogeology Laboratory

"An approach for water resource management in the semiarid region: A case study of Kalahandi district, Odisha, India", Rupsa Mitra, **Bhabani Prasad Mukhopadhyay**, Anirban Mitra, Swarnali Barua, Puja Chowdhury, IGWC 2025, National Institute of Hydrology, Roorkee, India, 2025

Ongoing R&D Projects

1. Detailed Hydrogeological study to asses the sustainability of water sources especially during the lean season for 2 X 500 MW extension project at Sagardighi Thermal Power Project, District Murshidabad, West Bengal, India. **West Bengal Power Development Corporation Limited (WBPDCL), Govt. of West Bengal. PI:** Prof. B. P. Mukhopadhyay.
2. Hydrogeological impact assessment on account of the ash pond due to storage of ash slurry in the ash pond and mitigation measures to be taken for avoiding any possible pollution on account of the same on water quality in that area at Sagardighi Thermal Power Plant, West Bengal, India. . **West Bengal Power Development Corporation Limited (WBPDCL), Govt. of West Bengal. PI:** Prof. B. P. Mukhopadhyay
3. Petrochemical investigation along two N-S transects in the Granulite Terrane of Southern India: Reconstructing the crustal architecture and the thermotectonic events during the late Archean/early Palaeoproterozoic and Neoproterozoic time, **Ministry of Earth Sciences (MoES), India,** Dr. Moumita Talukdar **in collaboration with IISER Kolkata and Jadavpur University, Kolkata, India.**
4. Water in Earth's mantle and its geodynamic implications: A first principles approach, **INSA & DST- SERB, India.** Dr. Pratik Kumar Das (DST INSPIRE Faculty)

Journal Publications

1. p-T dependent structural transformations of Zn-monochalcogenides to switch their semiconductor – metal transition: A DFT study; **Das, P.K.**, Mandal, N., Arya, A., 2024, Applied Physics A.

2. Superconductivity in CH4 and BH4- containing compounds derived from the high-pressure superhydrides; Nisha Geng, Katerina P. Hilleke, Francesco Belli, **Pratik Kumar Das**, Eva Zurek. 2024, Materials Today Physics.

3. Changes observed in land surface and air temperature after the Yushu (China)(6.9 Mw) and Kaikoura (New Zealand)(7.8 Mw) earthquakes using Landsat thermal and geophysical datasets. Nath, B., Zhao, W., Niu, Z., Wang, L., Xu, S., Acharjee, S. and **Mitra, A.K.**, 2024. Journal of Earth System Science, 133(4), pp.1-21.

4. Lineament extraction and structural mapping using Landsat-9 OLI and Sentinel-1 SAR data in the Proterozoic North Singhbhum Mobile Belt, Eastern India. Choudhury, N., **Mitra, A.K.**, Nath, B. and Lindsay, M.D., 2025. Geosystems and Geoenvironment, 4(3), p.100392.

Conference Publications

1. An approach for water resource management in the semiarid region: A case study of Kalahandi district, Odisha, India; Rupsa Mitra, **Bhabani Prasad Mukhopadhyay**, Anirban Mitra, Swarnali Barua, Puja Chowdhury, 10th International Ground Water Conference, 2025: Groundwater Vision 2047, National Institute of Hydrology, Roorkee, India, 2025

2. A hybrid approach using deep learning and hydrological modeling to identify aquifer stress zones in the barakar river basin, Jharkhand; Amit Bera, Sanjit Kumar Pal, **Bhabani Prasad Mukhopadhyay**, 10th International Ground Water Conference: Groundwater Vision 2047, National Institute of Hydrology, Roorkee, India, 2025.

3. Genesis of abandoned channels and its impact on agro-economy in lower teesta basin lying in Jalpaiguri district, West Bengal, India; Rima Roy, **Bhabani Prasad Mukhopadhyay**, Susanta Chaudhuri, International Seminar on Geography for Development: Economy, Society and Environmental Interactions, Presidency University, Kolkata, 2025.

4. Assessment of groundwater quality for irrigational purpose in the drought-prone region of Purulia district of West Bengal; Anish Jana, **Bhabani Prasad Mukhopadhyay**, Puja Chowdhury, 7th Regional Science and Technology Congress 2024-25, Bidhan Chandra Krishi Viswavidyalaya, Kalyani.

5. Impact of changing scenario of climate and precipitation on alluvial aquifers: a case study from recent alluvial of Dakshin Dinajpur district, West Bengal, India; Swarnali Barua, **Bhabani Prasad Mukhopadhyay**, Puja Chowdhury, ETES-2024 conference, IIT (ISM) Dhanbad, India, 2025

6. An integrated approach for the study of groundwater quality using water-quality index for the drought prone regions of Purulia district, India; Puja Chowdhury**, Bhabani Prasad Mukhopadhyay**, Swarnali Barua, ETES-2024 conference, IIT (ISM) Dhanbad, India, 2025

7. Lithological Controls over River Profiles in Umiam River Basin, Meghalaya; Saptarshi Saha, Shayani Roy, **Ananya Mukhopadhyay**, River Corridor Research and Management (RCRM) 2024.

8. Revealing the Impact of Neotectonics: A Geomorphological Study of the Dhansiri (North) River Basin in the Himalayan Foreland; Shayani Roy, **Ananya Mukhopadhyay**, Sunondo Bandyopadhyay, River Corridor Research and Management (RCRM) 2024.

Conference Publications

9. Gel wax and Ultrasound Transmission Gel as upper and lower crustal rheology analogues. Biswas, U., **Mitra, A. K.**, & Mandal, N, European Geosciences Union (EGU) 2024.

10. One terrane, varied rock types, varied data, and their convergence to one evolutionary history: an example from Mahadevi Layered Complex, Tamil Nadu. **Talukdar, M.** Women in Geosciences: Opportunities, Challenges and Accomplishments 2024.
11. Carbonation of an Archean oceanic crust during tectonic upliftment: An example from Mahadevi Layered complex, Nilgiri Namakkal Block, Southern Granulite Terrane, India. **Moumita Talukdar**, Rabirshi Chatterjee and Pratyush Kumar Dash. DPE 2025, Presidency university.

12. Giant epidote formation in parts of anorthosite layers of Sittampundi Layered Complex, Tamil Nadu. **Moumita Talukdar**. M^3 2025**,** NCESS, Thiruvanthapuram

13. First principle investigations on the water budget in olivine phases: Implications towards the behavior of hydrous mantle, **Pratik Kumar Das** and Anjitha Karangara, European Geosciences Union (EGU) 2024.

14. p-T dependent behavior of H bearing Olivine and Wadsleyite: Implication towards hydrous mantle; **Pratik Kumar Das** and Anjitha Karangara, Geosciences for Sustainable World (GSW) 2024.

15. High pressure phase of Magnesiowustite: Implications to the mineralogy of super-Earths; Anjitha Karangara **and Pratik Kumar Das,** European Geosciences Union (EGU) 2024.

16. Fluoride Dilemma in West Bengal: Navigating Challenges for Sustainable Drinking Water Solutions. **Ghosh, R.,** WaterSciCon24, 2024

17. Hidden Chronicles of Snowball Earth: Unveiling the Neoproterozoic Mysteries in outer Lesser Himalayan diamictite of Blaini Formation. **Ghosh, R.**, Mukhopadhyay, A., Geosciences for Sustainable World (GSW) 2024.

18. Unveiling the Hidden Dynamics: A Comprehensive Exploration of the Greater Himalayan Out-of-Sequence Thrust and Active Faults in the Sutlej River Section, India. **Ghosh, R.,** Mitra, A.K., International Geological Congress (IGC) 2024.

19. Optimal Applications of Solar Energy Systems: Comparative Analysis of Ground-Mounted and Rooftop Solar PV Installations in Drought-Prone and Residential Areas of the Indian Subcontinent, 18 (10), **Rajkumar Ghosh**, Bhabani Prasad Mukhopadhyay, 2024, International Conference on Renewable and Sustainable Energy, 2024.

20. Shear-Induced Box folds: Anisotropy-Driven Geometry in Chaura Thrust, Himachal Pradesh, **Rajkumar Ghosh**, Bhabani Prasad Mukhopadhyay ISBN: 978-81-979322-2-9, 81, 7th Regional Science and Technology Congress, 2024-25 (Region-4: Comprising Districts Bankura, Jhargram, Paschim Medinipur, Purba Medinipur & Purulia), 2025

Book Chapter

1. Assessment of the changing landscape and overall aquifer condition due to saline water intrusion: a review, **Bhabani Prasad Mukhopadhyay**, Ananya Chakraborty, Rima Roy, Amitava Bandopadhyay, *Hydrology and Urban Water Supply*, November, 2024, Springer Nature.

2. p-T dependent behavior of H bearing Olivine and Wadsleyite: Implication towards hydrous mantle; **Pratik Kumar Das** and Anjitha Karangara, *Geosciences for Sustainable World*, 2024, Springer Nature.

Programs organized

The Department of Earth Sciences organized the “NATION FIRST” program on 20th May, 2025 at 12 noon in the Department of Earth Sciences. The program was initiated with a speech on "Nation First" by the Head, Department of Earth Sciences. Students of the 4th semester delivered a short speech on the theme.

Students Achievements

- **Campus Placement (Aditya Birla Group)**
  - **Prashannjit Parida**
  - **Sneha Dey**

- **GATE 2025**
  - **Raghunath Sahoo (Air-427)**
  - **Brajeswar Nayak (Air-873)**

- **GMRDS Exam Qualified**
  - **L A Pratish Kumar Palaei**
  - **Laxmipriya Sahoo**
  - **Muskan Kumari**

- **South Asian Geoscience Conference And Exhibition**
  - **Shubhankar Dash (2nd Runner Up)**
  - **Laxmipriya Sahoo (2nd Runner Up)**

- **Attended Mdap Programme 2024**
  - **Brajeswar Nayak**
  - **Paramjeet Mahanta**