



GEOSPECTRUM

Volume 4 (May – July, 2025)



Theme of the volume

World Environmental Day

World Environment Day, celebrated annually on June 5, is a global event aimed at raising awareness and encouraging action to protect our planet. The day is marked by activities such as tree plantation drives, clean-up campaigns, environmental awareness workshops, art competitions, and sustainability exhibitions. Each year carries a specific theme, inspiring people worldwide to take positive steps for a greener, healthier future.



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From HoD's Desk

It gives me immense pleasure to write a message from the desk of the "Head" of the Department of Applied Geophysics, IIT(ISM), Dhanbad. The Department of Applied Geophysics is one of the oldest Departments in the country, committed to delivering 'Excellency'. Excellence in teaching, excellence in research and excellence in academic administration--- are the keys for sustainable growth of the department since 1957, which was the year marked as "International Geophysical Year". The department was established with a mandate to produce skilled geophysicists in the country to solve the complex geoscientific problems faced by the industry and to fill the technical expertise in the industry to provide an inclusive research-based geophysical solution, which was the need of the hour.



Since then, the department has been producing a good number of geophysicists each year who have become the heads of the reputed research and development (R&D) organisations, exploration and production(E&P) companies of oil and natural gas and minerals around the world.

The department has grown into one of the nation's premier centres for geophysical education and research. Over the decades, the department has nurtured a tradition of academic excellence, innovative research, and strong industrial collaborations in shaping generations of geophysicists who have made us proud by making significant contributions by doing cutting-edge research, discoveries of numerous petroleum basins/ oil fields, mineral/energy resources reserve both in India and across the globe. While Indian School of Mines (ISM) or "ISM" is already a brand name in Oil and Gas, Mineral and Mining industry, in tune with overall technological development to become a full-fledged technological institute, under IIT(ISM), the Department of Applied Geophysics is also continuously upgrading the academic programs/course curriculum, technicalities, research facilities which are very competitive with the other world class geophysics departments. The department offers a diverse range of academic programs, including the 3-Year M.Sc. Tech in Applied Geophysics, where students are admitted through JAM; the 5-Year Integrated M.Tech in Applied Geophysics, where students are admitted through IIT-JEE Advanced; the 2-Year M.Tech in Earthquake Science and Engineering where students are admitted through GATE; and Ph.D. programs where students are admitted through GATE/NET/National Examinations.

Over the years, the department has attracted some of the brightest minds in the country ensuring a vibrant academic environment driven by curiosity and intellectual rigor. While research remains a cornerstone of the department's vision and mission, honourable faculties are being actively engaged in emerging areas of geophysical research in gravity, magnetic, electrical, electromagnetic, seismic, well-logging, earthquake seismology, remote sensing, near-surface geophysics, geotechnical exploration, geodynamics and geothermic, geophysical inversion, artificial intelligence and machine learning in geosciences, geophysical signal processing, rock physics/ geomechanics, time series analysis in geosciences and computational/ mathematical geophysics, reservoir and mining geophysics.

From HoD's Desk

The department hosts state-of-the-art geophysical equipments of applied geophysics, seismological observatory, advanced laboratories dedicated to seismic data processing, geophysical inversion, gravity-magnetic and remote sensing, coal geophysics, global optimization, machine learning and geo-computing, early-warning systems, petrophysics/rock physics, computational seismology, subsurface resource characterisation, seismic simulation, geophysical fluid dynamics and geophysical instrumentation, providing an unique exposure to the UG and PG students, national and international research scholars to pursue cutting-edge research to develop skill to solve real world complex problems.

Thriving deep into the geophysical research with joy and excitement in pursuing original research, Department of Science & Technology (DST), Ministry of Earth Sciences(MoES), Indian Space Research Organisation (ISRO), Coal India Limited(CIL), Science and Engineering Research Board(SERB)/ Anusandhan National Research Foundation (ANRF) have sponsored the R&D projects and lab development facilities, for enhancing teaching and research facilities in the department.

The department takes pride in strong industry collaborations, outreach activities followed by innovations, startup cultures, conducting conferences, workshops, EDP programs, MHRD/Govt. of India, approved GIAN and NPTEL course and consultancy work from private companies/PSUs/NGO. Students are engaged in various activities by organizing webinars, quizzes, competitions under the geophysical societies in association with professional bodies like EAGE, IGU, AEG, SPG, AGU, and SEG. The department is committed to conducting innovation and/or inclusive research, offering cost-effective and data-driven solutions for industry ranging from natural resource exploration and management to renewable energy exploration, including hydrogen exploration, REE, REM, lithium exploration and mapping, to groundwater and hazard assessment, exemplifying the department's vision using geophysical expertise to build a safer, cleaner and sustainable future earth.

Students of the department have been placed in reputed companies like ONGC, OIL, Schlumberger, Cairn India, Vedanta, BP, ExxonMobil, Chevron,CIL, Essar, MECL, Sun Petrochemicals, as well as Google. Academic endeavours of the students span from the campuses of Stanford, ETH Zurich, University of Texas, Austin and Dallas to the institutes like IIM Ahmedabad through Internship, MBA and PhD enrolment.

The Department has strong relationships with GSI, CSIR-NGRI and other Earth Science Departments of IITs, IISERs, NITs and other Central and State universities.

As we look ahead, our focus remains on establishing new centres/ consortia of excellence in unconventional/conventional hydrocarbon exploration, renewable energy, geothermal exploration, mineral resource assessment, natural hazard mitigation, AI-driven solutions and automation, green energy evolution, and sustainable resource management. With continued dedication to academic and research excellence, we aim to further strengthen our contributions to the geoscience community and to the nation at large.

From HoD's Desk

We are committed to improving quality further:

- R&D
- Teaching
- Publication
- Patent
- Startups
- Translational research
- Inclusivity in research
- Outreach/Mobility
- Collaborations
- Alumni network

Our faculties and students are the crowning jewels of our education system. So, they are expected to play a central role in realizing the vision and the mission of the department.

I extend my heartfelt gratitude to our faculty, students, alumni, and collaborators for their unwavering support, enthusiasm and being member of the success story and growth as we continue this journey of enhancing knowledge and skill, improving innovation and service to the nation.

Prof. Saumen Maiti

Associate Professor

Head of the Department

Department of Applied Geophysics
IIT (ISM) Dhanbad, Jharkhand, India

Woman Faculty's Column

Being the only female faculty member in the Department of Applied Geophysics at IIT (ISM) Dhanbad, a journey filled with both challenges and rewards has been experienced. Unique experiences have been encountered while working in a field that has traditionally been dominated by men, and through them, both professional and personal growth have been shaped. A contribution has been made to the advancement of geophysical research and education, and efforts have been directed toward fostering greater diversity and inclusivity within the geosciences.



One of my core beliefs is that innovation and a broader, more inclusive approach to problem-solving are fostered by diversity in academia. Through my teaching and research, particularly in the field of seismology, efforts have been made to inspire the next generation of geoscientists, especially young women, to pursue careers in STEM. It is considered important that the classroom and research environment be maintained as inclusive, supportive, and collaborative spaces—where students are empowered to ask questions, challenge ideas, and contribute meaningfully to scientific advancement.

Over the past few months, several significant roles have been undertaken that have further strengthened my engagement with the academic community. As the Organizing Secretary of SME-2025, hosted by our department in March 2025, the coordination and leadership of a wide range of academic and outreach activities were carried out with great honor. An atmosphere of scholarly exchange and collective achievement was fostered by the event, which brought together researchers, professionals, and students. In this role, conscious efforts were made to encourage diverse participation and ensure that the inclusive values upheld by the department were reflected throughout the event.

Additionally, an invitation was extended to deliver a talk at the Department of Geology, North-Eastern Hill University (NEHU), Shillong. A truly enriching experience was had during this visit, where research was shared, academic discussions were engaged in, and interactions took place with enthusiastic postgraduate students. The warm hospitality and inspiring conversations—particularly those held with aspiring female geoscientists—served to reaffirm my commitment to mentorship and outreach.

An opportunity has been provided by this edition of the Department newsletter to reflect on these experiences, celebrate the department's achievements, and amplify the voices of both students and faculty. Continued excitement is felt for the journey ahead—one that is hoped to be defined by excellence, collaboration, and a shared commitment to building an inclusive scientific community.

Prof. Niptika Jana

Assistant Professor

Department of Applied Geophysics
IIT(ISM) Dhanbad, Jharkhand, India

Departmental Activities

Courses, Lectures & Development Programs

The Department of **Applied Geophysics, IIT (ISM) Dhanbad**, hosted a **GIAN course** on ***"Inverse Methods and Machine Learning: Applications in Geosciences,"*** led by **Prof. Saumen Maiti** and with hands-on sessions by world-renowned scientist **Prof. Mrinal Sen, Chair Holder of the Morgan Davis Centennial Chair in Petroleum Geology at The University of Texas at Austin**. The inaugural and valedictory sessions were graced by the presence of the **Director, Deputy Director, and Dean of IIT(ISM) Dhanbad**.

The program **introduced advanced inversion strategies, optimization, Bayesian frameworks**, and AI techniques such as **CNNs, GANs**, and **physics-informed learning**, with hands-on sessions on seismic inversion, gravity and geoelectrical studies, lithology clustering, and basement depth estimation.

Drawing participants from academia and industry, the course created a dynamic platform for exploring cutting-edge geoscientific applications of machine learning and inverse theory.



Departmental Activities

Courses, Lectures & Development Programs

The **Department of Applied Geophysics** hosted an **invited lecture** by **Dr. Deepak Singh**, **Assistant Professor at the Centre of Studies in Resources Engineering (CSRE), IIT Bombay**, on **July 7, 2025 (Monday)**.

Dr. Singh, an **alumnus** of the Department of Applied Geophysics, IIT (ISM) Dhanbad, delivered an engaging talk on **"Planetary Remote Sensing & Cryosphere."** The lecture, held at **5:00 PM** in the **Department's Conference Room**, provided valuable insights into advanced remote sensing techniques and their applications in **planetary science and cryospheric studies**.

The session was highly informative and was well appreciated by faculty members, research scholars, and students, fostering discussions on cutting-edge approaches in geoscientific research.



Centenary Guest Lecture on the topic: Planetary Remote Sensing & Cryosphere

Planetary remote sensing has revolutionized cryospheric research by delivering high-resolution multispectral, hyperspectral, lidar and radar data that reveal the composition, dynamics and energy balance of ice deposits on Earth and across the Solar System. The data showcases detailed insights from terrestrial ice to Martian polar caps and Europa's suspected saline shells, emphasizing albedo feedbacks, dust-ice interactions and sub-surface layering. On Earth, remote sensing supports the assessment of glacier mass balance, snow/ice evolution, and permafrost degradation. On extraterrestrial bodies, these techniques reveal volatile transport, dust-ice layering, and signatures of past climate oscillations. Integration with laboratory spectroscopy and numerical modeling enables detailed interpretation of observed reflectance and emissivity spectra. Such multi-disciplinary approaches are essential for reconstructing cryo-climatic histories, understanding surface-atmosphere coupling, and identifying potential astrobiological niches in extraterrestrial icy environments.

About Speaker

Dr. Deepak Singh is currently working as an Assistant Professor at CSRE, IIT Bombay. He has an Integrated Master's degree in Applied Geophysics from ISM Dhanbad. He has completed his MS & PhD at the University of Michigan in Atmospheric, Oceanic, and Space Sciences. Later, he joined PRL, Ahmedabad, as a postdoc and INSPIRE Faculty. His research areas include the cryosphere-climate interaction of planets in our solar system, modeling of planetary snow/ice and its impact on planets' energy budget, and understanding the behavior of various ices in our solar system and beyond.



Prof. Deepak Singh
Assistant Professor at CSRE,
IIT Bombay

Date: July 07, 2025 Time: 05 PM
Venue: Conference Room, 5th floor, New Academic Complex, Department of Applied Geophysics
Coordinator: Prof. Mohit Agrawal, Associate Professor, AGP
Prof. S. K. Pal, HOD (AGP)



Departmental Activities

A group of students and researchers from the **Department of Applied Geophysics, IIT (ISM) Dhanbad** — **Mr. Aman Sharma, Mr. Arpan Pan, Mr. Dhritideb Karmakar, Mr. Aman Dubey, Mr. Yashovardhan Gupta, Mr. Partha Pratim Jana, Mr. Nabin Mandal, Mr. Souvik Patra, Mr. Mahfooz Alam, and Mr. Amit Bajpai** — proudly represented the institute at the Summer School on **Current Trends in Oil and Gas Industry** organized by **Saint Petersburg Mining University, Russia**. The programme offered a comprehensive learning experience through lectures, hands-on training sessions, master classes, industrial site visits, and cultural activities, providing the students with valuable international exposure and practical insights into the global oil and gas sector.



Faculties' Activities & Achievements

Prof. Saurabh Dutta Gupta has been appointed as **Professor-In-Charge (International Relations and Alumni Affairs)**. **Prof. Saurabh Datta Gupta** delivered a presentation at the **Symposium** on the **Role of Upstream Petroleum Engineering in Energy Transition** held at **IIT Guwahati**.



We are delighted to share that **Prof. Niptika Jana** was invited to the **North-Eastern Hill University (NEHU), Shillong, India**, to deliver an **expert talk** on "**Seismotectonic Studies across Sikkim Himalayas.**" The lecture, held on **May 15, 2025**, offered valuable insights into the complex tectonic framework and seismic activity of the **Sikkim Himalayas**.



Students' Activity & Achievements

Conferences/Seminar/Workshops

Mr. Rajkumar Mondal (Final year M.Sc.-Tech. student) represented IIT(ISM) at the **SPWLA-2025 International Student Paper Contest** in **Dubai** on and from **17 to 21 May 2025**. He presented ***"Multidimensional Analysis of Geological and Geomechanical Factors for Underground Coal Gasification,"*** integrating **geological mapping, geomechanical assessment, and data-driven models** to evaluate **Underground Coal Gasification (UCG)** site suitability. His research, appreciated for its scientific depth and clean energy relevance, highlighted Indian geoscience on a global platform and fostered prospects for future collaborations in energy and subsurface engineering.



Associated Lab: Subsurface Resource Characterisation Group(sRCg)

Students' Activity & Achievements

Placements of the batch – 2025

Chevron

AYUSH KUMAR NAMDEO – MSC.TECH AGP
ANWESHA KODAL – MSC.TECH AGP
SAPTASHI CHATTERJEE – MSC.TECH AGP
HARSH RAMDAYAL PRAJAPATI – MSC.TECH AGP

ONGC

SOHAN KAR – MSC.TECH AGP
GOURAB KUMAR GIRI – MSC.TECH AGP

SLB

DEYASINI MITRA – MSC.TECH AGP

Rystad Energy

KARTIK GUPTA – MSC.TECH AGP
NANDAN MUKHERJEE – MSC.TECH AGP

Sun Petrochemicals Pvt. Ltd.

ARNAB DAS – MSC.TECH AGP
UJJWAL MONDAL – MSC.TECH AGP
SUBHAJIT SENGUPTA – MSC.TECH AGP

Oil India Limited

ROUNAK RAHA – MSC.TECH AGP

Students' Activity & Achievements

Placements of the batch – 2025

Cairn India Limited (PPO)

WRICK GHOSH – MSC.TECH AGP

ExxonMobil (PPO)

NAVANEETH BABU M – MSC.TECH AGP

KCCL

DIPTILATA MOHARANA – M.TECH AGP

MMPL Private Limited

SUSHANTA GHOSH – MSC.TECH AGP

DEBAJYOTI BANERJEE – MSC.TECH AGP

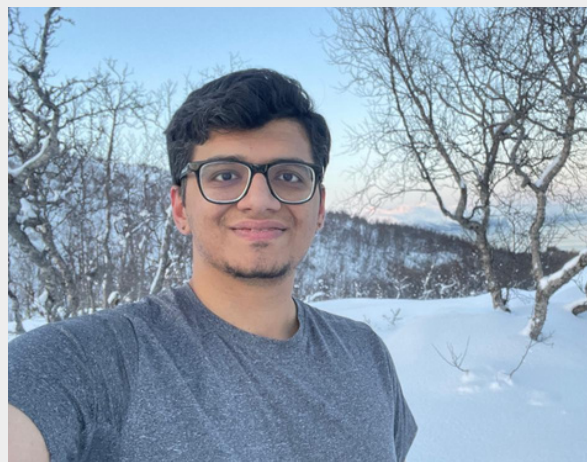
MANISH KUMAR – M.TECH AGP

Zynix AI

SAI SATYAM JENA – INT.M.TECH AGP

Students' Activities & Achievements

Call for PhD of pass out batch 2025



Mr. Rohan Sharma (Int. M.Tech) has secured a **PhD offer** from the **Stanford University, USA**, and will be joining the Department of Geophysics this fall quarter. He has submitted his masters' thesis entitled "*Poststack Seismic Inversion using Physics Informed Neural Network*" under the supervision of **Prof. Partha Pratim Mandal** and co-supervision of **Prof. Stefan Bunz** (UiT Norway) in **Subsurface Resource Characterization Group (sRCg)** under Department of Applied Geophysics, IIT(ISM) Dhanbad, Jharkhand, India.

Mr. Aditya Chowdhury (Int. M.Tech) has been offered a **PhD position** at **University of Texas at Dallas, USA**. He has submitted his masters' thesis entitled "*Seismological Signal Denoising using Stochastic Differential Equations*" under the supervision of **Prof. Mohit Agrawal** in **Observational Seismology Lab** under Department of Applied Geophysics, IIT(ISM) Dhanbad, Jharkhand, India.



Mr. Rajkumar Mondal (M.Sc.(Tech.)) has secured a PhD offer from the **University of Oklahoma, USA**, and will be joining the **School of Geosciences** this upcoming fall. He has submitted his masters' thesis entitled "*Optimising Geological Site selection for underground Coal Gasification*" under the supervision of **Prof. Partha Pratim Mandal** in **Subsurface Resource Characterization Group (sRCg)** under Department of Applied Geophysics, IIT(ISM) Dhanbad, Jharkhand, India.

Group Activities

We are thrilled to introduce **Team Geo Mavericks**, representing **IIT(ISM) Dhanbad** in the prestigious **SEG EVOLVE Energy Exploration Program 2025**. This global platform brings together brilliant minds to tackle real-world challenges in energy exploration and reservoir analysis.

Dr. Partha Pratim Mandal – Faculty Advisor, guiding the team with his expertise and mentorship. ♦ **Pareekshit Hegde – Team Leader and Petrophysicist**, orchestrating the team's vision. ♦ **Ramendra Pandey – Reservoir Engineer**, dedicated to unlocking the secrets of subsurface energy systems. ♦ **Arpan Pan & Karthik H S – Geophysicists**, transforming data into actionable insights. ♦ **Arun Krishna B. M. – Geologist**, unveiling Earth's geological story layer by layer. ♦ **Maneesh Vishvakarma – Mining Engineer and Geophysicist**, bridging exploration and extraction with innovation.

The banner features a world map background. At the top left is the SEG EVOLVE logo. At the top center is the text "SEG EVOLVE ENERGY EXPLORATION PROGRAM, 2025 Meet Our TEAM | GEO MAVERICKS". At the top right is the IIT(ISM) Dhanbad logo. Below the text are six circular portraits of team members and one larger portrait of the faculty advisor, arranged in two rows. Each portrait is accompanied by the person's name and title.

Name	Title
DR. PARTHA PRATIM MANDAL	FACULTY ADVISOR
PAREEKSHIT G HEGDE	TEAM LEADER PETROPHYSICIST
RAMENDRA PANDEY	RESERVOIR ENGINEER
ARUN KRISHNA B M	GEOLOGIST
ARPAN PAN	GEOPHYSICIST
KARTHIK H S	GEOPHYSICIST
MANEESH VISHVAKARMA	MINING ENGINEER

Journal Publications

Indian Geotech J
<https://doi.org/10.1007/s40098-025-01300-9>



TECHNICAL NOTE

Deterministic Seismic Hazard Assessment of the Chhotanagpur Plateau, India

Amaan Khan¹ · Mohit Agrawal¹

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Details: Khan, A. and Agrawal, M., 2025. Deterministic Seismic Hazard Assessment of the Chhotanagpur Plateau, India. Indian Geotechnical Journal, pp.1–12. ([Link](#))

Physics of the Earth and Planetary Interiors 366 (2025) 107408



Contents lists available at [ScienceDirect](#)

Physics of the Earth and Planetary Interiors

journal homepage: www.elsevier.com/locate/pepi



Investigating seismic crustal anisotropy and sub-crustal deformation beneath Northeast India through harmonic decomposition of receiver functions

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Details: Singh, D.K., Agrawal, M., Kasaundhan, H., Mishra, O.P. and Sen, M.K., 2025. Investigating seismic crustal anisotropy and sub-crustal deformation beneath Northeast India through harmonic decomposition of receiver functions. Physics of the Earth and Planetary Interiors, p.107408.. ([Link](#))

Journal Publications

Journal of Environmental Chemical Engineering 13 (2025) 118253



Contents lists available at ScienceDirect

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journal homepage: www.elsevier.com/locate/jece



Groundwater quality and fluoride contamination risks in Jharkhand state: A regional IWQI analysis and hydrochemistry insights

Surabhi Gupta , Saumen Maiti

Machine Learning and Geo-computing Lab., Department of Applied Geophysics, IIT(ISM), Dhanbad 826004, India

Details: Gupta, S. and Maiti, S., 2025. Groundwater Quality and Fluoride Contamination Risks in Jharkhand State: A Regional IWQI Analysis and Hydrochemistry Insights. Journal of Environmental Chemical Engineering, p.118253. ([Link](#))



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<http://pubs.acs.org/journal/acsodf>

Article

Geological Hydrogen Prospectivity of Iron Ore Deposits in India Based on Semiquantitative Analysis

Raj Kiran,* Mohd Saif, David A. Wood, Saurabh Datta Gupta, Ashutosh Kumar, Rajeev Upadhyay, and Vinay Kumar Rajak

Details: Kiran, R., Saif, M., Wood, D.A., **Datta Gupta, S.**, Kumar, A., Upadhyay, R. and Rajak, V.K., 2025. Geological Hydrogen Prospectivity of Iron Ore Deposits in India Based on Semiquantitative Analysis. ACS Omega. ([Link](#))



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Geophysical Society Team (2025 - 26)

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UNTIL NEXT TIME...