IEEE Conference Report

on

2025 IEEE India Geoscinece and Remote Sensing Symposium

(InGARSS 2025)

2025 IEEE India Geoscience and Remote Sensing Symposium (InGARSS 2025)

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Venue: International Institute of Information Technology Bhubaneswar (IIIT Bhubaneswar), Odisha, India
Organized under: IEEE Geoscience and Remote Sensing Society (IEEE GRSS)

1. Introduction

The 2025 IEEE India Geoscience and Remote Sensing Symposium (InGARSS 2025) was held successfully from 10th to 13th December 2025 at the International Institute of Information Technology Bhubaneswar (IIIT Bhubaneswar), Odisha, India. InGARSS is the flagship regional symposium of the IEEE Geoscience and Remote Sensing Society (GRSS) in India and serves as a premier platform for researchers, academicians, professionals, and students working in the fields of geoscience, remote sensing, and Earth observation technologies.

The symposium aimed to provide an interdisciplinary forum for presenting recent research advancements, exchanging innovative ideas, and fostering collaborations among academia, industry, government agencies, and space organizations at both national and international levels. Through a carefully structured technical and academic program spread over four days, InGARSS 2025 successfully addressed both theoretical and application-oriented aspects of geoscience and remote sensing.

The symposium commenced on 10th December 2025 with pre-conference tutorials and workshops, which focused on emerging tools, methodologies, and practical aspects of remote sensing, geospatial analytics, and artificial intelligence. These sessions were particularly beneficial for students and early-career researchers, offering hands-on exposure and in-depth understanding of advanced techniques used in Earth observation and data analysis.

The inaugural ceremony and main technical program were held on 11th December 2025, featuring the formal opening of the symposium, keynote addresses by eminent national and international experts, and the start of parallel oral technical sessions. The keynote lectures set the tone for the symposium by highlighting recent advancements, future research directions, and societal applications of geoscience and remote sensing technologies. The day also included invited talks and panel discussions that encouraged interaction among participants from academia, industry, and government organizations.

The technical program continued on 12th December 2025 with multiple parallel oral and poster sessions, covering a wide range of themes such as satellite-based Earth observation, SAR and hyperspectral imaging, machine learning and deep learning applications, climate and environmental studies, disaster management, agriculture, oceanography, and urban monitoring. Special sessions, including student-focused events, Young Professionals activities, Women in Engineering (WIE) programs, and thematic workshops, were organized to promote inclusivity, innovation, and capacity building within the geoscience and remote sensing community.

The symposium concluded on 13th December 2025 with the remaining technical sessions, interactive discussions, and the valedictory session, during which the key outcomes of the symposium were summarized. Awards and recognitions were presented to outstanding papers and contributors, and the organizing committee reflected on the scientific deliberations and collaborative opportunities that emerged during the event. The valedictory session marked the successful completion of InGARSS 2025 and reinforced its role as a significant IEEE GRSS event contributing to the advancement of geoscience and remote sensing research in India and beyond.

2. Theme and Objectives

InGARSS 2025 was organized under the theme:

"*Uttamaṁ Viśvaṁ, Ujjvalaṁ Bhaviṣyam* (Better World, Brighter Future)"

The theme emphasized the role of geoscience and remote sensing technologies in addressing global and regional challenges such as climate change, disaster management, environmental monitoring, sustainable development, food and water security, and urban resilience.

The primary objectives of the symposium included:

- Promoting interdisciplinary research and innovation in geoscience and remote sensing
- Encouraging the application of Earth observation technologies for societal benefit
- Strengthening collaboration among researchers, industry, and policy makers
- Supporting student and early-career researcher participation
- Advancing artificial intelligence and data-driven approaches in remote sensing applications

3. Venue and Host Institution

The symposium was hosted by **IIIT Bhubaneswar**, a premier institute known for its focus on advanced research, innovation, and technology-driven education. The institute provided state-of-the-art conference facilities, technical infrastructure, and organizational support essential for hosting an international IEEE event.

Bhubaneswar, the capital city of Odisha, offered a conducive academic and cultural environment for the symposium. Its proximity to coastal and ecologically diverse regions added contextual relevance to discussions on climate resilience, coastal monitoring, disaster management, and environmental sustainability.

4. Inauguration Session

InGARSS 2025 commenced with a solemn and dignified inaugural ceremony, marking the formal opening of the symposium in the presence of an august gathering of distinguished guests, eminent academicians, senior policymakers, and IEEE leadership. The event witnessed enthusiastic participation from researchers, academicians, industry professionals, and students from across India and several other countries, reflecting the international stature and growing influence of the symposium.

The symposium was formally inaugurated by His Excellency Dr. Hari Babu Kambhampati, Hon'ble Governor of Odisha and Chancellor of IIIT Bhubaneswar. In his inaugural address, His Excellency emphasized the strategic importance of geospatial technologies and Earth observation systems in national development, evidence-based governance, disaster resilience, and sustainable resource management. He highlighted the pivotal role of remote sensing, geospatial analytics, and artificial intelligence in shaping informed policy decisions and addressing pressing societal challenges.

The inaugural ceremony was graced by the presence of several eminent dignitaries on the dais, whose participation significantly elevated the prestige and academic stature of the event. Notably, Prof. Saibun Tjuatja, President of the IEEE Geoscience and Remote Sensing Society (GRSS), and Dr. Paul Rosen, Vice President and Finance Head of IEEE GRSS, were present, underscoring the strong support and global engagement of IEEE GRSS with InGARSS 2025. Their presence reaffirmed the symposium's alignment with the strategic vision and mission of IEEE GRSS.

Also present on the dais were Mr. Manoj Ahuja, Hon'ble Chief Secretary to the Government of Odisha, and Dr. P. K. Raut, Special Secretary, Electronics & Information Technology (E&IT), Government of Odisha. Their participation highlighted the growing recognition of geospatial technologies and digital innovation as key enablers of governance, infrastructure development, and technology-driven public service delivery.

The host institution was represented by Prof. Ashish Ghosh, Director of IIIT Bhubaneswar, who also served as the General Chair of InGARSS 2025. In his address, Prof. Ghosh welcomed the distinguished guests and participants, and highlighted the vision, objectives, and expected outcomes of the symposium. He emphasized the role of InGARSS as a premier platform for fostering research excellence, international collaboration, and capacity building in geoscience and remote sensing. Vote of thanks was given by Prof. Susmita Ghosh, the Program Chair of InGARSS 2025, who played a key role in shaping the high-quality technical program of the symposium.

The presence of senior IEEE leadership, distinguished policymakers, and academic leaders during the inaugural session significantly enhanced the ceremonial significance, academic depth, and professional relevance of InGARSS 2025. The inaugural proceedings set an inspiring tone for the symposium, reinforcing its role as a globally connected forum dedicated to advancing geoscience and remote sensing research in service of society, in strong alignment with the goals of IEEE GRSS.

5. Conference Program and Technical Sessions

The four-day technical program of InGARSS 2025 was carefully designed to ensure comprehensive coverage of contemporary research and technological advancements in geoscience and remote sensing. The symposium commenced with an inaugural session that outlined the objectives, scope, and vision

of the event, and concluded with a valedictory session summarizing the technical outcomes, key observations, and future directions. The four-day program of InGARSS 2025 consisted of:

- Inaugural and valedictory sessions
- Keynote and invited talks by eminent experts
- Oral and poster technical paper presentations
- Special sessions and panel discussions
- Tutorials and workshops on emerging technologies

The technical sessions covered a broad spectrum of topics, including:

- Optical, microwave, hyperspectral, and SAR remote sensing
- LiDAR, UAV, and CubeSat-based Earth observation
- Signal and image processing for remote sensing
- Machine learning and deep learning applications
- Atmospheric, oceanic, land, and cryosphere studies
- Climate change, disaster management, and environmental monitoring
- Agriculture, forestry, hydrology, and urban applications

The program featured a series of keynote and invited lectures delivered by distinguished experts from academia, research organizations, and industry. These lectures provided valuable insights into state-of-the-art developments, emerging research challenges, and strategic directions in geoscience and remote sensing, significantly enriching the technical depth of the symposium.

A major component of the symposium was the oral and poster technical paper presentations, with a total of 233 research papers presented across multiple parallel sessions. These presentations covered both theoretical and applied aspects of geoscience and remote sensing and facilitated in-depth technical exchange, peer feedback, and scholarly interaction among participants.

To address emerging, interdisciplinary, and application-driven themes, the symposium organized special sessions and panel discussions, enabling focused deliberations on critical research problems, technological trends, and societal challenges. These sessions promoted cross-disciplinary collaboration and strengthened engagement among researchers, practitioners, and policymakers.

In addition, tutorials and hands-on workshops were conducted on emerging technologies and methodologies, providing participants with practical exposure and skill development in advanced tools and techniques relevant to geoscience and remote sensing research and applications.

The technical sessions covered a wide spectrum of thematic areas, including optical, microwave, hyperspectral, and synthetic aperture radar (SAR) remote sensing. Dedicated sessions addressed advancements in LiDAR, UAV, and CubeSat-based Earth observation systems, reflecting the growing importance of high-resolution and cost-effective sensing platforms.

Significant emphasis was placed on signal and image processing techniques for remote sensing data analysis, as well as on machine learning and deep learning approaches for data-driven modeling, classification, and prediction. The program also featured sessions on atmospheric, oceanic, land, and cryosphere studies, highlighting the interdisciplinary nature of Earth system science.

Topics related to climate change, disaster management, and environmental monitoring received considerable attention, underscoring their relevance to societal resilience and sustainable development.

Applied domains such as agriculture, forestry, hydrology, and urban studies were well represented, demonstrating the practical impact of geoscience and remote sensing technologies in resource management and decision-support systems.

The symposium witnessed strong national and international participation, with more than 350 registered and attending participants from across India and several other countries worldwide. The technical sessions were well attended and characterized by high-quality presentations and active technical discussions, reflecting the strong engagement of the global geoscience and remote sensing community.

Overall, InGARSS 2025 successfully achieved its objectives of fostering technical excellence, promoting collaboration, enhancing capacity building, and advancing research aligned with the mission and strategic goals of IEEE Geoscience and Remote Sensing Society (GRSS).

6. Keynote Lectures and Distinguished Speakers

InGARSS 2025 featured a distinguished lineup of keynote addresses and invited talks presented by leading scientists, researchers, and professionals from premier international and national institutions, including major space agencies, top universities, and renowned research laboratories. The program brought together thought leaders whose expertise spans core and emerging areas of remote sensing, Earth observation, geospatial analytics, and applied geoscience.

Among the keynote speakers, Saibun Tjuatja (University of Texas at Arlington, USA) provided an advanced perspective on microwave remote sensing through physics-based modelling of wave–medium interactions, emphasizing fundamental insights into sensor physics and data interpretation. Paul A. Rosen (Jet Propulsion Laboratory/NASA, USA) presented on the NASA-ISRO Synthetic Aperture Radar (NISAR) mission, highlighting its novel capabilities for comprehensive Earth imaging and monitoring. Alejandro Frery (Victoria University of Wellington, New Zealand) discussed the use of entropy as a measure of texture in SAR imagery, underlining statistical approaches to enhance image understanding.

The symposium also featured distinguished lectures and invited talks that expanded on cutting-edge topics. Saurabh Prasad (University of Houston, USA) delivered a lecture on GeoAI and scalable analysis of multi-channel Earth observation imagery, outlining how artificial intelligence is transforming large-scale geospatial data interpretation. Ryo Natsuaki (The University of Tokyo, Japan) addressed L-band SAR and InSAR analysis in disaster monitoring, illustrating the operational relevance of radar techniques in hazard assessment. Gerardo Di Martino (University of Naples Federico II, Italy) explored SAR acquisition modes for maritime surveillance, providing insights into remote sensing of dynamic ocean environments. An invited talk was also contributed by Jun Zhou (Griffith University, Australia), adding further international perspectives to the scientific discourse.

These lectures comprehensively addressed emerging trends in Earth observation missions, including advanced SAR and hyperspectral imaging systems, as well as AI-driven geospatial analytics and their application to real-world problems, such as environmental monitoring, disaster resilience, and climate studies. The speakers shared both foundational knowledge and forward-looking views on technological innovations, research challenges, and opportunities for cross-disciplinary collaboration.

Collectively, these keynote and invited presentations provided participants with valuable insights into current research directions and anticipated future challenges in the geoscience and remote sensing

domain, reinforcing InGARSS 2025 as a globally relevant platform for academic exchange and technological advancement.

7. Workshop and Tutorials

InGARSS 2025 incorporated a series of high-impact workshops and tutorial sessions designed to deepen technical expertise, promote hands-on learning, and foster collaborative exploration of advanced methods in geoscience and remote sensing. These sessions were delivered by internationally recognized experts representing leading academic institutions from around the world, providing participants with both foundational knowledge and exposure to emerging research frontiers.

A highlight of the pre-symposium activities was the tutorial on Hyperspectral Imaging and Data Analysis delivered by Professor Emmett J. Ientilucci of Rochester Institute of Technology, USA. In this tutorial, Professor Ientilucci guided participants through core principles and practical approaches for processing and interpreting hyperspectral data, focusing on techniques that enhance spectral discrimination, improve feature extraction, and address challenges associated with high-dimensional imaging datasets. This session offered attendees valuable insights into the analytical workflows that underpin advanced environmental and material classification applications.

Another intensive technical session was the two-part tutorial on Polarimetric SAR Analytics: Advances in Information Extraction for Earth Observation presented by Professor Avik Bhattacharya from IIT Bombay, India. This tutorial provided a structured deep dive into polarimetric synthetic aperture radar (PolSAR) data analysis, including principles of polarization diversity, decomposition methods, and state-of-the-art information extraction strategies. Participants gained practical understanding of how polarimetric measurements can be exploited to characterize surface properties, distinguish materials, and support robust interpretation for diverse Earth observation applications.

Complementing these tutorials was the TC Quantum Earth Science and Technology Workshop, led jointly by Professor Artur Miroszewski (Jagiellonian University, Poland) and Professor Amer

Delilbasic (University of Iceland). This workshop explored pioneering concepts at the intersection of quantum technologies and Earth science, presenting participants with forward-looking perspectives on how quantum computing, sensing, and information science may influence future remote sensing methodologies and data-driven modeling paradigms.

These tutorials and workshop sessions were integral to the InGARSS 2025 technical program, offering attendees hands-on experience, structured learning, and expert guidance on cutting-edge analytical techniques and emerging scientific themes. The sessions not only reinforced theoretical understanding but also equipped participants with practical tools and frameworks applicable to research and operational problems in remote sensing, environmental monitoring, and geospatial analytics.

8. Industry Session and Inspiring Talk

InGARSS 2025 featured a dedicated Industry Session highlighting industry perspectives on the application of remote sensing, geospatial technologies, and AI in real-world scenarios, particularly in agriculture and environmental monitoring. Anu Swatantran (Corteva Agriscience) presented “Vision Intelligence and the Collapse of Scale in Earth Observations,” emphasizing how advances in Earth observation enable scalable, multi-resolution analytics for large-area decision-making. Parmita Ghosh and Annie Rana (Corteva Agriscience) complemented this with a joint presentation on “Unlocking Agricultural Insights – Geospatial Foundation Models,” focusing on practical deployment of geospatial AI and foundation models through real-world case studies in precision agriculture.

Collectively, these talks demonstrated how cutting-edge geospatial analytics are being translated into operational solutions, effectively bridging academic research and industry applications. In addition, an Inspiring Talk by Brian Brophy (California Institute of Technology, USA) titled “A Brighter Future of Connectedness” offered a visionary perspective on connectivity, collaboration, and societal impact. Together, the industry and inspiring sessions enriched the symposium by blending technical innovation with forward-looking vision and community engagement.

9. Special Sessions and Student Activities

InGARSS 2025 organized several special sessions and thematic initiatives aimed at highlighting emerging research areas, fostering innovation, and promoting inclusivity across the geoscience and remote sensing community. These sessions complemented the core technical program by addressing interdisciplinary challenges, encouraging participation from diverse groups, and supporting the next generation of researchers and professionals.

A key highlight among these initiatives was GlacierHack 2025, a Young Professionals (YP)–led hackathon focused on developing AI-based solutions for glacier and cryosphere monitoring. This innovative activity brought together students and early-career researchers to collaboratively address real-world challenges related to climate change and cryospheric processes using remote sensing data and machine learning techniques. The hackathon promoted hands-on learning, teamwork, and creative problem-solving. The outcomes of GlacierHack 2025 were showcased during the symposium through dedicated poster presentations, enabling participants to present their solutions to a wider audience and engage in technical discussions with domain experts.

The symposium also featured a special session on SPARK, organized by the IEEE Student Branch of Birla Institute of Technology (BIT) Mesra. The SPARK session was designed to provide a dedicated platform for budding innovators and aspiring entrepreneurs, encouraging them to present novel ideas, prototypes, and technology-driven solutions with potential for societal and commercial impact. This session emphasized innovation, entrepreneurship, and translational research, inspiring students to think beyond conventional academic boundaries and explore pathways for transforming research ideas into start-ups and real-world applications.

In line with IEEE's strong commitment to equity and inclusion, InGARSS 2025 hosted activities under the Women in Engineering (WIE) and Inclusion, Diversity, Equity, and Accessibility (IDEA) initiatives. These sessions underscored the importance of fostering an inclusive scientific ecosystem by promoting participation from underrepresented groups, addressing challenges related to access and opportunity, and highlighting the role of mentorship and leadership in shaping equitable research communities.

Student engagement and capacity building were integral to the symposium. To encourage broad participation, particularly from students and early-career researchers, travel support grants were provided to selected participants. The program also included mentoring opportunities and dedicated interaction sessions with senior researchers, keynote speakers, and industry professionals. These sessions enabled students to gain guidance on research directions, career development, and professional growth, thereby enriching their overall symposium experience.

Collectively, these special sessions and initiatives reinforced InGARSS 2025's role as not only a premier technical forum but also a community-centric and future-oriented platform that promotes innovation, entrepreneurship, inclusivity, and the professional development of students and young researchers, in strong alignment with the mission and values of IEEE GRSS.

10. Publications

All accepted and presented papers at InGARSS 2025 will be submitted for publication in the IEEE Xplore Digital Library, thereby ensuring global visibility, long-term archival, and wide dissemination of the research contributions to the international scientific community. Publication in IEEE Xplore

enables the presented works to reach a broad audience of researchers, practitioners, and policymakers, while also ensuring indexing and citation within a trusted and widely used digital repository.

In addition to the conference proceedings, authors of accepted and presented papers have been invited to submit extended versions of their work for consideration in a special issue of the IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (J-STARS), a premier peer-reviewed journal of the IEEE Geoscience and Remote Sensing Society. This special issue aims to feature high-quality, substantially extended manuscripts that build upon the conference presentations and offer deeper technical insights, enhanced experimental validation, and expanded discussions of results.

The call for papers for the J-STARS special issue has already been widely circulated among conference participants and the broader research community. Authors are required to ensure that the extended submissions contain significant new material beyond the conference version and comply fully with IEEE and J-STARS publication guidelines.

The deadline for submission of extended manuscripts to the J-STARS special issue is 31st May 2026. This initiative further strengthens the technical impact of InGARSS 2025 by providing authors with an opportunity to disseminate their research through both a leading IEEE journal and the IEEE Xplore platform, thereby enhancing the scholarly value and long-term impact of the symposium.

11. Organizational Support and Logistics

The Organizing Committee of InGARSS 2025 ensured the smooth execution of the symposium through careful planning and comprehensive logistical support, including accommodation assistance, student travel grants, and efficient on-site coordination. These efforts contributed significantly to a seamless and professionally managed event.

The symposium received strong institutional support from IIIT Bhubaneswar, whose leadership, faculty, staff, and infrastructure played a central role in hosting the event. Valuable contributions were also made by IEEE GRSS chapters and affinity groups, along with the dedicated efforts of volunteers, whose commitment was instrumental in the successful conduct of technical sessions and related activities.

InGARSS 2025 was generously supported by several esteemed sponsors and partner organizations, including Corteva Agriscience, Odisha Computer Application Centre (OCAC), Department of Electronics & Information Technology (E&IT), Government of Odisha, Union Bank of India, and National Remote Sensing Centre (NRSC), ISRO. Additional support from IDEA–GRSS, BIT Mesra Student Branch Chapter (SBC), and UEMK SBC significantly strengthened student engagement and inclusivity initiatives.

Complementing the technical program, cultural and networking events were organized to promote professional interaction, collaboration, and community building among participants. Collectively, the support of the host institution, IEEE GRSS community, sponsors, volunteers, and student branches played a key role in making InGARSS 2025 a well-coordinated and impactful symposium, aligned with the mission and values of IEEE GRSS.

12. Conclusion

The **2025 IEEE India Geoscience and Remote Sensing Symposium (InGARSS 2025)** was successfully conducted and widely appreciated for its technical depth, interdisciplinary scope, and strong emphasis on societal relevance. The symposium provided a robust platform for knowledge exchange, collaboration, and capacity building in geoscience and remote sensing.

InGARSS 2025 reinforced India's growing contribution to the global IEEE GRSS community and is expected to have a lasting impact on research, innovation, and applications in Earth observation technologies aligned with the vision of a **better world and a brighter future**.