

REFLECTIONS



*The Quarterly In-House Newsletter of the
North Eastern Space Applications Centre*



From the Director's Desk



Dr. S. P. Aggarwal
Director, NESAC

HIGHLIGHTS OF THIS ISSUE:

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The first quarter of 2025 has been an eventful and inspiring period for NESAC, marked by notable accomplishments and distinguished visits. A highlight of this quarter was the visit of Dr. V. Narayanan, Chairman, ISRO/Secretary, Department of Space and Chairman, NESAC Governing Council, on 1st April 2025. Dr. Narayanan reviewed the Centre's ongoing activities in detail, visited all NESAC facilities and interacted with employees. He appreciated the progress and overall development of the Centre and encouraged NESAC staff to continue striving for excellence in service to the nation, while carrying forward the legacy of ISRO's visionary leaders. He also visited the land identified for NETRA project at Guwahati and engaged in a productive discussion with the Hon'ble Science & Technology Minister of Assam. Over the past three months, NESAC has successfully completed several key projects across multiple domains, adhering to timelines and ensuring impactful outcomes. In alignment with its user-centric approach, NESAC also conducted a number of workshops to facilitate effective implementation and knowledge sharing with user departments. As part of its outreach and capacity-building initiatives, NESAC organized three specialized training programs focusing on Climate Change-related studies, Geo-tourism application development, Forest Fire mitigation using GIS. These programs reached over 100 participants from government departments, academia and industry across the country.

NESAC also coordinated the first edition of NE-SPARKS program at Bengaluru, where 99 students from all eight NE states visited ISTRAC and URSC, gaining insights into India's space missions.

In celebration of National Science Day 2025, NESAC welcomed 140 school students to its campus, fostering curiosity and interest in science and space technology. Additionally, the Centre actively observed Swachhata Pakhwada from January 31st to February 14th, conducting a series of cleanliness and awareness programs.

Adding to its list of recognitions, NESAC was awarded the 3rd Prize for Official Language Implementation for the year 2023-24, a testament to its commitment to linguistic inclusivity.

Unveiling Seismo-Ionospheric and Atmospheric Coupling: Evidence from TEC and Electric Field Measurements

Gopal Sharma and Abhay Srivastava

Lithosphere–Atmosphere–Ionosphere–Coupling (LAIC) illustrates the synergy between different ground, atmospheric and ionosphere processes and their anomalous variations prior to earthquakes. It presents a concept of a complex multidisciplinary approach to understanding anomalies observed in the atmosphere, atmospheric electricity and in the ionosphere and magnetosphere. As a demonstrative study, we selected a 5.4 Mw earthquake that occurred on 14-08-2023 in Bangladesh, which was at 76 km aerial distance from NESAC, where the measurement stations (Global Navigation Satellite System & Electric Field Meter, EFM) are installed. For the identification of Total Electron Content (TEC) anomaly due to an earthquake as a precursor, variation in VTEC from GNSS observation was monitored continuously using the past 15 days of TEC data. The TEC time series from GNSS station installed at NESAC suggests an anomaly on 03 - 08 - 2023, 10 days prior to the earthquake, as shown in Fig 1

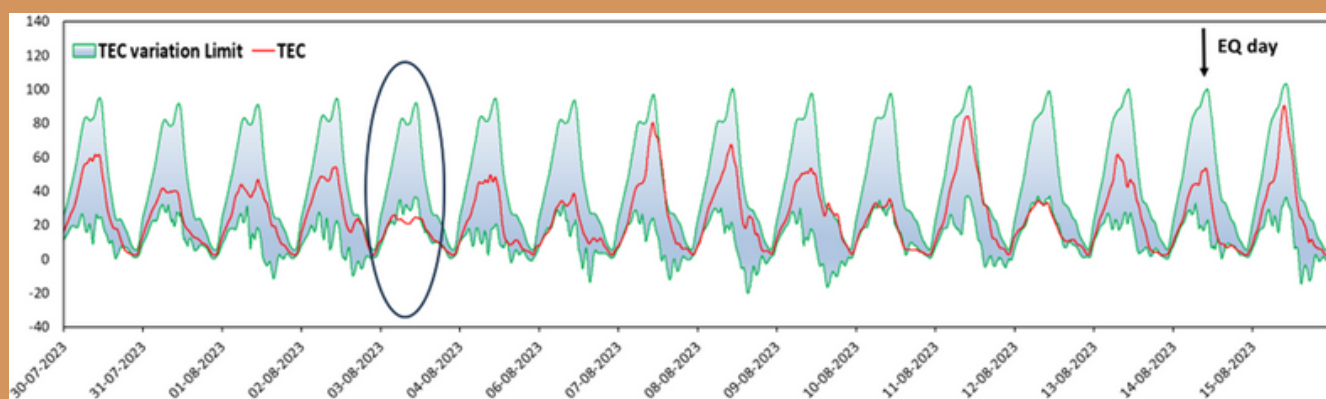


Fig 1. TEC time series from GNSS station (Shlg) at NESAC for 15 days duration prior to Mw 5.4 Bangladesh earthquake. Anomaly day is highlighted by black circle. TEC variation limits are calculated utilising past 15 days mean and standard deviation. Arrow represent earthquake day.

The peak anomaly was observed during 5 to 11 UTC (10:30 – 16:30 IST). We further analysed the EFM data from station installed at NESAC for the TEC anomaly day. EFM data reveals an increase in the electric field during 15:20-16:10 Hrs in the range of 10 to 40 volts/meter. There was a sharp change in the electric field which is not obvious in the low-range electric field during fair weather (clear sky) conditions. Further, no lightning and severe cloud activity occurred during 15:30 Hrs and nearby time windows. Moreover, in the case of disturbed weather, electric field usually varies in the range of several 1000's volts/meter, indicating the observed increase in electric field to be associated with earthquake precursory signals similar to TEC data.

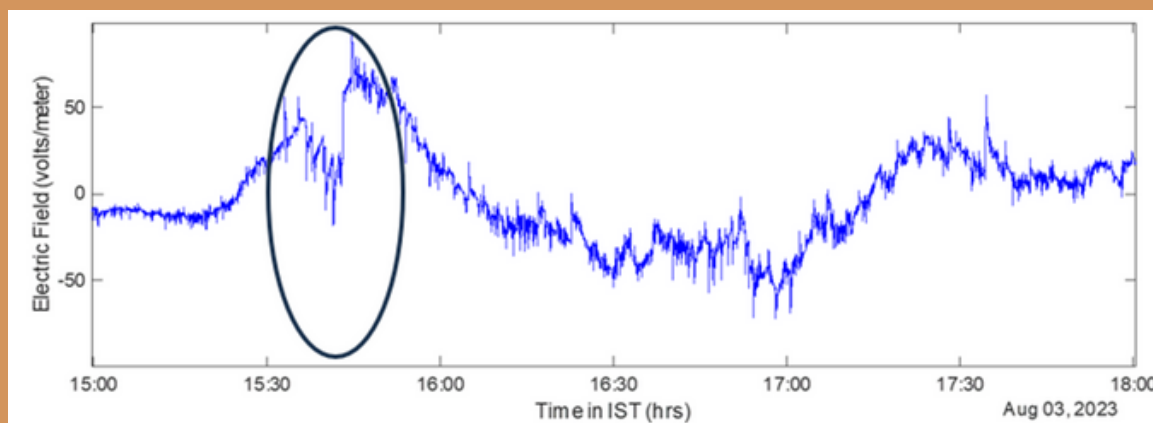
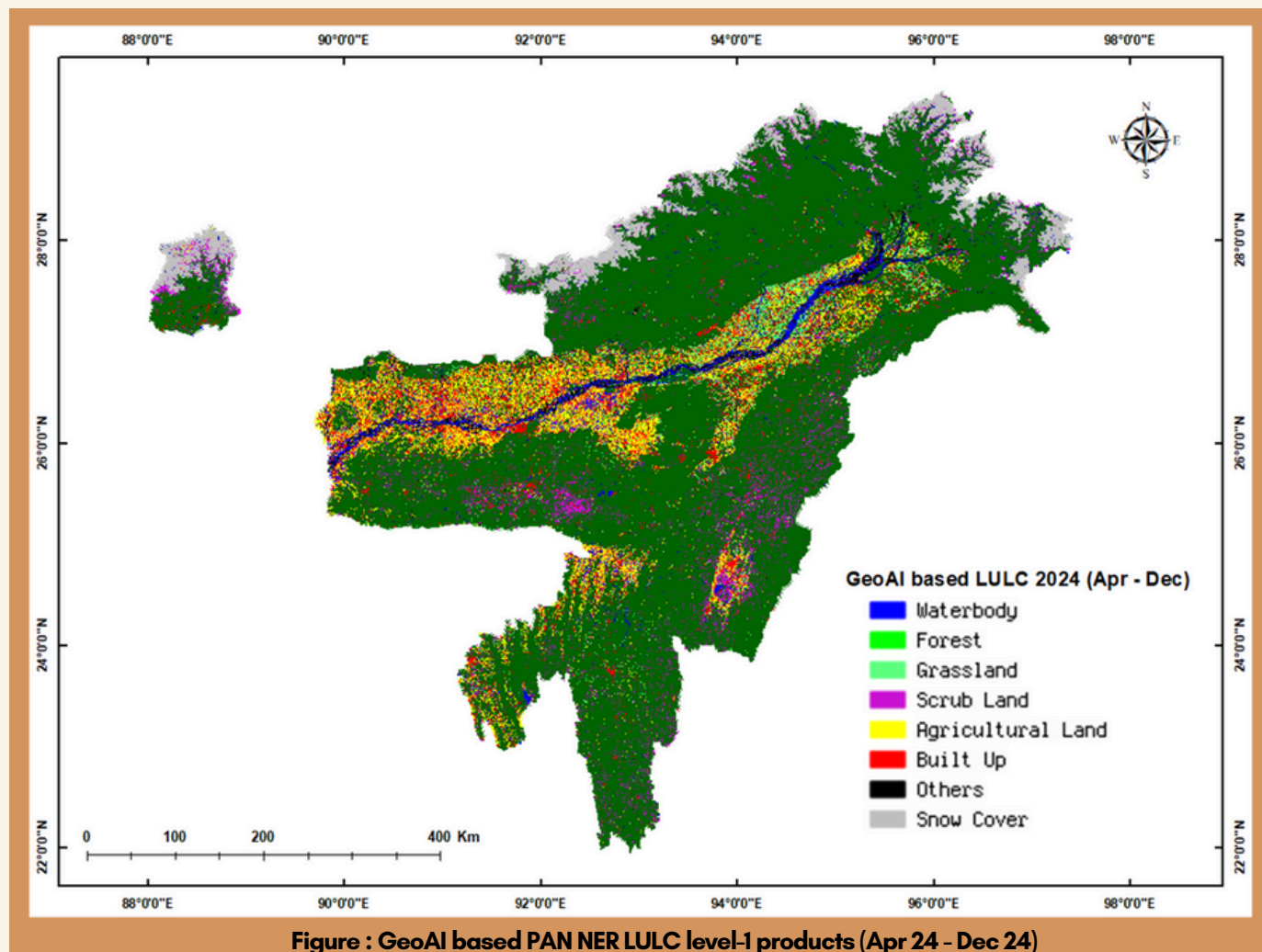


Fig 2: Electric Field Meter (EFM) Data from observation station at NESAC on 03-08-2023 during TEC anomaly time windows.

GeoAI Model Development for Automated Level-1 Land Use and Land Cover Classification

Avinash Chouhan and Dibyajyoti Chutia

Automated land use and land cover (LULC) classification is a vital remote sensing image analysis task that supports applications such as environmental monitoring, urban planning and resource management. Traditional LULC mapping, which depends heavily on extensive ground-truth surveys, provides high accuracy but is labor-intensive and time-consuming, often leading to delays and forcing users to rely on outdated maps for timely visualization.



In this work, we developed the Aggregated Context Network (ACNet), a GeoAI-based satellite semantic segmentation model for the automated generation of Level-1 LULC classification. ACNet integrates multi-scale contextual information to overcome spatial limitations of existing methods, delivering more refined and accurate results. The model was trained on 10,000 carefully curated Sentinel-2 image patches and validated against 6,000 randomly sampled ground-truth points, using the 2015–16 LULC map as a baseline. ACNet achieved an overall accuracy of 76%. As part of ongoing GeoAI R&D efforts, ACNet is deployed biannually for PAN North Eastern Region (NER) LULC generation. The outputs are disseminated through the North Eastern Spatial Data Repository (NeSDR) portal, enabling rapid visualization in regions lacking recent LULC updates. Continuous user feedback and visual validation are integrated to improve the accuracy of Level-1 outputs, while efforts are underway to extend ACNet for fully automated Level-2 LULC classification.

Capacity Building

Two-week basic course on 'Space technology applications to study climate change and its impacts'

The course was conducted during 24th February – 7th March 2025 with a total 09 participants from different parts of India. The course featured lectures on regional climate modeling, satellite precipitation retrieval, cryospheric studies, data analysis techniques for climate change etc. The course focused on hands-on sessions of python based data analysis of satellite and climate data. Dr. Bikash Gogoi, Head, Department of Geological Sciences, Guwahati University presided over the Valedictory program as the Chief Guest.



One-day Brainstorming Workshop on GeoTourism Application

The workshop was jointly organized by NESAC & NEC on 3rd March 2025 at NESAC for 41 officials and stakeholders from different state tourism Directorates, Ministry of Tourism, State Remote Sensing Applications Centres (SRSACs) including NGOs of NE region. It aimed at strengthening tourism planning and management through innovative geospatial solutions. Shri Angshuman Dey, IFS, Secretary, NEC, graced the event as the Chief Guest via online mode. The technical sessions saw presentations on cutting-edge geospatial technologies for geo-tourism, including UAV-based 3D visualization and AI-driven GeoTourism tools.



One-day training program for NDRF Team

NESAC Conducted a one-day orientation program for a group of 50 NDRF personnel on 17th March, 2025 on Forest fire prevention and mitigation. A facility visit was arranged at NESAC with special focus on NavIC System, Drone-based monitoring and NERDRR facility. A detailed presentation on Remote Sensing-based Forest Fire monitoring was given to the participants.



Achievements

NESAC awarded 3rd prize for Official Language implementation during the year 2023-24

NESAC was awarded the 3rd Prize by the Department of Official Language, Ministry of Home Affairs for outstanding Official Language implementation during the year 2023-24 in the category of Central Government Offices (more than 50 employees) located in 'C' Region during the Joint Regional Official Language Conference held on 5th March, 2025 in Assam.



NEWS & EVENTS

NESAC Observes Swachhta Pakwada 2025

NESAC observed Swachhta Pakhwada-2025 with a series of cleaning and sanitation activities within NESAC and the surrounding areas of Umiam from January 31st to February 14th, 2025.

Throughout the Pakhwada, various activities were undertaken including a plogging run, cleaning of nearby market and repair and maintenance of the Sulabh toilet complex, awareness campaigns in nearby schools and cleaning efforts at Umiam Lake's lay-by, the banks of Umiam River and rainwater harvesting structure. Additionally, quiz and painting competitions were organized to engage participants. Coordinators were designated for daily activities, and the program concluded on February 14th, 2025.



Celebration of National Science Day



National Science Day 2025 was celebrated with great enthusiasm at NESAC on 28th February 2025, commemorating the remarkable discovery of the Raman Effect by the eminent physicist Sir C.V. Raman. This year's celebration revolved around the theme – “Empowering Indian Youth for Global Leadership in Science and Innovation for a Developed India.” 140 Students from nearby schools participated in the event.

The inaugural session began with a warm welcome address by Dr. D. Chutia, Secretary, ISRS Shillong Chapter. An insightful talk was delivered by Dr. D. Sinha Roy, Professor and Dean, NIT Meghalaya, on the topic ‘Empowering Society Using Artificial Intelligence’, which captivated the audience by highlighting the transformative role of AI in addressing societal challenges.



As part of the event, quiz competition and painting competition were organized, encouraging active participation from school students and igniting their curiosity in science and technology.

The valedictory session was graced by Dr. S.P. Aggarwal, President, ISRS and Director, NESAC, as the Chief Guest. In his address, Dr. Aggarwal emphasized the significance of National Science Day in accelerating scientific temperament, innovation, and curiosity among young minds. The event also witnessed insightful speeches from Dr. B.K. Handique, Secretary, ISG Shillong Chapter, and Dr. S.K. Kundu, Secretary, IMS Shillong Chapter, who highlighted the importance of collaborative scientific endeavors.

The event was organized by Indian Society of Remote Sensing (ISRS), Shillong Chapter in collaboration with the chapters of Indian Society of Geomatics (ISG) and Indian Society of Meteorology (IMS).

Chairman, ISRO/Secretary, DOS & Chairman, NESAC Governing Council Reviews the Activities of NESAC



Chairman, ISRO/Secretary, Department of Space and the Chairman NESAC Governing Council Dr. V. Narayanan visited NESAC and reviewed the activities of NESAC on 0^{1st} April, 2025. He visited the construction site for the 500 seater Multi-purpose Auditorium and reviewed other construction activities.. Later, he visited the various facilities inside NESAC campus like UAV Lab, NaVIC Ground Station (IRCDR), MCF MATRIS Station and witnessed a demonstration on NER-DRR web portal and its various functionalities by NESAC Scientists.



He addressed NESAC staff at NESAC Outreach Conference Hall where he appreciated the facilities developed at NESAC. Dr. Narayanan provided his suggestions and guidance for the improvement of the overall work ethics and efficiency of the staff of NESAC. Dr. S.P. Aggarwal, Director, NESAC presented the activities & achievements of NESAC in various thematic areas through the application of Space Technology. Chairman, NESAC GC critically reviewed the activities of NESAC and encouraged NESAC Staff to work more vigorously and contribute towards national development. He addressed all NESAC Staff at the Auditorium revisiting his experiences in ISRO and encouraged the young staff of NESAC to continue the legacy of past ISRO leaders. Dr. Narayanan congratulated all NESAC Staff on the numerous achievements during the past two decades.



On 2nd April, 2025, he visited the land identified for NETRA (Network for Space Object Tracking and Analysis) project at Chandrapur, Assam and had discussions with Hon'ble S&T Minister of Assam Shri Keshab Mahanta.

NESAC coordinated NE-SPARKS program



NESAC coordinated the first edition of the "North East Student Program for Awareness, Reach and Knowledge on Space (NE-SPARKS)" on 22nd-23rd April 2025 at Bengaluru.

NE-SPARKS is an outreach initiative of the Ministry of DoNER, implemented by NESAC, aiming to provide at least 100 science students from each northeastern state with exposure to ISRO centres by December 2025. In this first batch, 99 students from all eight northeastern states visited ISTRAC and URSC, ISRO, gaining firsthand insight into India's space missions and technologies.

NEWS & EVENTS

Student Visits to NESAC

Upcoming Events



37 Students from Earth Science department of IIT Roorkee visited Nesac on 06.01.2025



10 Students from Science department of North East Adventist University visited Nesac on April 03,2025



13 Students from Earth science department of USTM Meghalaya visited NESAC on April 22, 2025.

YUVIKA 2025

The 5th Edition of the ISRO Yuva Vigyani Karyakram (YuViKa) - Young Scientist Program will be organized at NESAC during May 19-30, 2025.



This edition of YuViKa will see 49 students from the five NER States of Arunachal Pradesh, Manipur, Meghalaya, Mizoram & Nagaland attend the program at NESAC.

Know more about various training and capacity building programmes

📅 Course Calendar 2024-25 ← NEW



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North Eastern Space Applications Centre
Department of Space, Government of India
Umiam-793103, Shillong, Meghalaya
Ph: +91 364 2570141/2570140
Fax: +91 364 2570139
Web: www.nesac.gov.in

Editor

Shri Ranjit Das
Water Resource Division, RSAG

Editorial Team

Shri Anjan Debnath
Dr. Gopal Sharma
Shri Siddhartha Bhuyan
Shri Sumanth B C
Shri Rosly Boy Lyngdoh
Dr. Francis Dutta
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