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NORTH EASTERN SPACE APPLICATIONS CENTRE
उत्तर पूर्वी अंतरिक्ष अनुप्रयोग केंद्र

REFLECTIONS

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

Dr. S. P. Aggarwal
Director, NESAC

HIGHLIGHTS OF THIS ISSUE:

From the Director's Desk

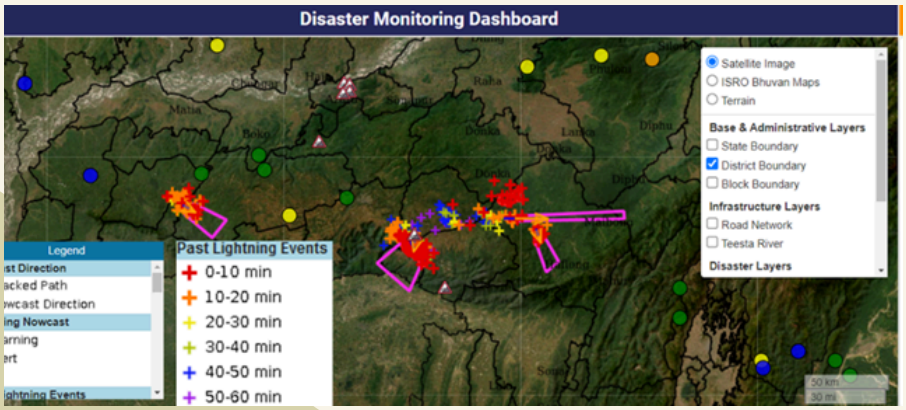
NESAC has consistently been providing space technology-based support for Natural Resource Management as well as Disaster Risk Management in the North Eastern Region of India. During this monsoon season, NESAC has issued 50 flood alerts for different parts of Assam under the Flood Early Warning System project, disseminating information via email and the NERDRR geoportal. Landslides are another major issue in the region, and we have been providing essential geospatial support to disaster management authorities as needed. Recognizing the importance of space technology in disaster management, NESAC, in collaboration with NRSC and NIDM, conducted a workshop on "Space Technology in Disaster Risk Management" from May 27-28, 2024, at NESAC. Over 60 participants from eight northeastern states, West Bengal, and Odisha attended, making it a grand success.

During this period, NESAC undertook several other major programs, including ISRO's Yuva Vigyani Karyakram (YUVIKA), conducted with six other key ISRO centers and involving 44 students from the northeastern region. Another significant initiative was organising a workshop under Capacity Building for Women in Geospatial Technology on "Satellite in Your Hand," held from May 30-31, 2024, at NESAC. This program saw the participation of 72 women from various government organizations and NGOs. Additionally, the Government of India declared August 23 as National Space Day (NSpD) to mark the successful landing of the Chandrayan-3 Vikram lander on the moon. NESAC is leading the NSpD celebrations across 8 northeastern states and West Bengal, with events already completed in Meghalaya, Nagaland, Manipur, West Bengal, Sikkim, Arunachal Pradesh and West Bengal.

R&D Activities

Severe Weather Tracking System Using Ground-Based Lightning Data

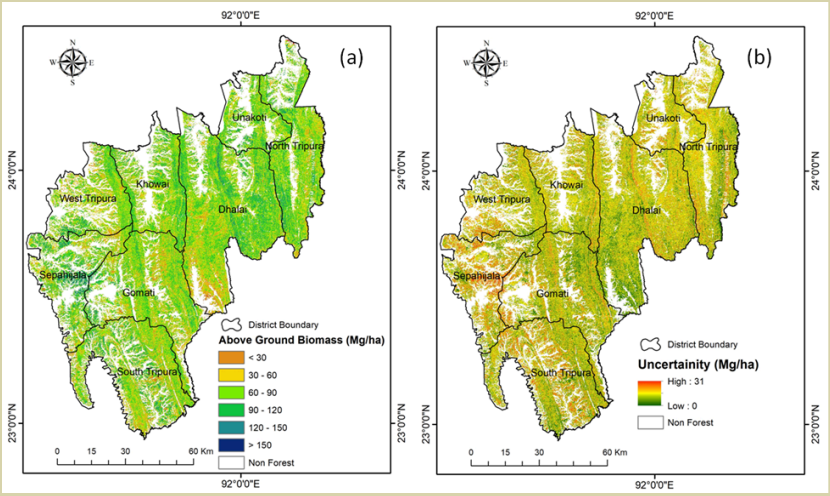
Abhay Srivastava, Shyam S Kundu



NESAC have developed a severe weather tracking system using ground-based lightning data. The beta version of the system already hosted in the NER-DRR website for location based now-cast with 5-minutes refresh interval. The system is skilled to watch the sudden changes in the lightning flash rate as the flashrate changes are the indicator of severe weather. The real time total lightning data availability seems significant for thunderstorm tracking and lightning now-casting as shown in the figure. Daily lightning report and INSAT 3DR TIR base layers are the additional feature of this tracking system to get overall idea. The real time severe weather tracking system are displayed at https://www.nerdrr.gov.in/storm/index.php and "smartaxom" mobile app.

Above Ground Biomass (AGB) Mapping of Tropical Forest of Tripura

Dhruval Bhavsar, Kasturi Chakraborty

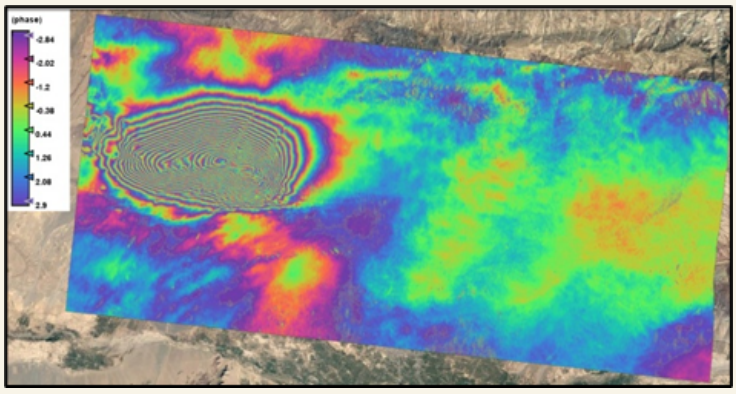


This study implemented Synthetic Aperture Radar (SAR) remote sensing to estimate aboveground biomass (AGB) in the forests of Tripura. It utilized multi-frequency SAR data, specifically HH and HV dual polarisation from both EOS-04 (C-band) and ALOS-2 PALSAR-2 (L-band) satellites. The findings revealed that combining data from these two distinct wavelengths enhanced the accuracy of AGB estimates, particularly for forests with low and medium densities. While the model performed well for AGB values up to 120 Mg/ha, higher values exhibited greater uncertainty.

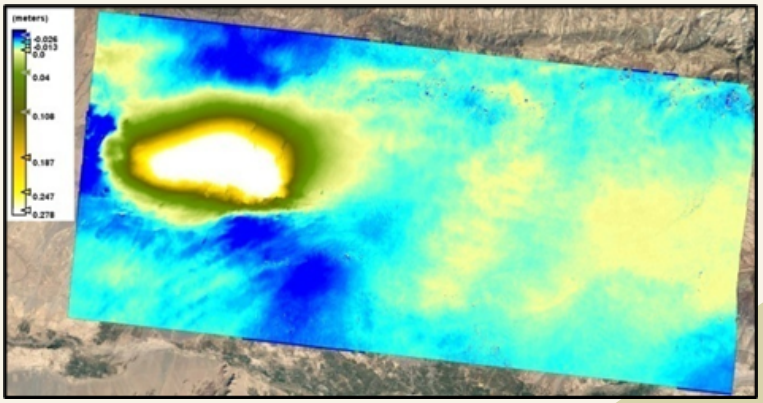
Earthquake deformation analysis using satellite-based temporal InSAR data

Gopal Sharma

As R& D activity, ground deformation associated with the October 2023 Herat earthquakes is investigated utilizing Differential Interferometric SAR (DInSAR) Technique. The earthquake occurred on October 7, 2023 due to a rupture along Afghanistan's Harirud Fault System, a significant right-lateral strike-slip fault. In the present study, Sentinel-1 SLC (Single look complex) datasets of pre and post earthquakes are used for the



Interferometric fringes developed due to the earthquake



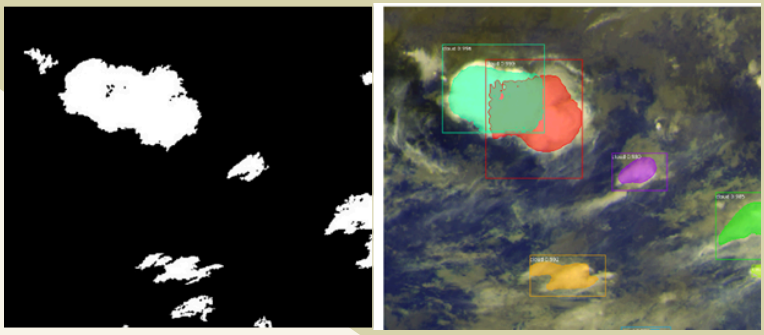
Displacement along the line of sight due to the earthquake

analysis. DInSAR analysis suggests a subsidence of about -26 mm away from the satellite's Line of sight (LOS) and an uplift of roughly 500 mm towards the satellite's LOS when analysed data from the descending pass. The findings emphasised the DInSAR's effectiveness in detecting and monitoring natural and human-induced processes such as tectonic activity, volcanic deformation, and urban subsidence. The study further suggests that DInSAR and multi-temporal-InSAR spatial and temporal resolutions may enhance our understanding of complex deformation patterns resulting from earthquakes.

Segmentation of Convective Clouds from INSAT-3D images using Deep Learning Method

Rekha B Gogoi, P Subhash Singh

Satellite images and their derived products are invaluable for monitoring and short-term weather forecasting, providing critical atmospheric data over large areas in short time intervals. Automated analysis algorithms enhance the accuracy of identifying potentially hazardous deep convective storms. Alongside traditional warning systems, deep learning (DL) has demonstrated strong performance in various predictive tasks, further improving weather prediction capabilities.



Predicted Cloud Mask: UNET (Left), Mask R-CNN (right)

In this study, two DL models UNET and Mask R-CNN have been used to segregate convective clouds from INSAT-3D images for thunderstorm nowcasting. It can be observed from the results that Mask R-CNN not only identifies the clouds but also offers more detailed results by identifying and segmenting individual cloud structures.

Study on Electric propulsion system(motor-propeller) for small category (<25kgs) Unmanned Aerial Vehicles (UAVs)-T2308

Chirag Gupta, Sanjay Pandit

This work aims to study the electric propulsion system (for different motor-proller combinations) for small class UAVs. A thrust stand (Flight Stand 15) necessary for experimentation was setup at UAV lab. The Flight Stand 15 allows to precisely characterize and evaluate the performance of motors and propellers by measuring thrust, torque, RPM, current, voltage, temperature, propeller efficiency and motor efficiency. The stand at NESAC supports force and torque measurement up to 15 Kgf and 8 Nm respectively. Five sets of different propeller-motor combinations were tested using the thrust stand, and data analysis is currently in progress. Simultaneously, we have initiated the design of propeller profiles to run CFD simulations for obtaining analogous results.

Thrust stand set up

Capacity Building

One Day Training on Utilization of NeSDR Platform for Meghalaya Basin Development Authority

A one day training programme on the Utilization of North Eastern Spatial Data Repository (NeSDR) Platform was organized for Meghalaya Basin Development Authority (MBDA), Shillong on May 6, 2024. A total of 24 MBDA Officials attended the training programme held at NESAC Outreach facility. During the valedictory programme, Dr. S P Aggarwal, Director, NESAC interacted with the participants and offered his valedictory remarks.

NESAC hosted the 4th edition of the YUVIKA Program

NESAC hosted the fourth edition of the YUva VIgyani KAryakram (YUVIKA) or the Young Scientist Program of ISRO during May 13-24, 2024 along with six other major centres of ISRO. NESAC hosted the program for the 44 students from Arunachal Pradesh, Manipur, Meghalaya, Mizoram, and Nagaland. The program was inaugurated virtually from URSC, Bengaluru by Shri S Somanath, Chairman, ISRO on May 13, 2024. The program covered many interesting activities like Model Rocket making and launching, Telescope assembly, robotics and robot assembly, interactive games, etc. in addition to lectures on different interesting topics covering Astronomy, Astrophysics, Cosmology, Chandrayaan, Mangalyaan, Gaganyaan, different Space Applications, etc.

NESAC Conducted 2 Days Workshop on Space Technology in Disaster Risk Management

NESAC along with National Remote Sensing Centre (NRSC), Hyderabad and National Institute of Disaster Management (NIDM), Delhi jointly organized a two-days workshop on "Space Technology in Disaster Risk Management" at NESAC, Umiam during 27-28 May, 2024.

More than 60 participants from different departments and institutions such as State/District Disaster Management Authority, Water Resource Department, Brahmaputra Board, Geological Survey of India, State Remote Sensing Centres, planning department, IITs, NITs, other state Universities from 8 NE states, West Bengal and Odisha took part in the workshop. The workshop had experts from renowned institutions such as NEIST, NIDM, ISRO, NRSC, IIRS, IIT, CROPC including NESAC offering participants a valuable opportunity to gain insights into the effective utilization of geospatial technology for disaster risk reduction.

Capacity Building

Capacity-Building Training Program for Women in Geospatial Technology, "Satellite in Your Hand"

NESAC conducted a Two-Day Capacity-Building Training Program for Women in geospatial Technology, "Satellite in Your Hand," during May 30-31, 2024, in collaboration with Rambhau Mhalgi Prabodhini, and Earth Sight Foundation and the initiative was supported by the National Commission for Women. Seventy two women working in government offices in various departments, such as Agriculture, Fishery, Soil Water Conservation, Water Resources, Forestry, Urban Development and also working in NGOs that deal with the environment, disaster management, etc. participated in the program. Smt. Delina Khongdup, Member, National Commission for Women graced the occasion as the Chief Guest. Dr. S.P. Aggarwal, Director, NESAC & Shri P.L.N. Raju Special Secretary, Dept. of S&T and CC, Govt. of Assam, addressed during inaugural program as the Guest of Honour.

NESAC Conducts a Two Weeks Training Course on 'Applications of Remote Sensing and GIS in Sericulture' for CSB Scientists

NESAC successfully conducted a two-week training on 'Applications of Remote Sensing and GIS in Sericulture' for Central Silk Board (CSB) scientists from June 24th to July 5th, 2024. A total of 28 Scientists from various CSB organizations from all over the country participated in the CSB sponsored training. The program featured lectures, practical sessions, and field visits.

The valedictory program was held on July 5, 2024 with Brig. Rajiv Kumar Singh (Retd.), Managing Director of North Eastern Handicrafts & Handlooms Development Corporation Ltd (NEHHDC), as the Chief Guest. Course completion certificates were distributed during this session.

Basic Course on Remote Sensing & GIS Technologies and Applications Conducted for CAPF & IB Officials

A one week Basic course on Remote Sensing & GIS Technologies and Applications for CAPF & IB Officials sponsored by NIIE, FHQ BSF was organised during July 22 to 26, 2024. The programme was attended by one 2IC & four Assistant Commandants from CRPF and five Constables from ITBP.

NEWS & EVENTS

Visit of Chairman, Brahmaputra Board, Guwahati to NESAC

Dr. Ranbir Singh, Chairman, Brahmaputra Board, Guwahati visited NESAC on May 16, 2024 and had a discussion with Director, NESAC and Scientists from WRD, NESAC on the future collaborative avenues with NESAC.

Visit of Dr. Indra Mani, VC of VNMKV to NESAC

Prof. Dr. Indra Mani, Hon. Vice-Chancellor, Vasantrao Naik Marathwada Krishi Vidyapeeth (VNMKV) visited NESAC on June 04, 2024. He delivered a talk on "Digital and Sustainable Agriculture - The Way Forward". He gave a detailed account of the initiatives taken by VNMKV in the domain of digital and sustainable agriculture and stressed on the need of collaboration between NESAC and VNMKV.

Inauguration of Meghalaya Forest Fire Information System

Hon'ble Chief Minister Shri Conrad K. Sangma launched the "Meghalaya Forest Fire Information System (MeFFIS)" containing a dashboard and mobile App named "Forest Fire Incident Reporting App" on June 19, 2024 developed by NESAC at the Cabinet Room in the main Secretariat. The dashboard and mobile app are open to all the citizens and have been designed as a single point source of information for near real-time and past forest fire events, forest fire vulnerability and prone zone, and historical burnt areas for entire Meghalaya which will help decision makers in mitigating forest fires and contributing to the sustainable management of the state's forest resources. The launch ceremony also included the release of the publication "Geospatial Mapping of Forest Fire Vulnerable and Forest Fire Prone Areas in Meghalaya" which outlines a comprehensive spatio-temporal assessment of forest fire scenario of the state for effective disaster risk reduction and planning.

National Science Day Celebration

India successfully landed its Chandrayaan-3 Vikram Lander on the lunar South Pole on August 23, 2023

To commemorate the successful landing of Chandrayaan-3 Vikram Lander, the Government of India has declared August 23 as National Space Day (NSpD). The Department of Space plans extensive celebrations for the first NSpD across the country in July-August 2024. The theme is "Touching Lives while Touching the Moon: India's Space Saga". NESAC is leading NSpD celebrations in Zone-1, covering the 8 Northeastern states and West Bengal.

The NSpD celebrations that commenced in July 2024 covered the NER states namely Meghalaya, Nagaland, Manipur, Arunachal Pradesh, and Sikkim along with West Bengal.

The first National Space Day (NSpD) celebration took place in Nongpoh, **Meghalaya**, with Dr. Joram Beda (IAS), Commissioner and Secretary, Planning Investment Promotion and Sustainable Development Department, Govt. of Meghalaya as the Chief Guest.

The programme was attended by more than 475 students and other invitees. In the Inaugural Session, Director, NESAC welcomed all the dignitaries and participants to the programme. Five schools got selected for the quiz competition, and the winning team was from Army Public School, Umroi.

NESAC in collaboration with the Nagaland Geographic Information System & Remote Sensing Centre (NGISRSC) organized the National Space Day celebrations at the SIRD Auditorium in Kohima, **Nagaland** on July 16, 2024. The event commenced with a welcome address by Er. M. Kithan, Project Director, NGISRSC Planning and Transformation Department. The event saw enthusiastic participation by 150 students from various schools in Kohima, Nagaland. The event was graced by Principal Secretary and Development Commissioner R. Ramakrishnan, IAS, as the Chief Guest.

NESAC in collaborations with the **Manipur** Science and Technological Council (MASTEC) and National Institute of Electronics and Information Technology (NIELIT) organized the National Space Day celebrations at NIELIT, Imphal, Manipur. The event was graced by Th. Biswajit Singh, Minister for Science & Technology, Government of Manipur, as the Chief Guest, along with other distinguished guests. A quiz on space technology was also conducted, with trophies and cash prizes awarded to the top three schools. The event saw participation from 220 students representing 54 schools across the state.

NEWS & EVENTS

NESAC in collaboration with **Arunachal Pradesh** Space Application Centre (APSAC) jointly organised National Space Day 2024 on July 25, 2024 at Dorjee Khandu State Convention Centre, Itanagar, Arunachal Pradesh. The programme was graced by Ms. Sumedha Yadav, Secretary (Science & Technology), Government of Arunachal Pradesh as the Chief Guest and was attended by around 180 students representing 16 schools of Itanagar Capital Region.

A state-of-the-art Space Exhibition was also showcased during the programme. This was followed by a quiz competition among the students of the schools.

NESAC, in collaboration with RRSC-East organized the one day event to celebrate the National Space Day-2024 in Kolkata, **West Bengal** on July 25, 2024. The program consisted of invited talks, space exhibition, quiz, interaction with scientists, etc.

In addition, NSpD was also jointly organised by Siliguri Institute of Technology (SIT) & NESAC at Siliguri in West Bengal on July 26, 2024. Dr. Buddhadev Sau, Former VC, Jadavpur University, Kolkata was the Chief Guest for the Inaugural program. Approximately 600 students from the 22 invited schools visited the Space On Wheels Exhibition bus

National Space Day for the state of **Sikkim** was celebrated on July 29, 2024 at Gangtok. The event was jointly organized by the Sikkim State Council of Science and Technological Council (DST) and NESAC. Dr Sandeep Tambe, Secretary, DST, Government of Sikkim, was the Chief Guest of the event.

Approximately 130 students from 20 schools across the state participated in the event. Dr. Shamrao, Sci./Engr. from URSC, ISRO delivered a keynote address on Indian Space Programs with a particular focus on Moon missions. Shri D. G. Shrestha, Principal Director, DST, Govt. of Sikkim presented a talk on the applications of space technology for societal benefits.

8th Dr. APJ Abdul Kalam Memorial Lecture

In honor of Dr. APJ Abdul Kalam's legacy, IIM Shillong hosted the 8th Dr. APJ Abdul Kalam Memorial Lecture on July 27, 2024. The memorial lecture was delivered by Director, NESAC.

NESAC in collaboration with IIM, Shillong organised an exhibition highlighting India's space accomplishments that served as a powerful testament to India's cosmic journey and a tribute to Dr Kalam, who ignited the nation's space aspirations.

Student Visits to NESAC

Students from the Department of Forestry and Department of Environmental Sciences, Manipur University, Imphal visited NESAC on May 28, 2024

Students from Army Public School, Umroi and Army Public School, Shillong visited NESAC on June 03, 2024.

Coming up

- Celebration of 25th NESAC Foundation Day
- NESAC User Interaction Meet 2024 https://www.neuim2024.in/
- National Space Day Celebration in NER States

REFLECTIONS

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