



The Regional Network Office for Urban Safety (RNUS)

Monthly Report (April 2025)

Report to STE/SET

Prepared by RNUS

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1.1 Summary

This report summarizes the activities done in RNUS office during the month of April 2025. Progress has been summarized in the following orders:

- 1) RNUS Outreach Activities
- 2) Progress on Research Activities
 - Satellite-based flood map (support in RIMES's project)
 - Water level measurement with low-cost device for CH₄ emission mitigation in Thailand
 - Structural Health Monitoring with remote sensing techniques
 - Study on post-disaster recovery dynamics
 - Study on Development of Land-use Optimization tool
 - Activities related to 2025 Myanmar Earthquake
- 3) Plans

1.2 RNUS Outreach Activities

No update for this month.

1.3 Progress on Research Activities

1.3.1 Satellite-based flood map (support in RIMES's project)

No update for this month.

1.3.2 Water level measurement with low-cost device for CH₄ emission mitigation in Thailand

Continuous water level monitoring is achieved using sensors positioned in the paddy field, providing uninterrupted real-time data. Methane (CH₄) emissions are measured periodically during field visits, offering snapshot data at specific intervals to complement ongoing satellite-based monitoring efforts. Professor Takeuchi made a visit to the RID paddy field in Nakhon Pathom on April 30, 2025, to gather the emission data and ensure the continued progress of the data collection process. Such fieldwork plays a vital role in ensuring accurate measurement.

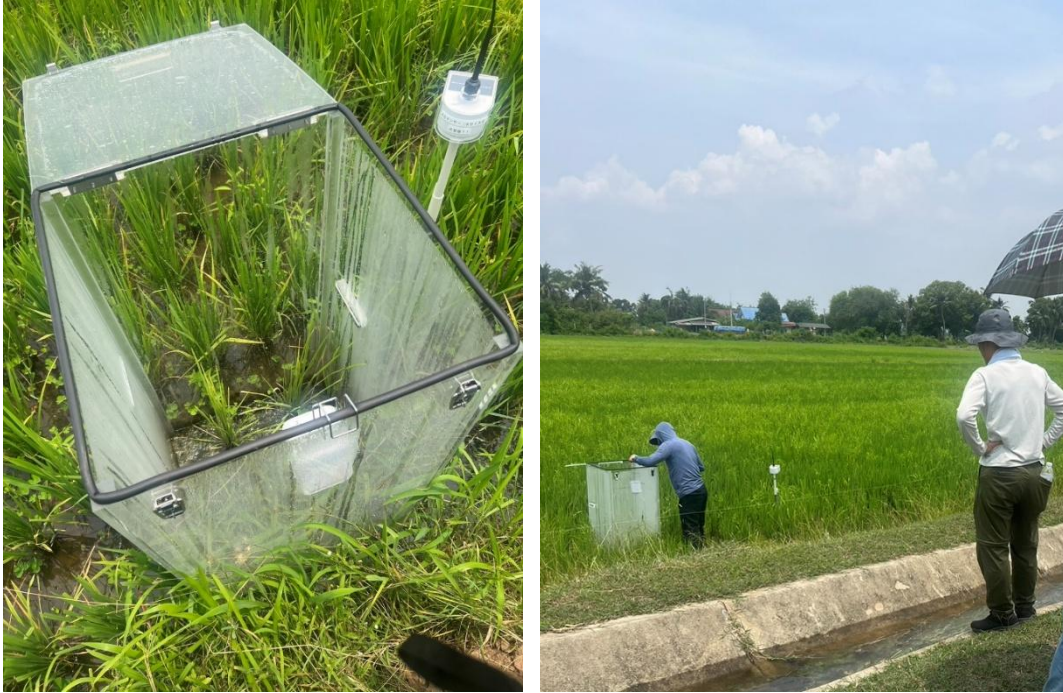


Figure-1. CH₄ methane emission measurement in RID paddy field (30 April 2025).

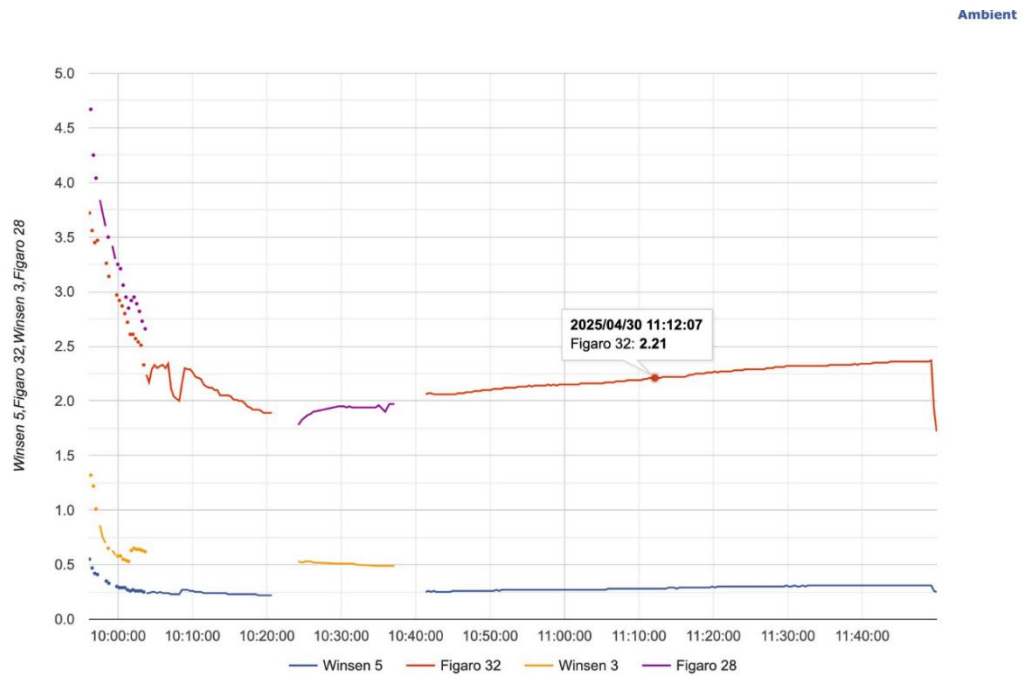


Figure-3 Real-time CH₄ emission readings.

1.3.3 Structural Health Monitoring with remote sensing techniques

No update for this month.

1.3.4 Study on post-disaster recovery dynamics

No update for this month.

1.3.5 Study on Development of Land-use Optimization Tool

Under the guidance of Dr. Yasmin, semi-structured interviews and community surveys are being carried out by a Master student in two case-study areas situated in Phuket (Bangtao and Patong). These coastal urban areas were selected due to their historical tsunami exposure, population density, critical infrastructure, and economic significance. About 230 surveys have been carried out currently are being analyzed to represent the tsunami preparedness levels in Thailand communities.

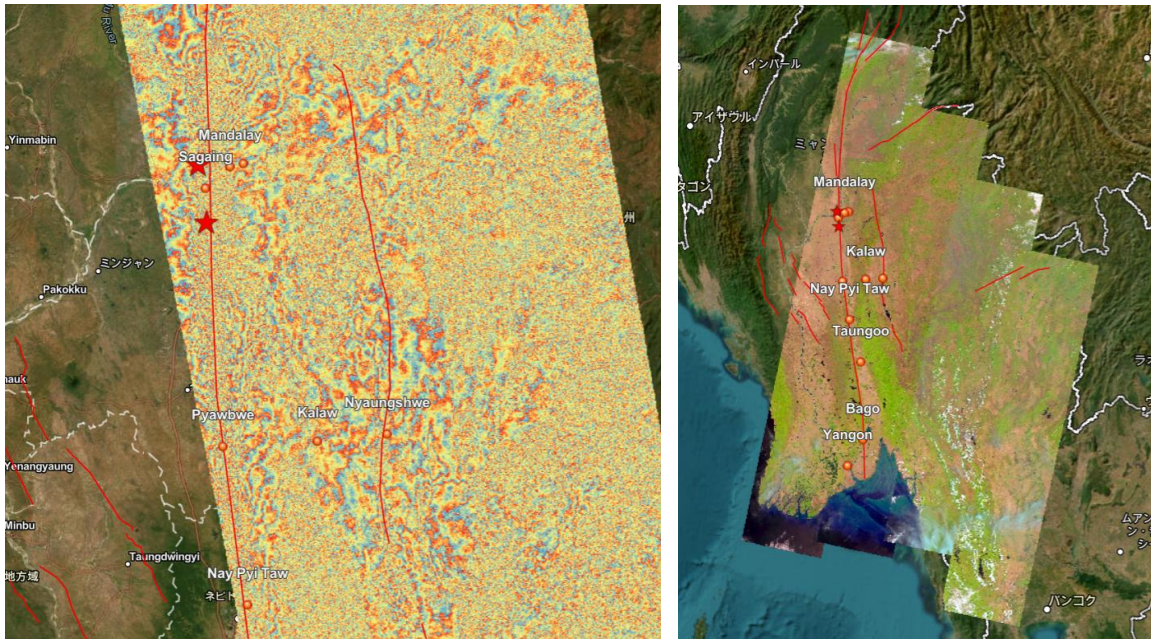
Further to this, a recent grant application was also submitted for the 2025 eAsia JRP project (titled: Digital Twin-Driven Planning and Multi-Hazard Risk Assessment for Resilient Urban Development in Subsidence-Prone Cities) jointly with the Phillippines, Japan, and Indonesia, which would be based on some of the fundamental ideas from this project.

1.3.6 Activities related to 2025 Myanmar Earthquake

Building upon the critical infrastructure ground truth mapping presented in last month's report, two geospatial products were developed to enhance the overall earthquake damage assessment. The first is the "InSAR Interferogram of M7.7 Mandalay, Myanmar Earthquake" which provides detailed surface deformation patterns derived from satellite radar data. The second is the "Landsat Mosaic Imagery: Pre- and Post-Earthquake Visualization", offering a comparative view of the affected region before and after the seismic event using high-resolution optical satellite imagery. These visual datasets have been integrated into the existing interactive dashboard, allowing users to explore and analyse the spatial extent of the damage. The updated dashboard, now enriched with these new layers, can be accessed through the following link (<https://arcg.is/1jf4Pa3>), dashboard visualization shown in Fig. 5.

Figure 4(a) presents an interferogram derived from Interferometric Synthetic Aperture Radar (InSAR) analysis, illustrating ground surface displacement associated with the seismic event. The colour fringes correspond to phase shifts, with each fringe cycle representing approximately 2.8 cm of displacement in the satellite's ascending line-of-sight (LOS) direction. The presence of concentric fringe patterns is indicative of ground motion—either toward satellite or away from the satellite—typically associated with fault slip mechanisms. This deformation signature provides critical insights into the rupture dynamics and fault geometry of the earthquake. The interferometric pair was generated using Sentinel-1A SAR acquisitions from 22 March 2025 (pre-event) and 3 April 2025 (post-event).

Landsat 8/9 surface reflectance mosaics acquired before (2025/03/16-27) and after (2025/04/01-04) the earthquake have been integrated as shown in Fig. 4(b). These mosaics provide a synoptic view of landscape changes, surface disturbances, and possible secondary hazards (e.g., landslides, sediment plumes, infrastructure disruption). The imagery enables contextual interpretation of the earthquake's impact, particularly in areas lacking ground-truth data.



(a)

(b)

Figure-4. (a) Sentinel1's Interferogram and (b) Landsat 8/9 surface reflectance map (detailed explanations in above paragraph).

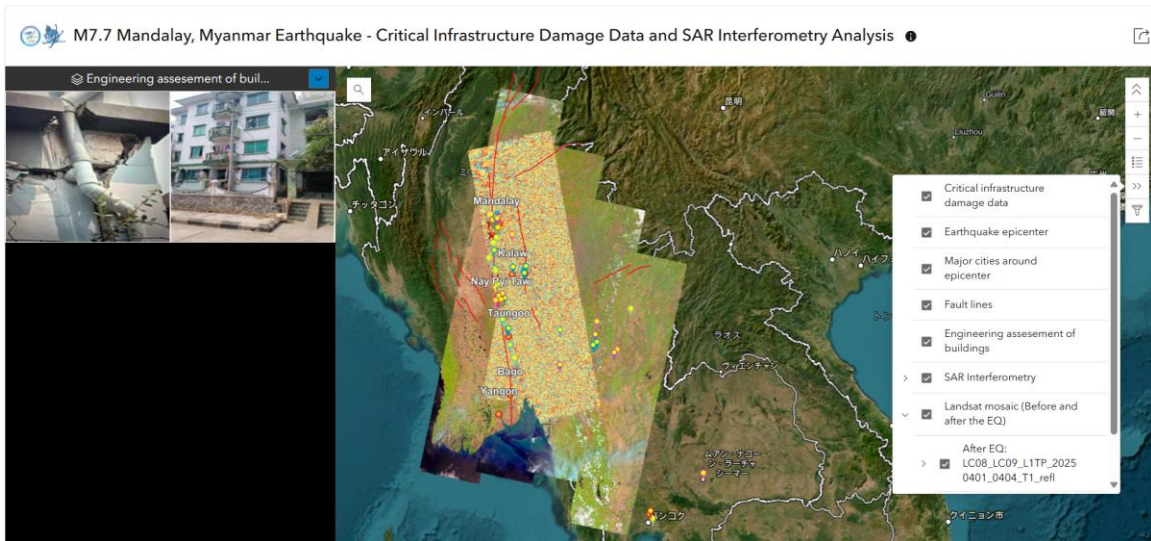


Figure-5. Updated dashboard on 2025 Myanmar Earthquake

1.4 Plans

Dr. Fujiwara and RNUS team plan to visit the RID paddy field in Nakhon Pathom on April 14 and April 28, 2025, to measure methane emissions.

We hope to apply for AIT-U-Tokyo Sakura Science Program in 2025 to promote further interactions between students at both universities.