Introduction to AIT and Our Role in AGATE Project

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GIC
Geoinformatics Center

ASIAN INSTITUTE OF TECHNOLOGY
1959

- Established in **1959** as an international institute
- Over 1,600 Graduate students from 40+ countries
- 24,000 alumni from 100+ countries
- 38,000 short-term trainees from 100+ countries
- Over 125 faculty members, 500+ researchers and staff from 20+ countries
- **300+** ongoing research projects

REMOTE SENSING & GIS APP.   AGRICULTURE   DISASTER MANAGEMENT   ENVIRONMENT   CAPACITY BUILDING

GIC
Geoinformatics Center
Established in 1999

Our Portfolios

RS / GIS
- Satellite and drone-based mapping
- Machine Learning and AI based Applications
- Web-GIS based platform development
- Mobile App development for crowd-sourcing
- IOT for geospatial applications
- GNSS applications and tools
- Data analytics

Disaster Mgmt
- Hazard modeling
- Multi-Hazard Risk Assessment
- Post-disaster sat. data processing for response
- Development of DSS for disaster mgmt
- Land subsidence and stability monitoring
- Forest fire mapping

Training
- Tailor-made trainings
- Online learning
- Knowledge and technology transfer through consultancy

Agriculture
- Crop mapping and monitoring
- Development of Ag related web-based platforms
- Agro-ecological zoning and crop suitability mapping
- Agriculture statistics

Environment
- Climate downscaling
- Drought mapping
- Land cover mapping
- Biomass estimation
- Land-based plastic pollution

Our Past Work Related to Emission Monitoring
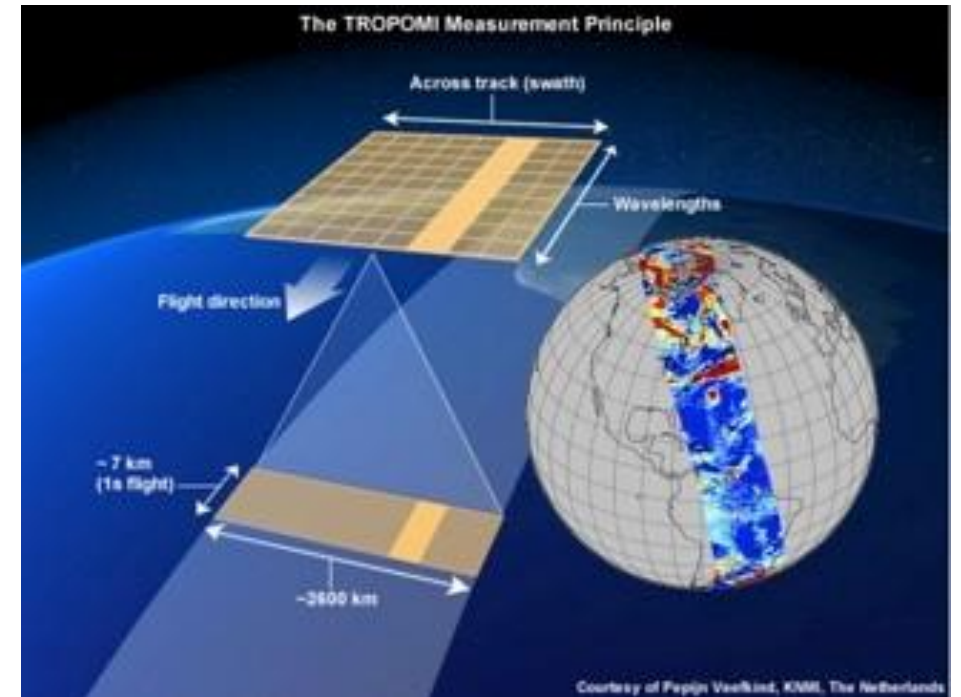
NO_2 and SO_2 Emission Monitoring

- We have experience in monitoring NO_2 and SO_2 emissions over an oil refinery.
- This experience will be helpful in implementing the AGATE project

Monitoring of NO_2 and SO_2 Using TROPOMI Satellite Data

| Satellite sensor	Freq.	Resolution	Operating years
ESA TROPOMI (S5P)	**Daily**	**3.5 km × 5 km**	**2018-present**
NASA OMI	Daily	13 km × 25 km	2004-present
ESA GOME-2(METOP-B)	Daily	40 km × 80km	2013-present

TROPOMI (Sentinel-5 Precursor) offers:

- **Highest** spatial resolution available

- Suitable for regional study

- Offer products for all of the key atmospheric pollutants:

  nitrogen dioxide, ozone, formaldehyde, **sulphur dioxide**,
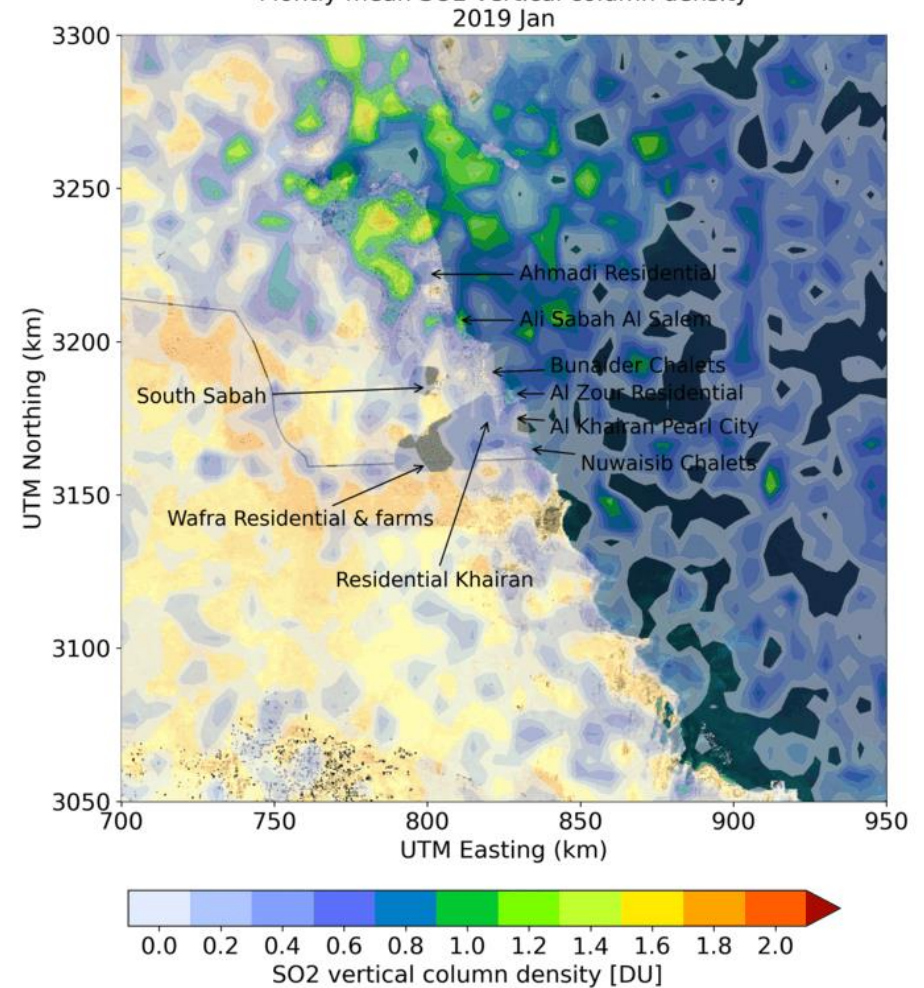
  methane and carbon monoxide

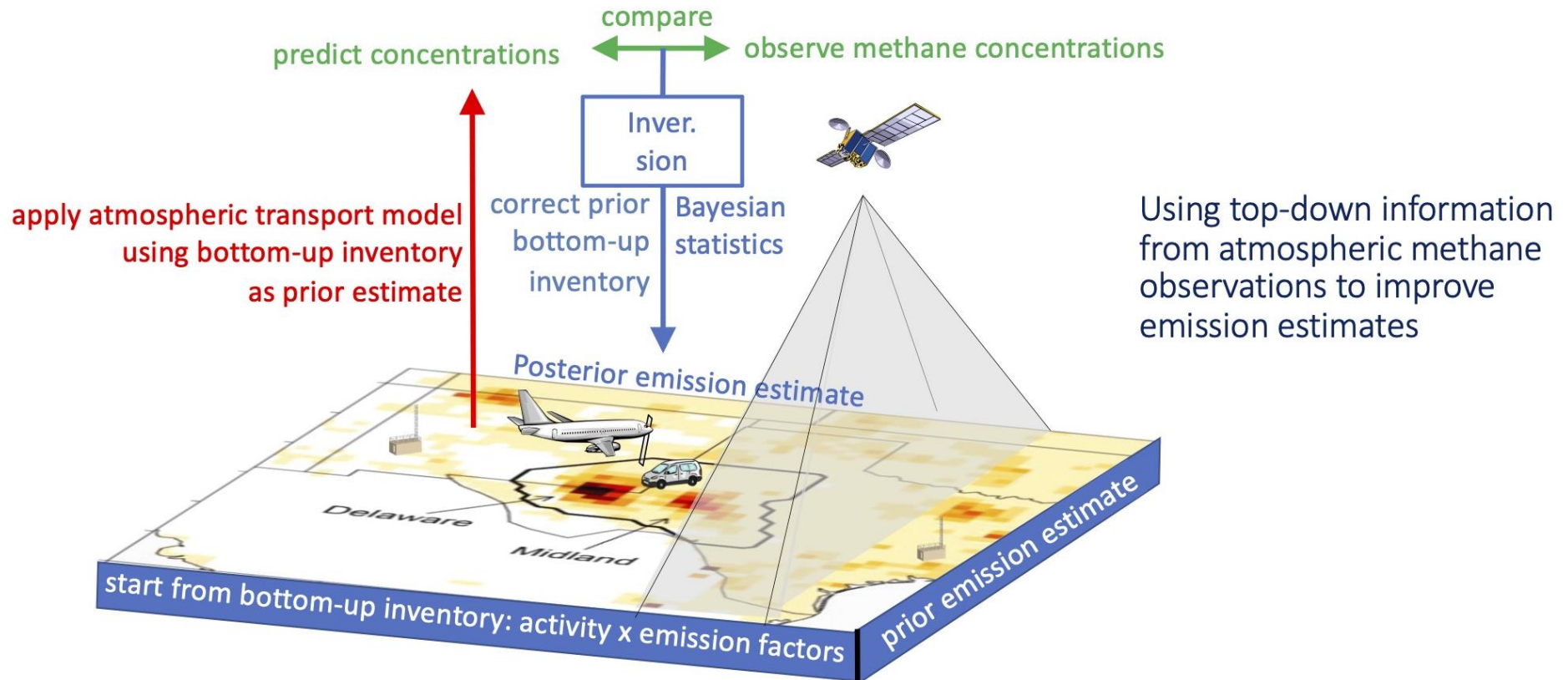# Distribution of NO$_2$ and SO$_2$

Monthly mean tropospheric NO$_2$
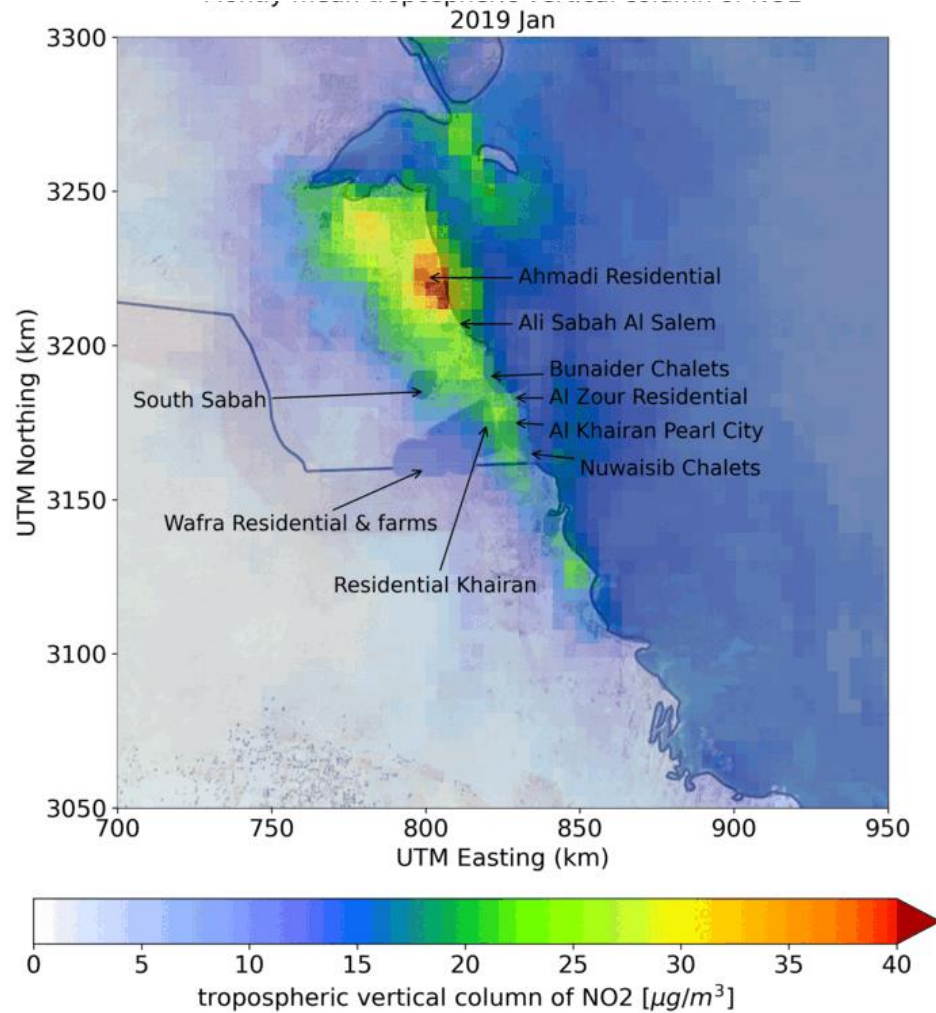
Monthly mean tropospheric SO$_2$

Expected FAO Project on Monitoring CH$_4$ Emissions from Rice

Our Expected Role in the AGATE Project

Data Translation and Application
- Our Center has <u>extensive experience</u> in analysing geospatial data, especially satellite data.
- We can focus on monitoring the study areas using satellite data.

Capacity Building and Training
- As a regional hub for geospatial expertise, we can organise training programs for government agencies and researchers from South-East Asia.

Regional Knowledge Dissemination
- We shall be interested in enhancing collaboration among South-East Asian countries by facilitating the sharing of best practices, tools, and methodologies for utilising satellite data in emission assessments.

Policy Guidance and Support
- We shall provide the necessary support to align satellite data-derived emission products with policymakers' requirements.

Our Contribution in Providing Proxy Data

Bottom-up Emission Inventory
- We can collect <u>publicly available</u> national or regional emission data from the region.

Bottom-up Activity Data
- We can provide <u>satellite data-derived crop maps</u>, which will help to estimate their emission contributions.

Large Point Sources
- Using land use and satellite data, we shall identify potential locations of large agricultural point sources.

Land Use and Land Cover (LULC)
- We shall provide satellite data-derived Land Use and Land Cover (LULC) maps.

CloudSEOS - A Machine Learning-based Platform for Satellite Data-Derived Crop Maps
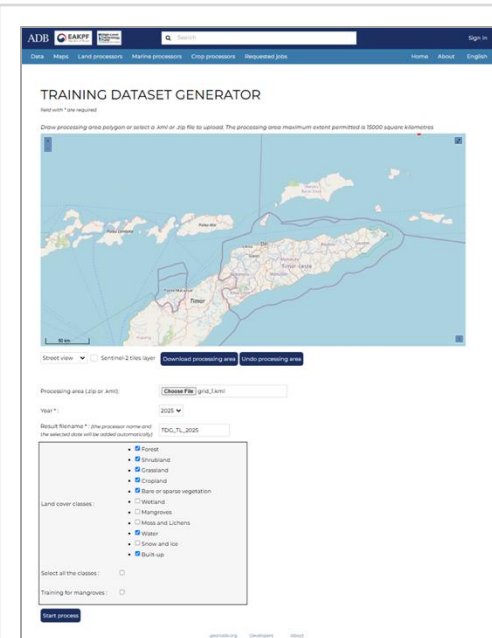

Mobile app for coffee plantations surveying

- Collect the locations of coffee plantation.
- Gather more detail information on the coffee characteristics.

**Drone imagery for coffee plantations mapping**

- Capture high-resolution images to monitor wide-areas.
- Each flight covers 0.5 km² for 15 minutes.

Cloud SEOS:

Training Dataset Generator

- Training data is generated from the intersection of global and open datasets, including Copernicus GLC, ESA World Cover, FROM-GLC, GLAD, and ESRI World Cover.
- Training data is enhanced and updated by Sentinel-2 time series, processed using ML algorithm (LGBM), based on the user's requested date.
- Land Cover classes are generated according to the user's selection.

CloudSEOS:

Land Cover Classification
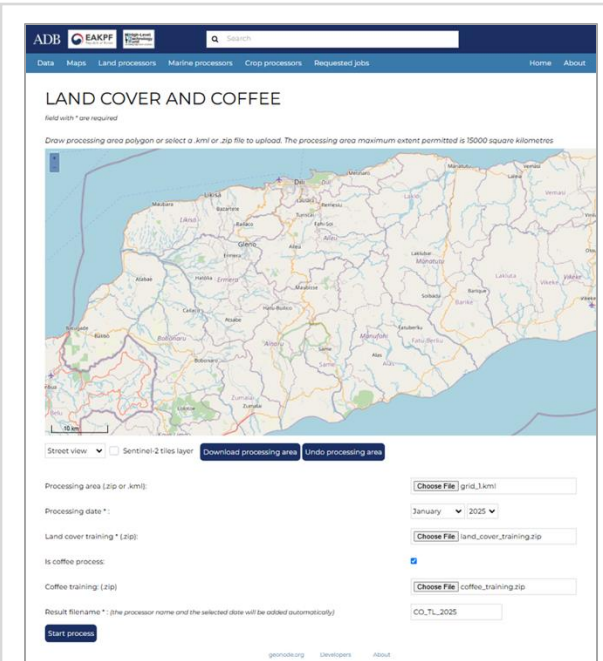
- User provides training samples for Land Cover and coffee plantations.
- Land Cover and Coffee classification is performed on multi-temporal Sentinel-1 and Sentinel-2 data using ML algorithm (LGBM), with results aggregated quarterly.
- Coffee classification focused on the forested areas to detect Albizia and Casuarina trees, under which coffee is cultivated.

Output: Landcover and Coffee
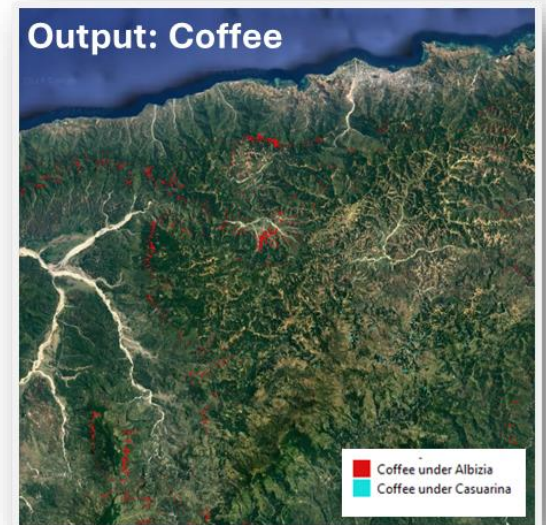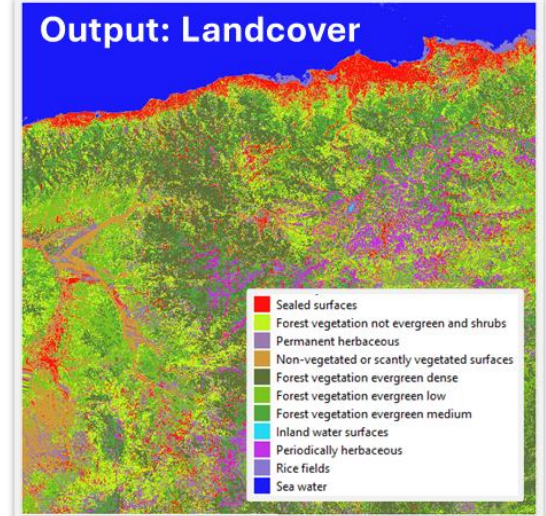
The Land Cover and Coffee maps are processed using **Cloud SEOS** and validated through on-site surveys.

Thank you for your kind attention