AOMSUC-15 FYSUC-2025

FIFTEENTH ASIA-OCEANIA METEOROLOGICAL SATELLITE USERS' CONFERENCE

THE JOINT 2025 FENGYUN SATELLITE USER CONFERENCE

IMPLEMENTATION STATUS IN ROMANIA OF FY-3D SATELLITE IMAGE ANALYSIS USING THE SATELLITE MONITORING ANALYSIS REMOTE SENSING (SMART 2.0) PLATFORM

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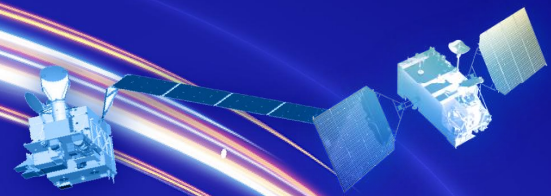
ROMANIA



Outline:

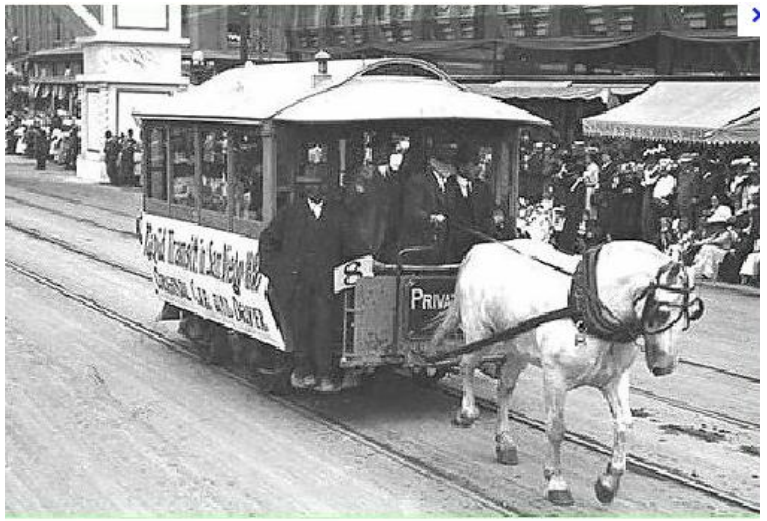
- Short presentation of Romania and Politehnica University of Timisoara (UPT)
- Integration in UPT Curriculum FY Products
- Satellite Image Analysis Using FY3D Data and SMART 2.0 in Romania
- Conclusions and Future Perspectives

Facts about Romania:

- 19.000.000 inhabitants
- 238.397 sq km
- A Romanian Patented Insulin: The discovery (or at least the identification of the antidiabetic hormone "pancreine") by Nicolae Paulescu (1921), which laid the groundwork for modern diabetes treatment.
- Although it was an experimental model, the Coandă-1910 aircraft is considered a precursor to jet aircraft. Henri Coandă also discovered the Coandă Effect.
- Romania was the third country in the world (after the USSR and Bulgaria) to recognize the People's Republic of China and established diplomatic relations

Facts about Timisoara:

- the 3rd largest city in Romania (333000 people)
- the main social, economic and cultural center in Western Romania
- 2023: European Capital of Culture

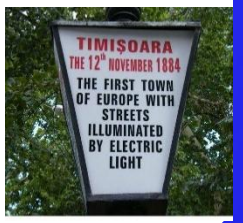


Timișoara is the city in Romania with the **highest number of historical buildings,** over 13,000, representing multiple European architectural cultures and styles.

1746 in Timisoara the first engineering works for water supply and sewerage are executed.

The second European and the first city from Romania with horse drawn trams in **1867**

November 1884 Timisoara was the first town of Europe with streets illuminated by electric light



Facts about UPT:

- Politehnica University Timişoara (UPT) is founded in 1920, by the Royal decree 4822/11.11.1920;
- 10 faculties, 26 departments, 25 research centers **available teaching languages Romanian, English and German; over 150 PhD coordinators**;
- 13.000 students (Bachelor, Master and PhD programs) and more than 130.000 graduates;
- high employability of graduates (over 90%)…

Research.com

Best Universities in Romania 2025 Ranking

The 3rd edition of Research.com ranking of the best universities was created using data combined from multiple data sources including OpenAlex and CrossRef. The bibliometric data for evaluating the citation-based metrics were gathered on 27-11-2024. Position in the ranking is based on a sum of D-indexes (Discipline H-index) of all ranking researcher's affiliated with a given institution. D-index includes exclusively papers and citation metrics for an examined discipline.
Show more

Search by keyword | Romania (18)

World	National	University Details	Scholars	Σ Publications	Σ H-Index
1598	1	Polytechnic University of Timişoara, Romania	5	1,539	260
1679	2	Transylvania University of Braşov, Romania	4	965	224

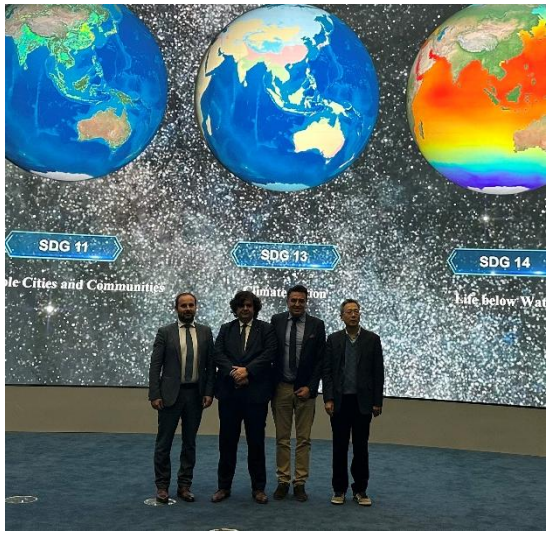
Integration in UPT Curriculum FY Products:

- Relation with NUIST: Seminar: On the Application of FY Meteorological Satellites Products for Belt and Road Countries;

PLAN DE ÎNVĂŢĂMÂNT
Pentru seria de studenti 2024-2026
ANUL I (2024-2025)

	SEMESTRUL 1										
1	Tehnologii avansate de măsurare										
	M141.24.01.V1	6	E	28	0	28	0		DCAV	94	M141.24.02.A1
2	Programe speciale de compensare în cadastru										A
	M141.24.01.V2	6	E	14	0	42	0		DCAV	94	M141.24.02.A2
3	Analiza inteligentă a datelor prin satelit şi digitalizarea mediului (Smart satellite data analysis and environment digitalization)										
	M141.24.01.A3	5	D	28	0	0	28		DA	69	M141.24.02.S3

- Aerospace Information Research Institute, Chinese Academy of Sciences



Satellite Image Analysis Using FY3D Data and SMART 2.0 in Romania (Satellite Monitoring Analysis Remote Sensing)

The project pursued the following aims:

- to help students get familiar with modern methodologies for pre-processing, spectral analysis, and classification of satellite imagery;
- to apply advanced unsupervised classification techniques (K-Means, ISODATA, Neural Network Clustering) in order to identify spectral differences and detect temporal or seasonal variations;
- to evaluate the applicability of FY-3D MERSI data in domains such as cadastral studies, environmental monitoring, urban planning, and natural hazard assessment;
- to enhance the integration of geospatial products into decision-support systems through vectorization, post-classification processing, and GIS-based interpretation.

Satellite Image Analysis Using FY3D Data and SMART 2.0 in Romania (Satellite Monitoring Analysis Remote Sensing)

The study approach:

- The study utilized FengYun-3D (FY-3D) satellite imagery obtained from the MERSI (Medium Resolution Spectral Imager) instrument, focusing on two datasets;

  The methodological workflow was developed to ensure accurate spectral analysis and classification, with all steps implemented within the SMART 2.0 software environment. This software enabled efficient processing, visualization, and interpretation of FY-3D MERSI satellite data

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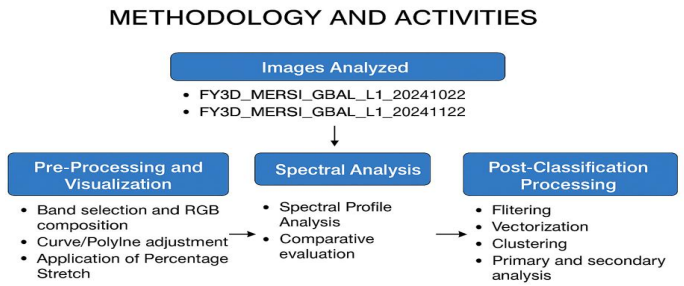
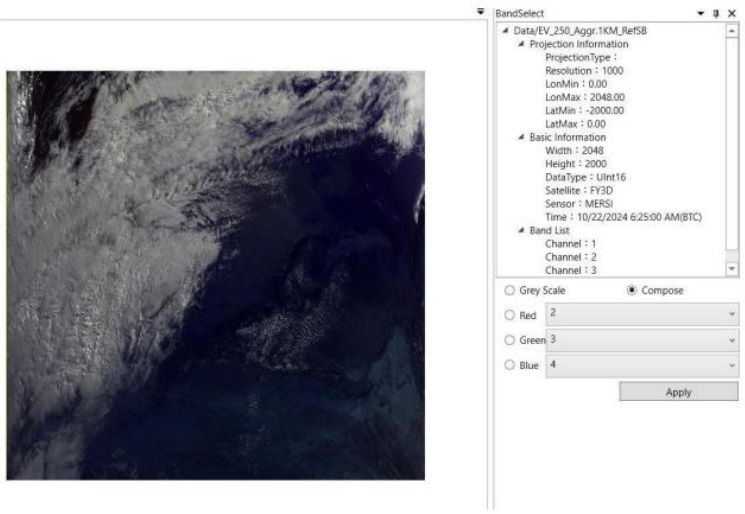
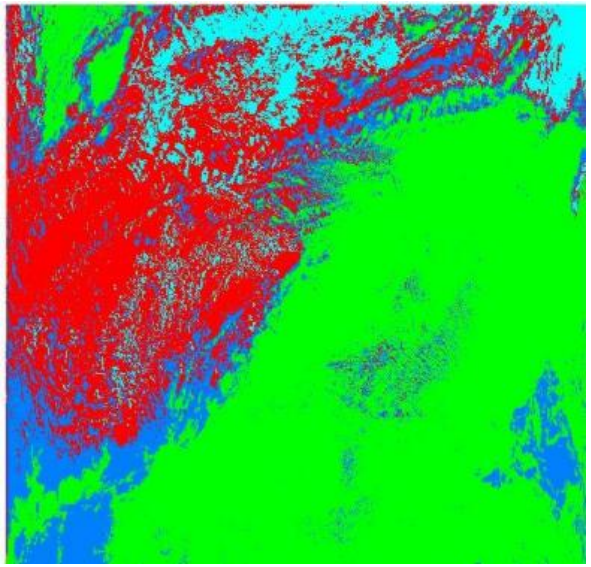


http://satellite.nsmc.org.cn/portalsite/default.aspx

Satellite Image Analysis Using FY3D Data and SMART 2.0 in Romania (Satellite Monitoring Analysis Remote Sensing)

The analysis revealed notable spectral differences between the two datasets, primarily influenced by acquisition dates and environmental conditions. These differences highlight the sensitivity of FY-3D MERSI data for monitoring temporal changes in atmospheric and surface parameters, **providing valuable insights for meteorological and environmental applications**. The unsupervised classification algorithms enabled pixel grouping based on spectral characteristics, achieving high visual accuracy**.**





Satellite Image Analysis Using FY3D Data and SMART 2.0 in Romania (Satellite Monitoring Analysis Remote Sensing)

Results and Discussion

The analysis of the two FY-3D MERSI satellite images revealed clear spectral differences driven by the acquisition dates and environmental factors such as vegetation state, surface moisture, and atmospheric conditions.

Following the classification, post-classification processing steps such as filtering, vectorization, and clustering were applied. Vectorization was particularly important, as it transformed raster data into geospatial vector layers, enabling advanced spatial analysis like overlay with cadastral data, temporal comparisons, and thematic map generation. These outputs provide actionable information for practical applications, including:

- Climate and environmental monitoring, by detecting seasonal vegetation dynamics and long-term trends.
- Urban planning, through mapping of urban sprawl and land-use changes.
- Natural disaster management, by identifying areas affected by floods, droughts, or wildfires.
- Space weather research, by linking surface environmental patterns with atmospheric and ionospheric observations.

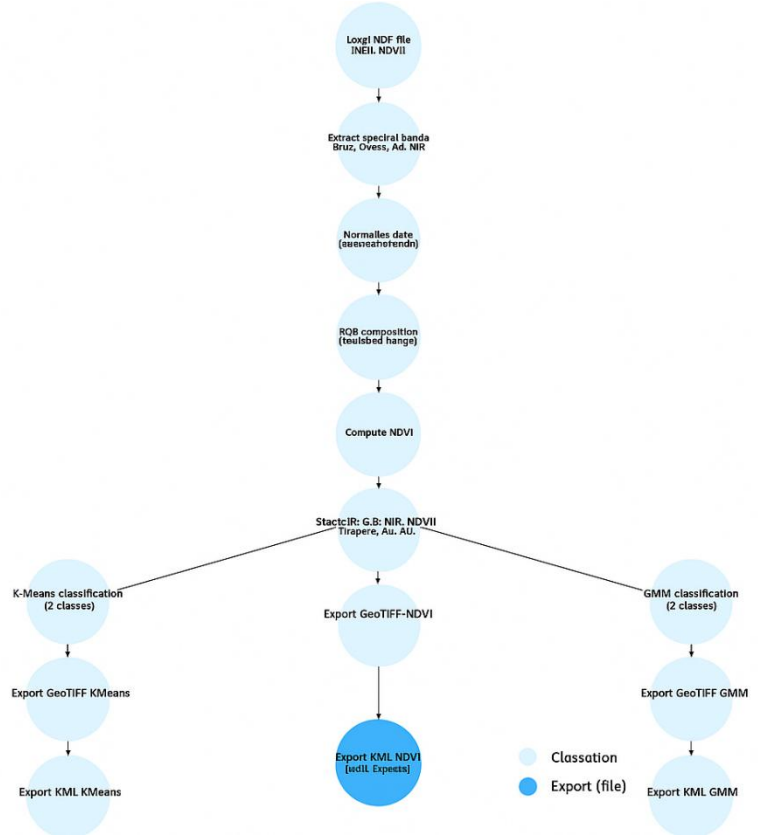
The workflow demonstrated that FY-3D satellite data, when processed through a systematic methodology, can produce high-value geospatial products ready for integration into GIS platforms and decision-support systems

Satellite Image Analysis Using FY3D Data and SMART 2.0 in Romania (Satellite Monitoring Analysis Remote Sensing)

Conclusions and Future Perspectives

The methodological workflow, as illustrated in the figure, demonstrates a structured process for transforming raw FY-3D satellite data into ready-to-use geospatial products. Beginning with data loading and spectral band extraction, the workflow integrates key steps such as NDVI computation, machine learning classification (K-Means and GMM), and the generation of Geo TIFF and KML outputs.

These steps can be implemented using Python libraries specialized in satellite image processing, NDVI analysis, classification with machine learning algorithms, and the generation of Geo TIFF and KML files. This ensures that the final products are optimized for GIS integration and spatial analysis



Conclusions and Future Perspectives

Future work will focus on **multi-temporal analysis**, leveraging time-series satellite data to **capture seasonal dynamics and long-term environmental trends**.

By expanding the machine learning component and integrating predictive modeling, the workflow can evolve into a powerful analytical tool **for monitoring climate variability and improving early-warning systems in meteorology and space weather applications**.

THANK YOU!

非常感谢

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