# REMOTE SENSING LABORATORY

*http://www.survey.ntua.gr/en/rslab*


**Demetre Argialas**
**Director**

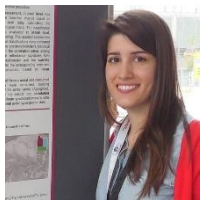
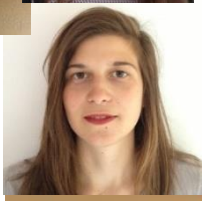
**Lia Karathanasi**

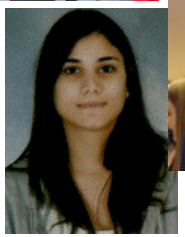
**Konstantinos Karantzalos**


RSLab
Remote Sensing Laboratory
National Technical University of Athens
✓ Sensing ✓ Analytics ✓ Monitoring

# People






- ✓ Common goals
- ✓ Complementary skills, interests, synergy
- ✓ Always nice, smooth and close co-operation

**Faculty**

- ❖ Prof. Argialas
- ❖ Prof. Karathanassi
- ❖ As. Prof. Karantzalos
- ❖ Em. Prof. Rokos

**Educational Personnel**

- ❖ V. Andronis
- ❖ C. Iossifides
- ❖ Dr. P. Kolokoussis
- ❖ K. Vassili-Vassiliou

**Researchers (PhD, etc)**

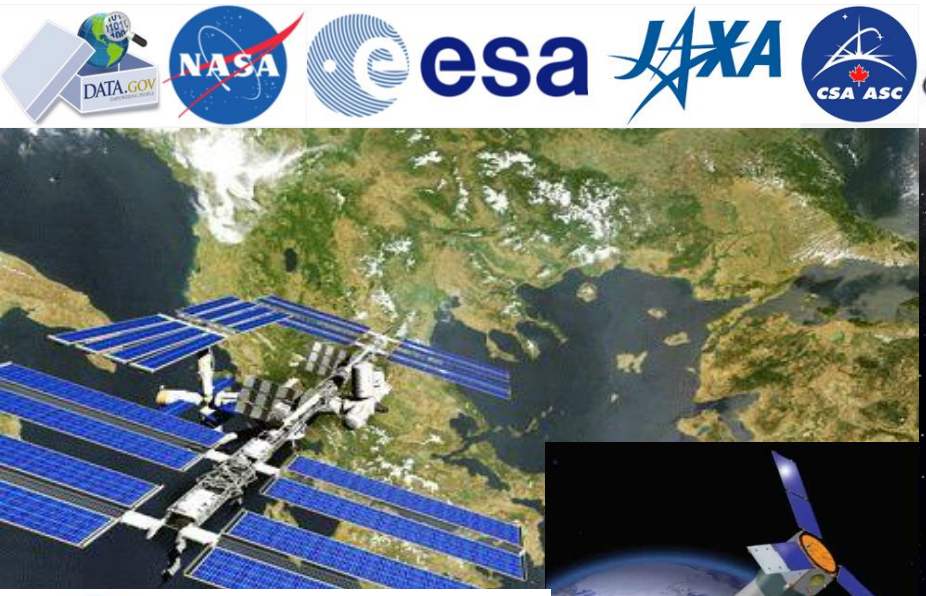
- ❖ M. Dekavalla
- ❖ M. Papadomanolaki
- ❖ A. Sakellari
- ❖ P. Sismanidis
- ❖ A. Vaiopoulos
- ❖ C. Karakizi
- ❖ Z. Kandylakis

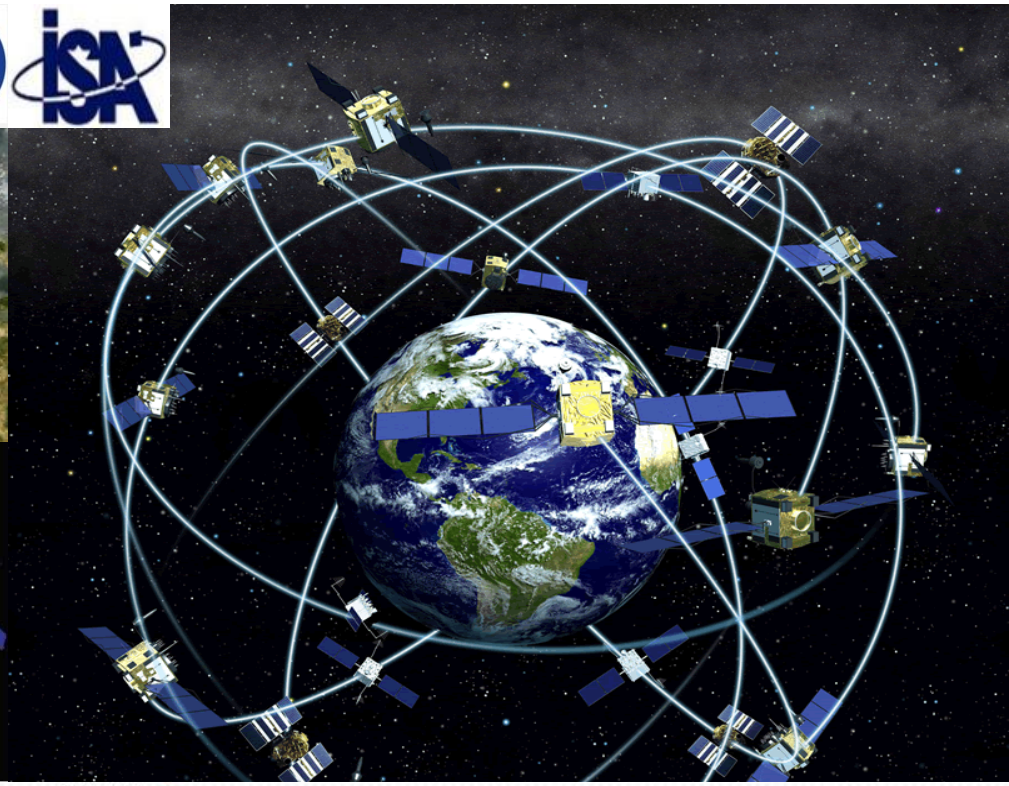


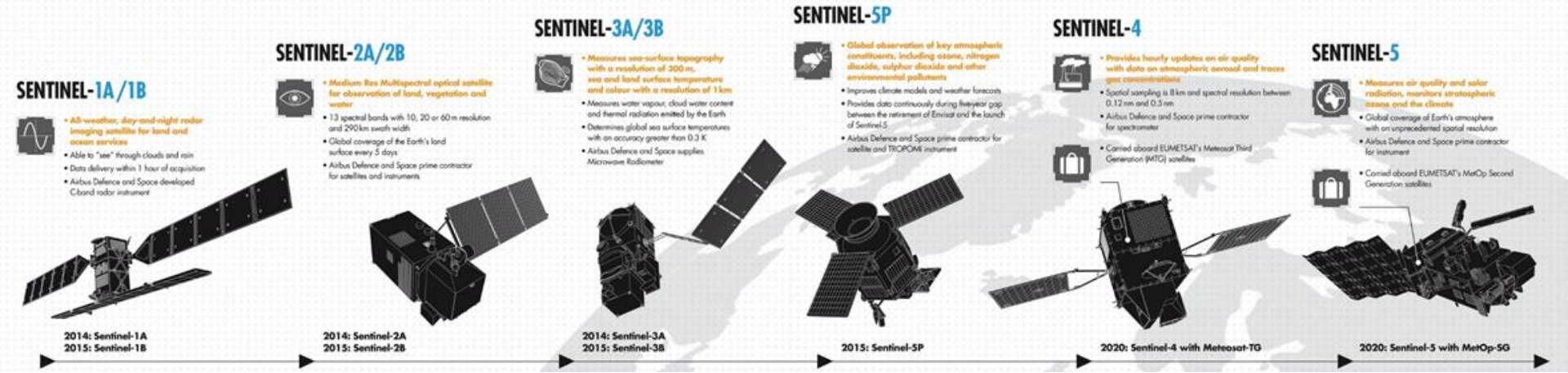


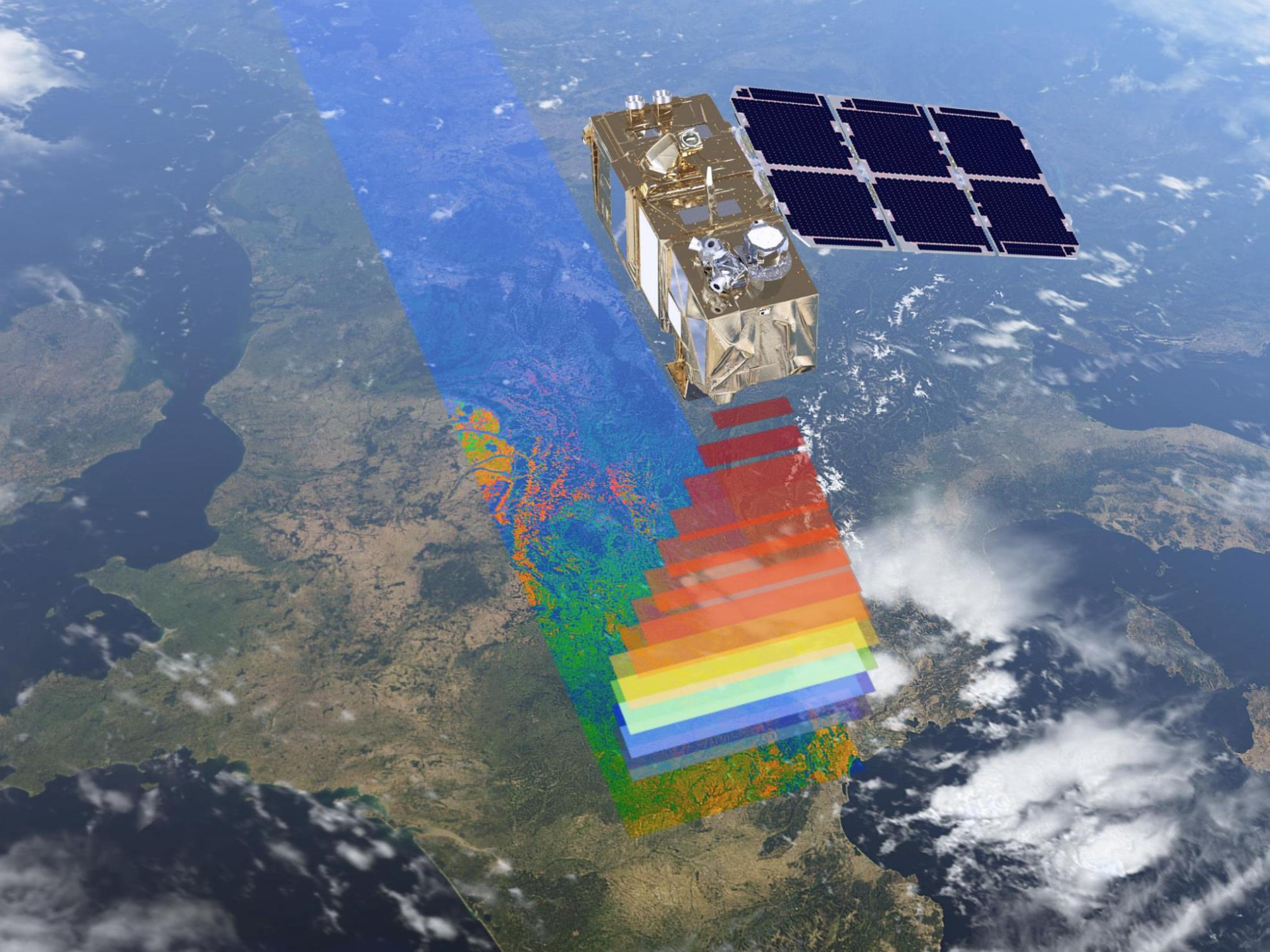


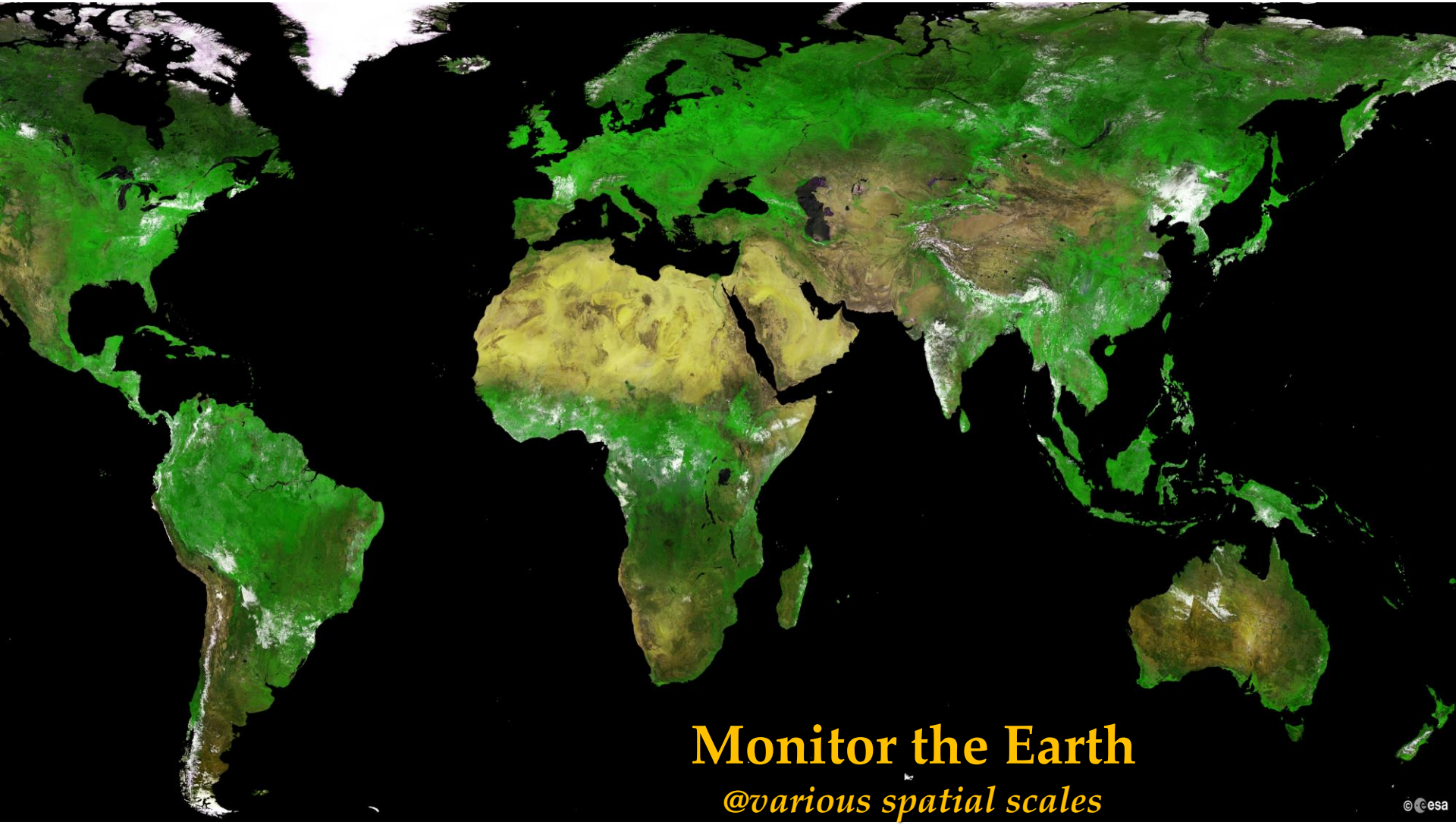

# Remote Sensing Platforms

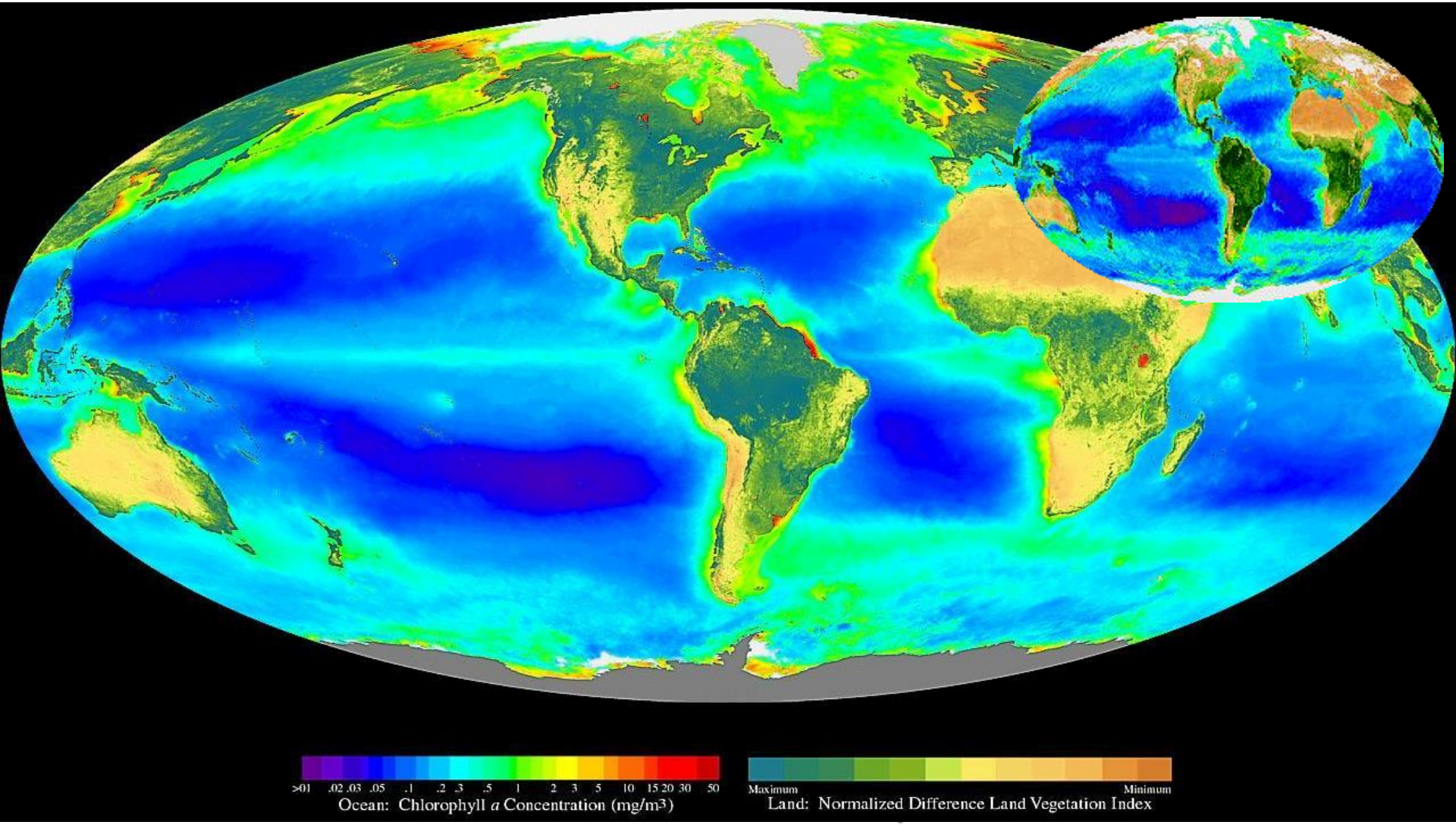








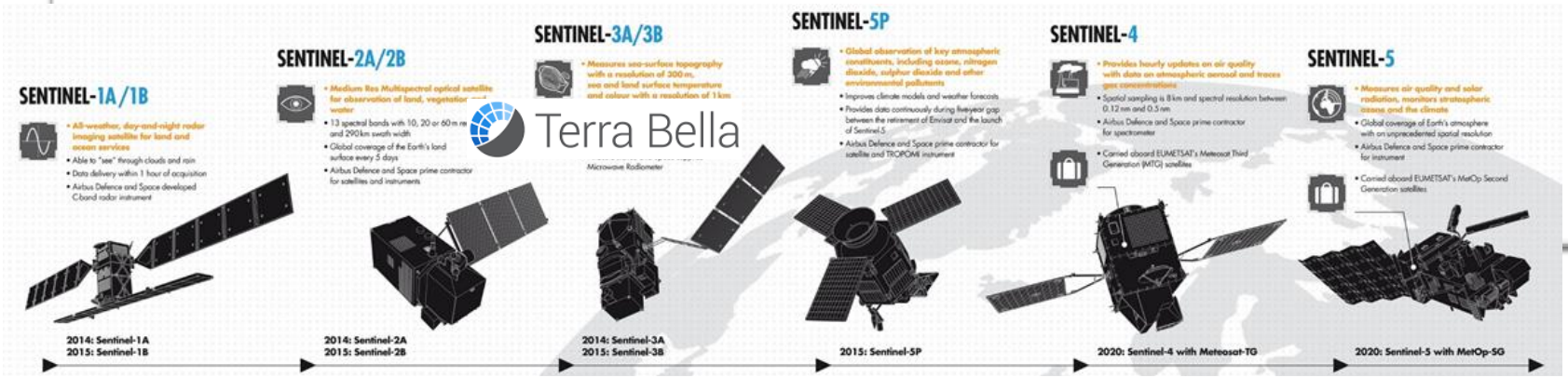

Monitor the Earth
@various spatial scales
©esa


>01 .02 .03 .05 .1 .2 .3 .5 1 2 3 5 10 15 20 30 50
Ocean: Chlorophyll a Concentration (mg/m3)
Maximum
Minimum
Land: Normalized Difference Land Vegetation Index

# Scientific Field & Research Interests *(1/3)*

**Core Expertise:**

- ✓ **Platforms**



# Scientific Field & Research Interests *(1/3)*

**Core Expertise:**

✓ **Sensors:** Multispectral, Hyperspectral, SWIR, Thermal, Lidar
Push-broom/line-scanning & Snapshot/Frame/Video


itres

***Cooperation with industry***

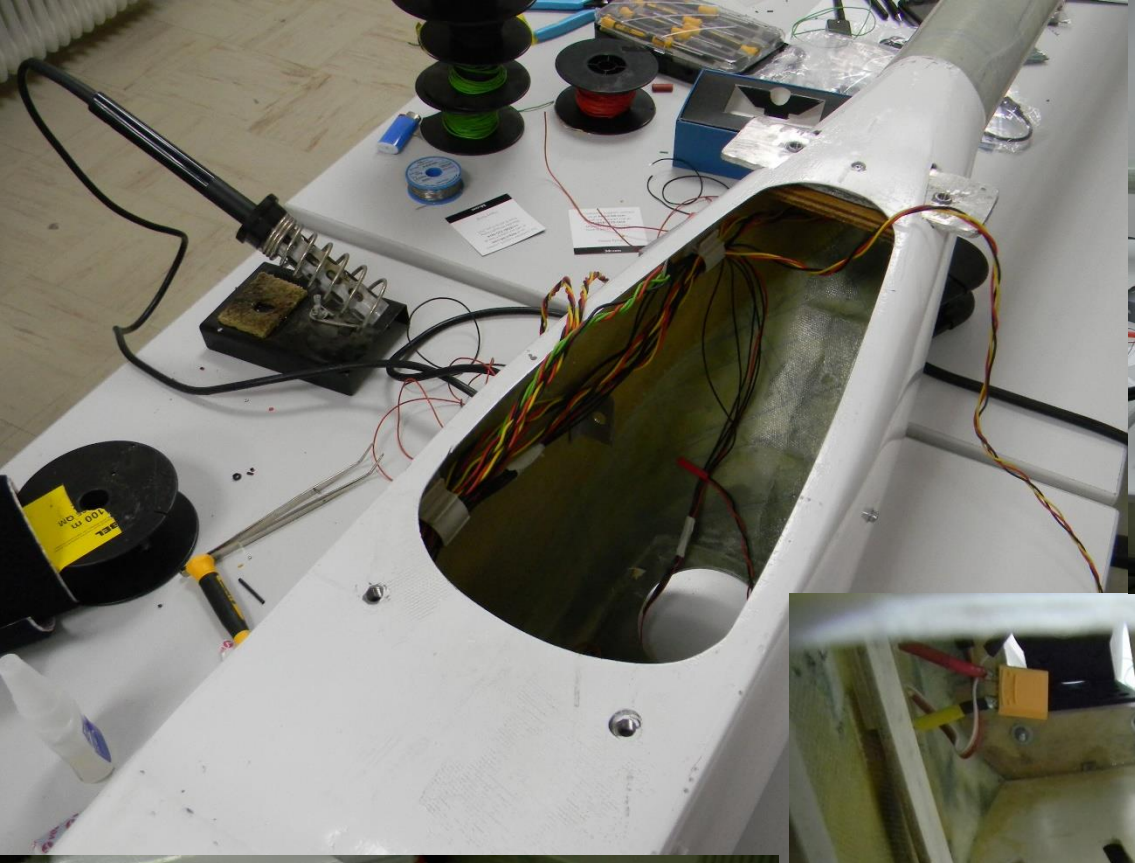
ximea 3D-ONE FLIR Xenics Infrared Solutions Headwall PHOTONICS imec

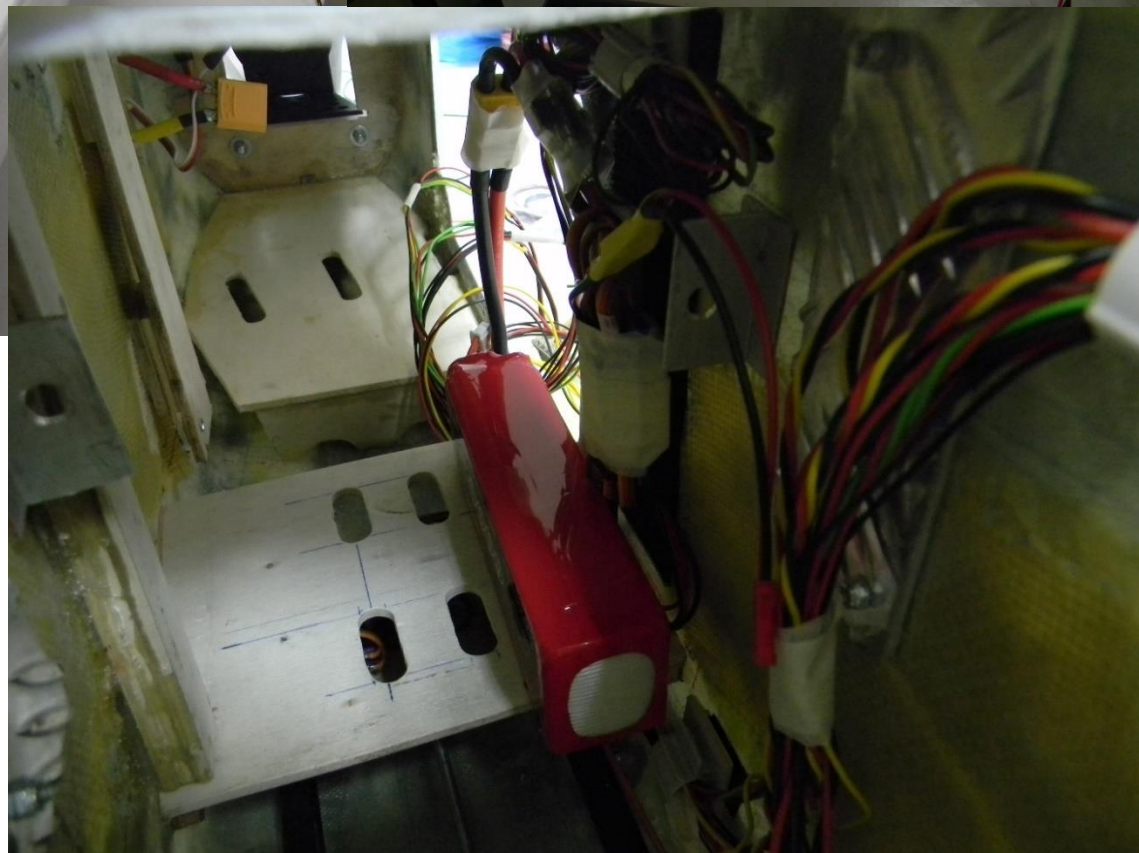
# Scientific Field & Research Interests *(1/3)*

- ✓ Αερομεταφερόμενος υπερφασματικός δέκτης **CASI-550** (ITRES, Canada)
- ✓ Αερομεταφερόμενος θερμικός δέκτης **TABI-320** (ITRES, Canada))
- ✓ Υπερφασματικός δέκτης **Micro-Hyperspectral** VNIR Sensor (Headwall Photonics, USA)
- ✓ Υπερφασματικός δέκτης **IMEC Snapshot** mosaic
- ✓ Θερμική Tau-2 **FLIR**

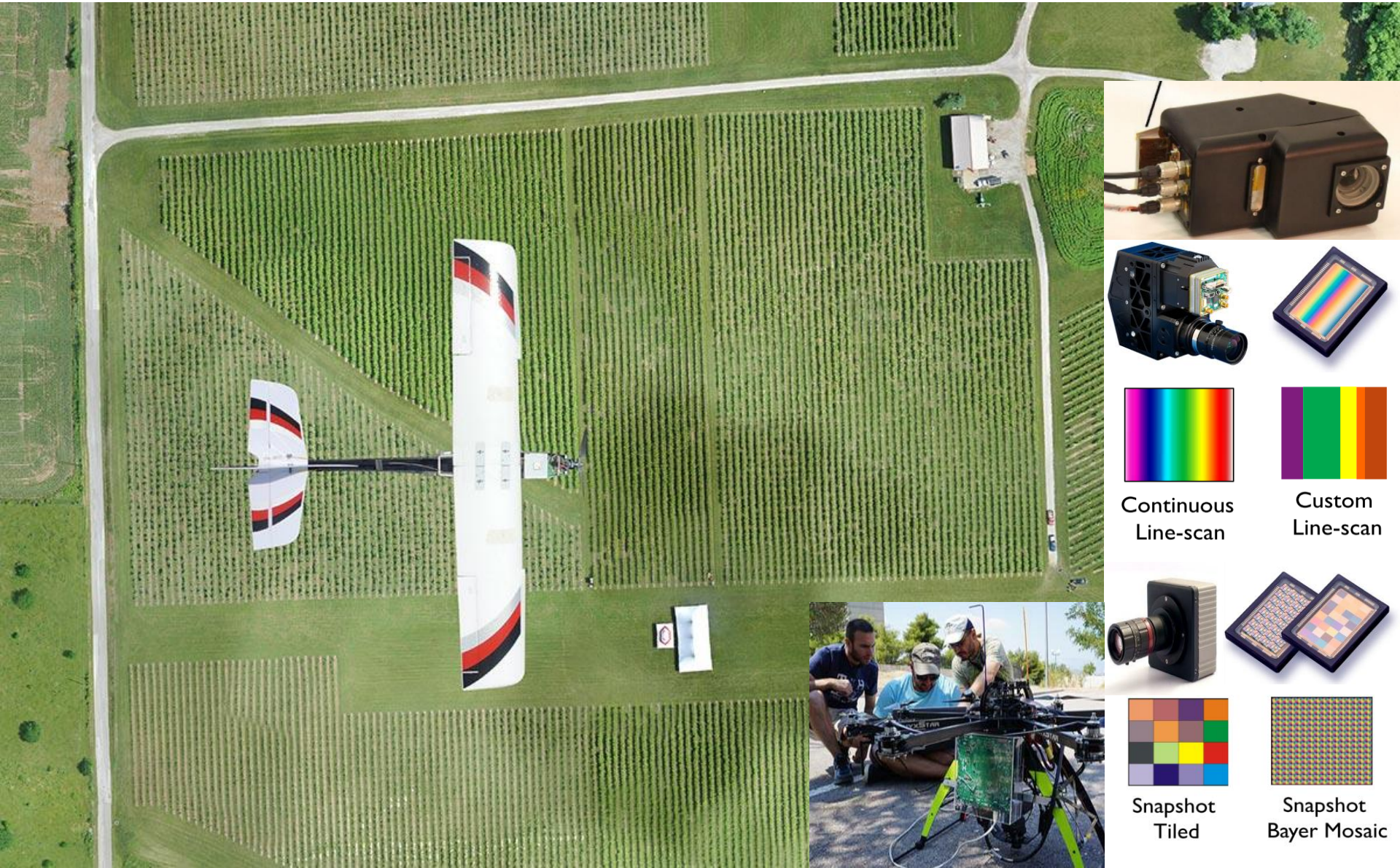
- ✓ Onyxstar BAT-F8 8copter (**Altigator**, Belgium)
- ✓ Αερομεταφερόμενο σύστημα πλοήγησης Applanix POS/AV 410 (**Applanix**, Canada)
- ✓ Αερομεταφερόμενο σύστημα πλοήγησης CMIGITS III (**Systron** Donner, USA)


κτίριο Λαμπαδαριου





# Remote Sensing Platforms











Continuous
Line-scan



Custom
Line-scan







Snapshot
Tiled



Snapshot
Bayer Mosaic


AltiGator


OmniStar


κτίριο Λαμπαδαρίου

# Ground/ Terrestrial Platforms

# Scientific Field & Research Interests *(2/3)*

**Methods & techniques:**

- Atmospheric, Radiometric and Geometric corrections
- Multi-modal and Multi-temporal image fusion, integration
- Object detection & pattern recognition in 2D and 3D
- Data Segmentation and Classification
- Object-based data analysis
- Spectral unmixing methods
- Terrain analysis, scene modeling, model-based analysis
- SAR Interferometry

# Scientific Field & Research Interests *(3/3)*

**Applications:**

- Forestry, vegetation, biodiversity studies
- Agriculture and precision agriculture
- Hydrology, oceanography, coastal zone management
- Atmospheric and weather studies
- Geology and geomorphology studies
- Monitoring and management of land and water resources
- Land use, human impact and ecosystem analyses
- Disaster monitoring, mitigation and damage assessment
- Infrastructure, transportation and communications studies
- Earth Observation activities to support sustainable and integrated development
- GIS, web-based applications, geospatial database update
- Open-source and open-data services

# Research – Publications
## *(last 5years)*

- ✓ approx. 3 journal papers per year
- ✓ approx. 6 conference papers per year

**<u>30</u> peer-reviewed Journals/Book Chapters**

- on Change Detection
- on Hyperspectral Data Processing
- on Object-based Image Analysis
- on Scale Space Filtering
- on Spectral Unmixing
- on Automatic Object Detection
- on Model-based Detection
- on Hyperspectral & Thermal Fusion
- on Urban-Peri Urban Monitoring
- on Oil-Spills
- on Man-Made/ Building Detection
- on Geomorphology
- on Coastal Zones/ Springs
- on Roads, Asphalt Condition
- on SAR Interferometry

**<u>32</u> Conference Publications (peer-reviewed & not)**

# Funding

- ✓ approx. 100K per year
- ✓ 4 projects directly funding PhD Theses

## Recent Research projects

- **SEO-DWARF:** “Semantic EO Data WEB Alert and Retrieval Framework”, H2020-MSCA-RISE-2015, Budget 1.584.000 €, 2015-2018.
- **LandMAP:** Multitemporal Land Use/ Land Cover Mapping at a National Scale from High Resolution Satellite Data with Deep Learning, IKY-Fellowships of Excellence – Siemens, 2016-2018
- **UrbanMonitor**: "Automatic Detection and Modelling of 2D and 3D Changes in the Urban Environment from Multi-Modal, Multi-Temporal Remote Sensing Data", European Social Fund (75%) and National Resources (25%), Budget: 600.000€, 2012 - 2015.
- **TeleKyoto**: "Vegetation Mapping and Biomass Estimation with Modern Remote Sensing Methods in Order to Fulfil the Country's Obligations Under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol", European Social Fund (75%) and National Resources (25 %), Budget: 600.000€, 2012 - 2015.
- **GNORASI**: "Knowledge and processing algorithms data-flow development tool for remote sensing data management", European Social Fund (75%) and National Resources (25%), Budget: 493.176€, 2010 - 2013.

*Important funding increase (>30%) during the last 5 years*

# Equipment


✓ Airborne (Airplanes, UAVs)
& Field campaigns

**Sensors**

- VNIR Spectrographic Imaging System CASI-550 (ITRES, Canada)
- Thermal Imaging System TABI-320 (ITRES, Canada)
- Micro-Hyperspectral VNIR Sensor (Headwall Photonics, USA)

OSGeo Live

in-house software
open source

Orfeo Toolbox

**Platforms/Instruments**

- MultiCopter Onyxstar BAT-F8 (Altigator, Belgium)
- Airborne GPS/IMU navigation system Applanix POS/AV 410 (Applanix, Canada)
- Airborne GPS/IMU navigation system CMIGITS III (Systron Donner, USA)

**Field Instruments/ Proximate Sensors**

- GER 1500 Spectroradiometer
- Soil moisture sensor Decagon 5TE (water content, electric cond., temp.)
- Thermal camera Trotec IC60

# Collaborations & Mobility

✓ with high level EU institutes

**In EU Research Projects** (currently)

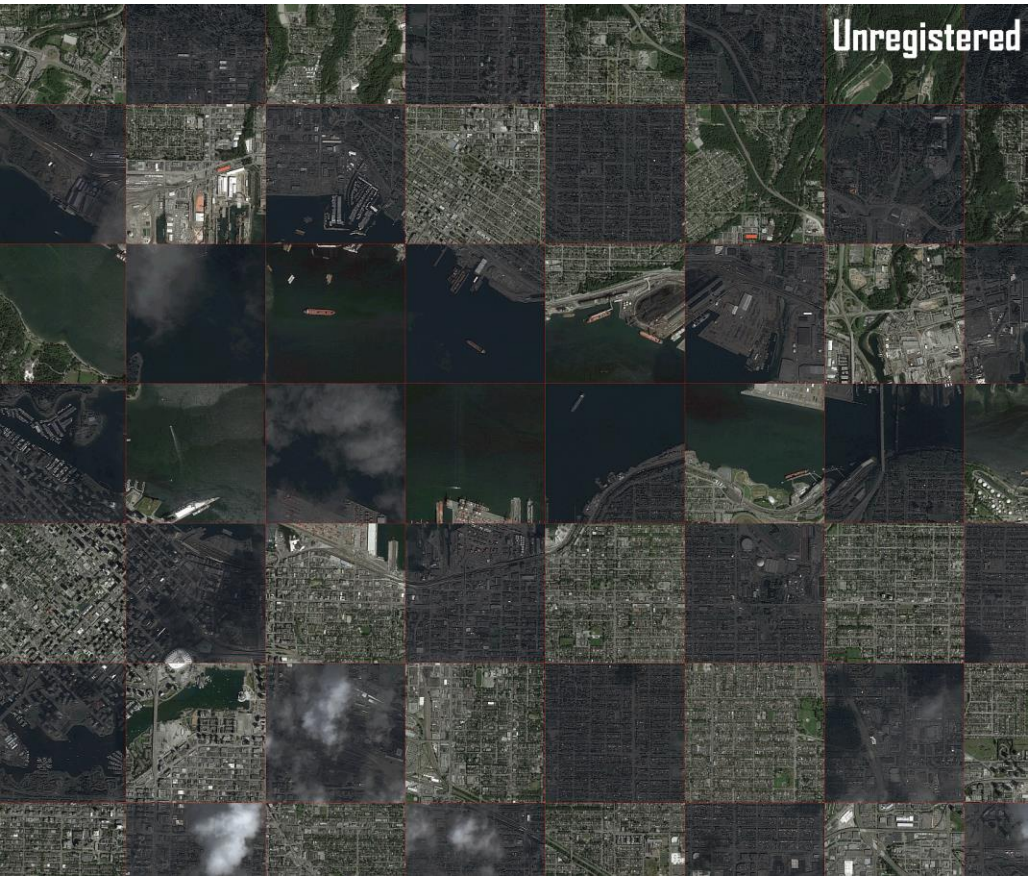
- **Ecole Centrale de Paris**, France
- **Ecole de Ponts ParisTech**, ENPC, France
- **Oxford University,** UK
- **Imperial College London,** UK
- **Kingston University,** UK
- **National Research Council**, CNR-ISTI, Italy
- **Nansen Environmental and Remote Sensing Center**, Portugal
- **Joint Research Center**, IPSC, EU
- + **SMEs**

**Greek Collaborator** (currently)

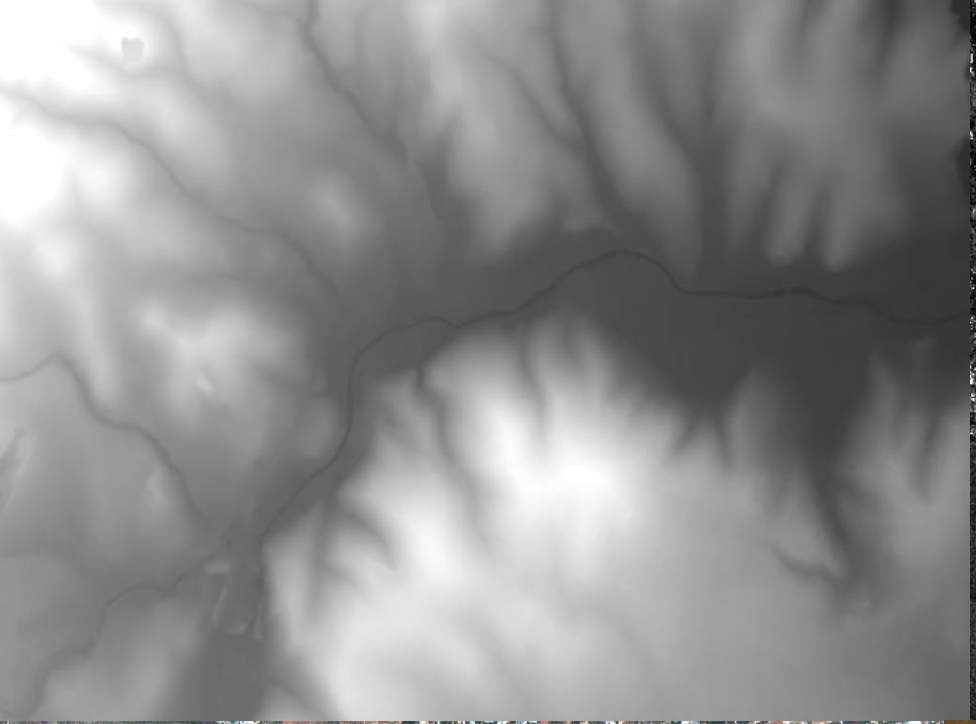
- **6 Universities/ Research Institutions**
- **5 SME's**
- **Public Sector**

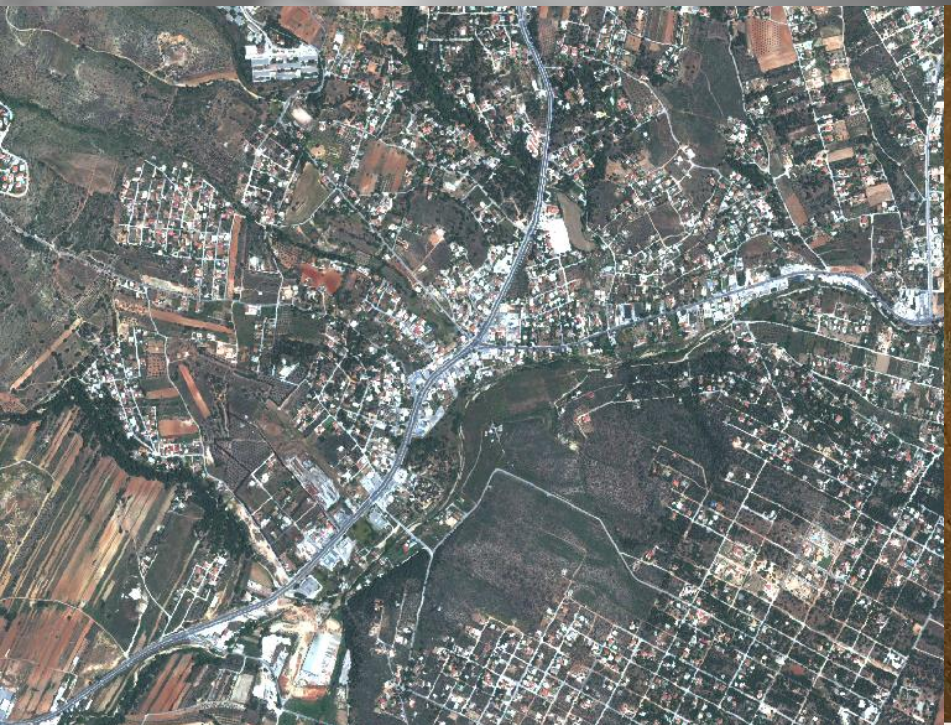
# RSLab's recent published research results

**2nd place @**
**2016 IEEE GRSS Data Fusion Contest**
*"Simultaneous Registration, Segmentation and Change Detection from Satellite Image Pairs".*



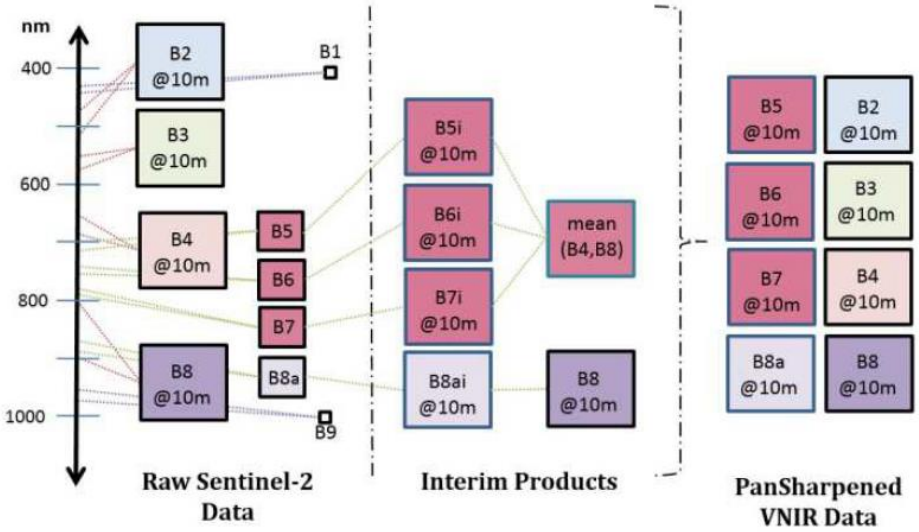

IEEE GRSS Geoscience and Remote Sensing Society
IEEE
Data Fusion Contest





# RSLab's recent published research results

**Best Poster Award**
@ISPRS Congress **2016** for the paper
"**Pansharpening on the Narrow VNIR and SWIR Spectral Bands of Sentinel-2**"

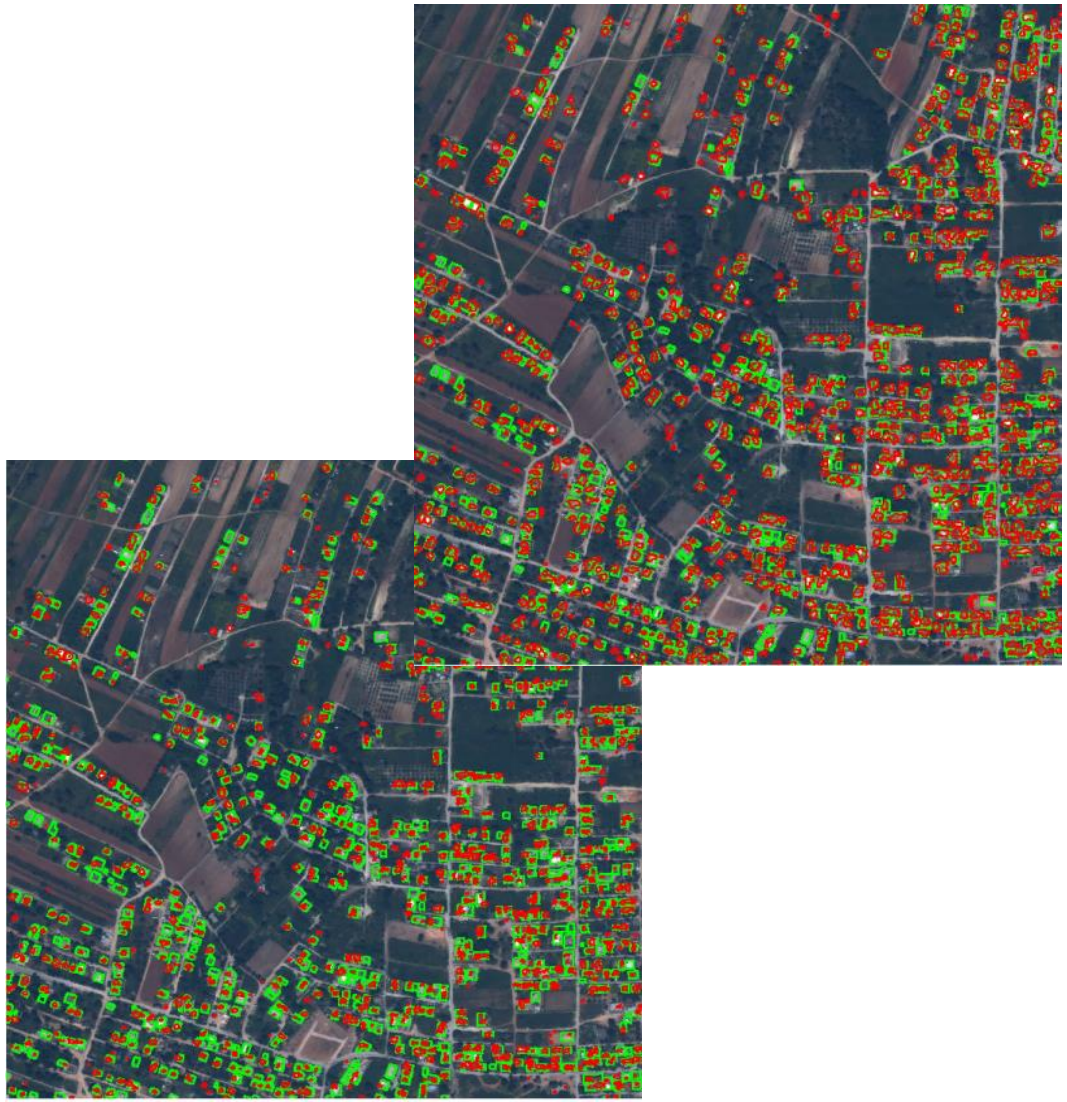



# RSLab's recent published research results


**Best Paper Award**
**@IEEE WHISPERS'15**
for the paper

**"Multiple Object Tracking with Background Estimation in Hyperspectral Video Sequences**

# RSLab's recent published research results

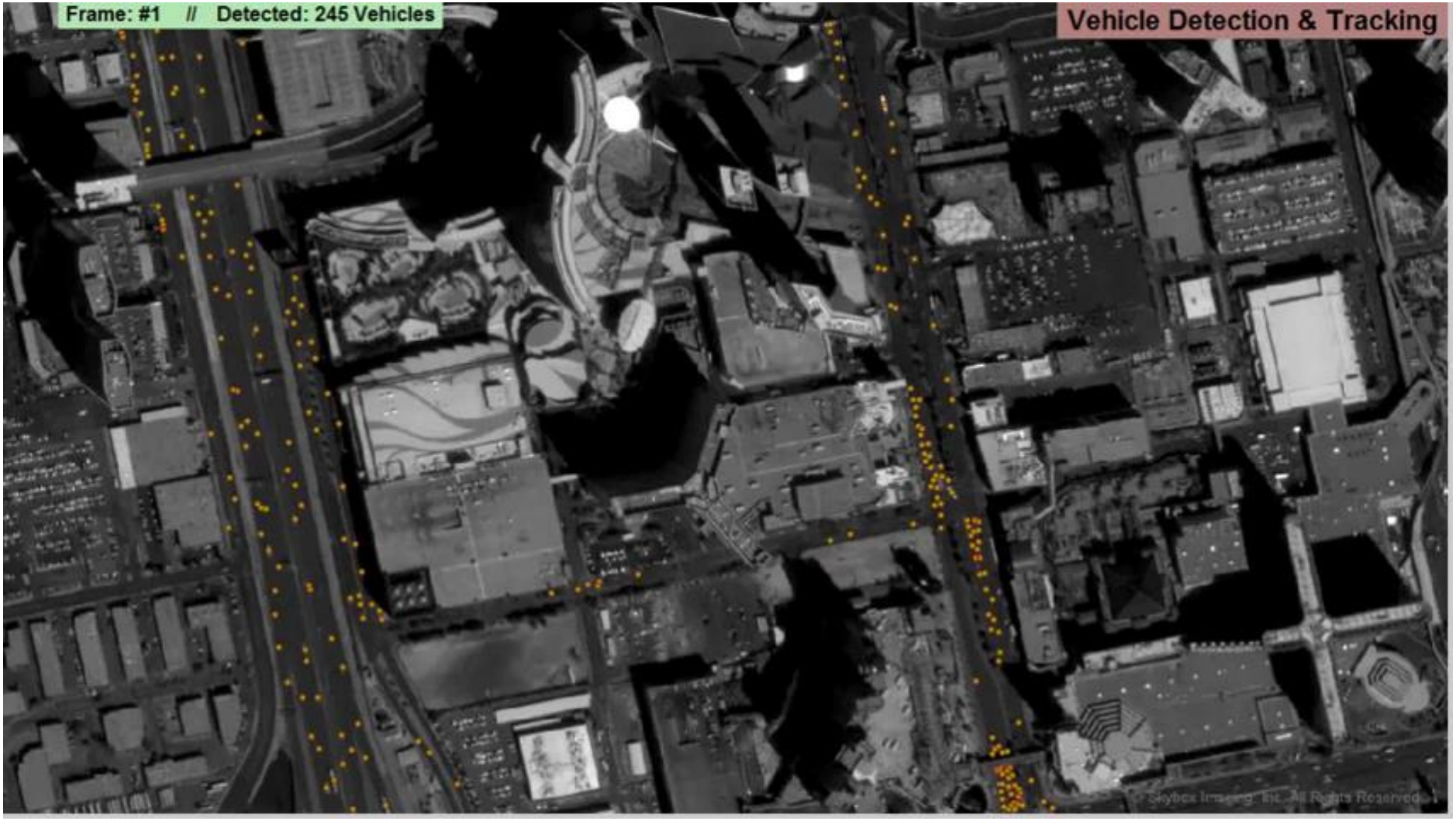


**Best Poster Award**
**@IEEE IGRASS'15**
**for the paper**

**"Building Detection in VHR Multispectral Data with Deep Learning Features"**

FIGURE 16. The Symposium Interactive Session Prize Paper Award recipient Maria Vakalopoulou (right) with GRSS President Kamal Sarabandi.

# Satellite Video

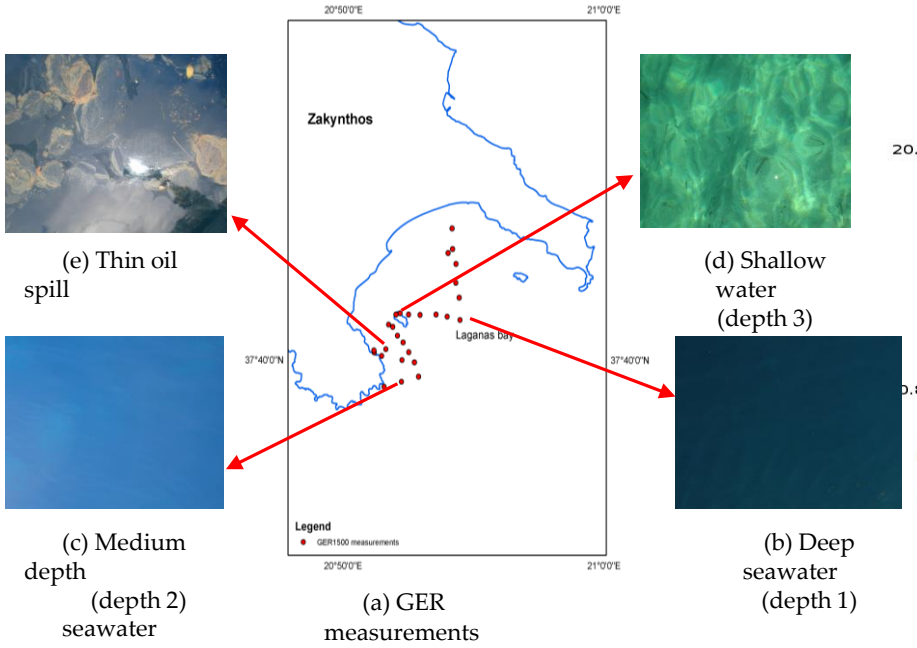


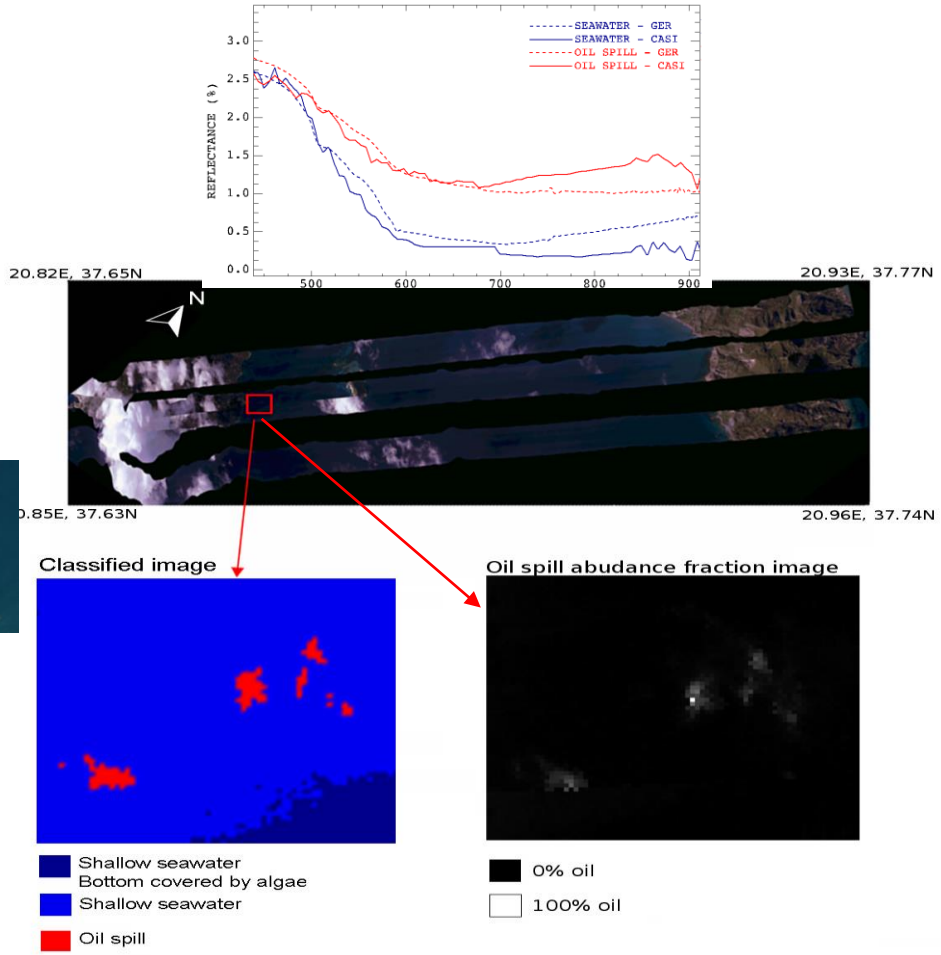
# RSLab's recent (2014) published research results

✓ ..selected

"Spectral Unmixing Evaluation for Oil Spill Characterization",

***Karathanassi, 2014***



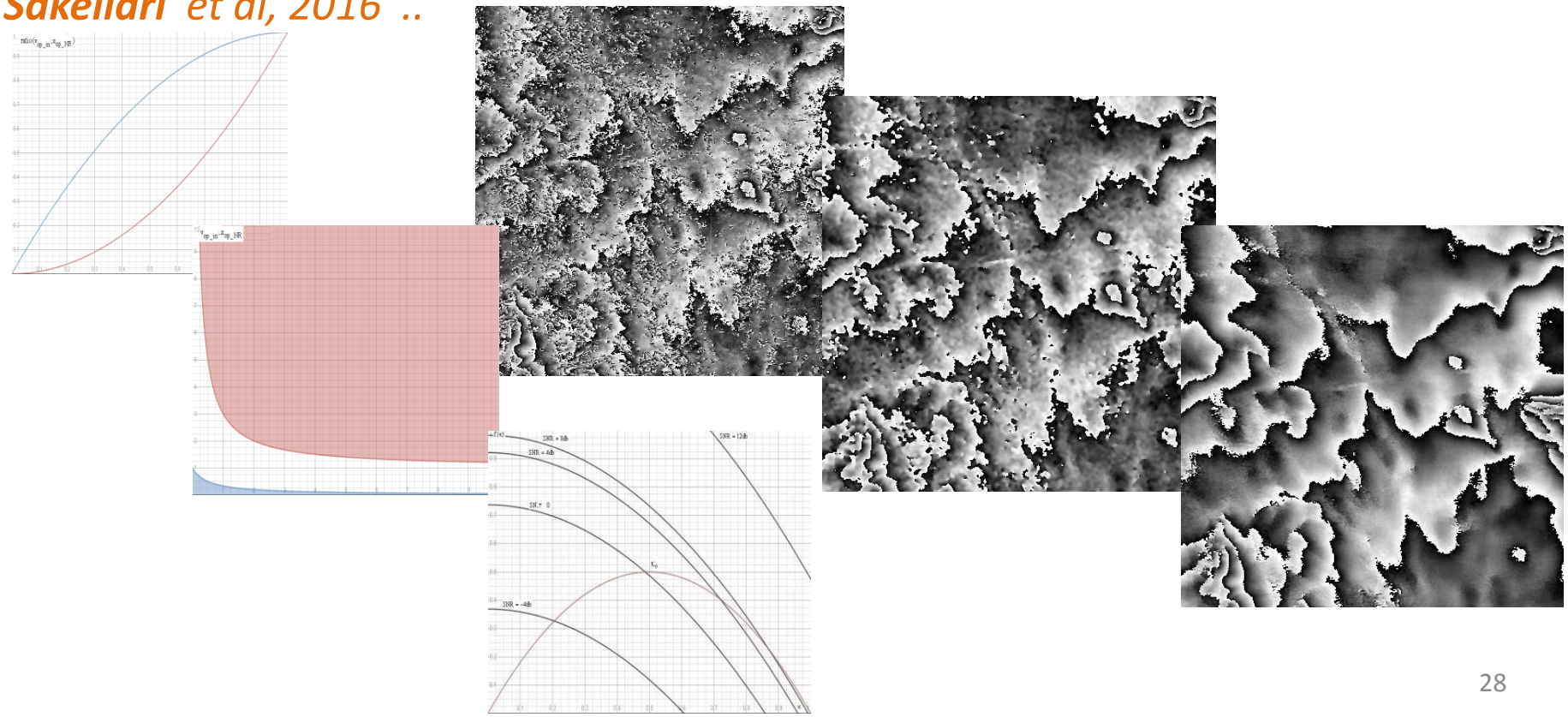



# RSLab's recent (2016) published research results

✓ ..selected

"New parametric model based method for noise reduction in the Interferometric process"

***Sakellari*** *et al, 2016 ..*

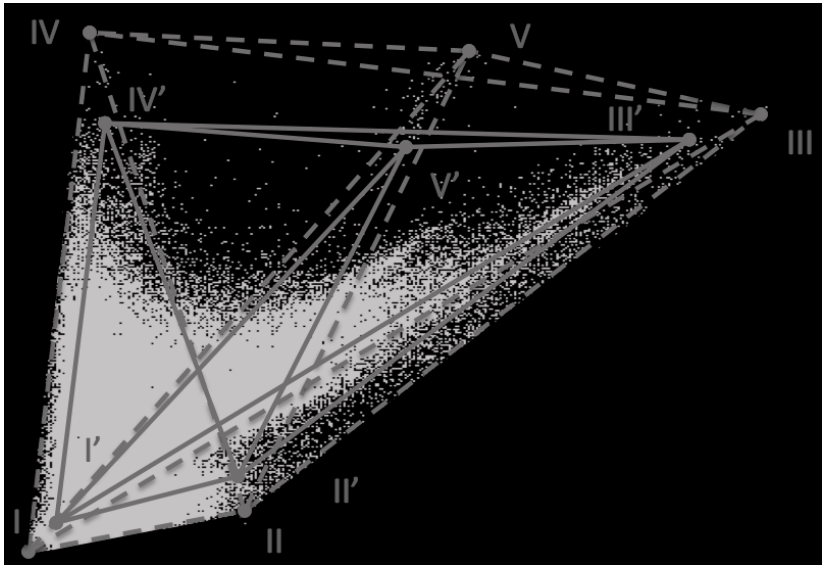


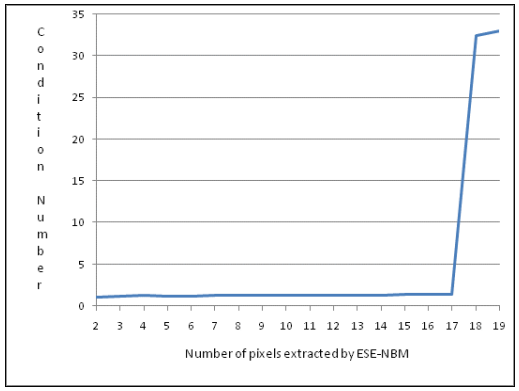
# RSLab's recent (2015) published research results

✓ ..selected

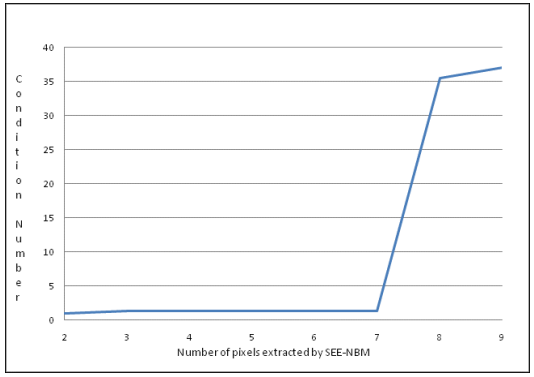
"Exploiting the Fractional Distance Matrix for estimating the number of endmembers and extract them"

***Sykas*** *et al, 2015 ..*




Indian pines (17 endmembers)




Cuprite image (7 endmembers)

# REMOTE SENSING LABORATORY

*!! Thank you !!*







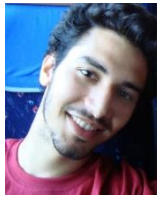








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