

# Cross-border green digital investments in agri-food sector

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Faculty of Agriculture,  
Forestry and Natural  
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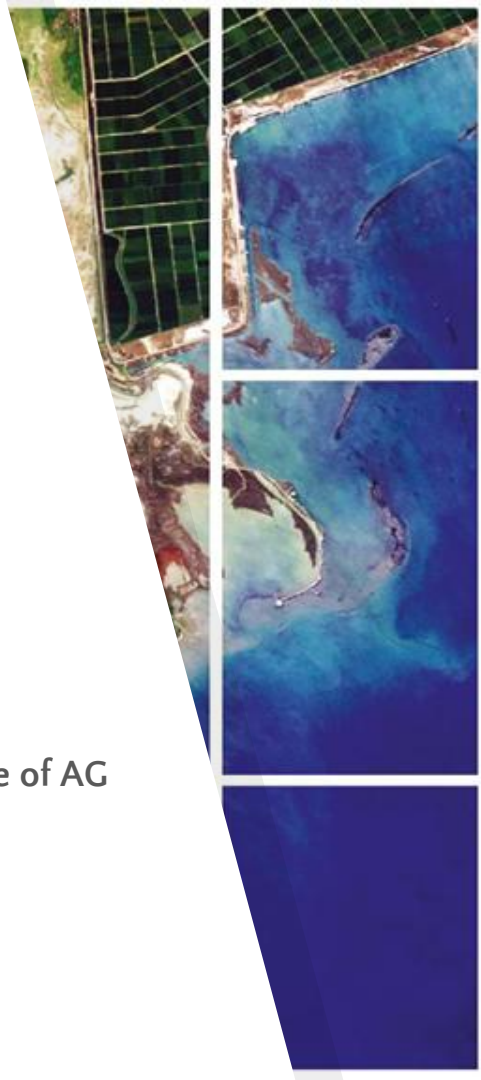


Lab of Remote Sensing,  
Spectral Analysis and GIS



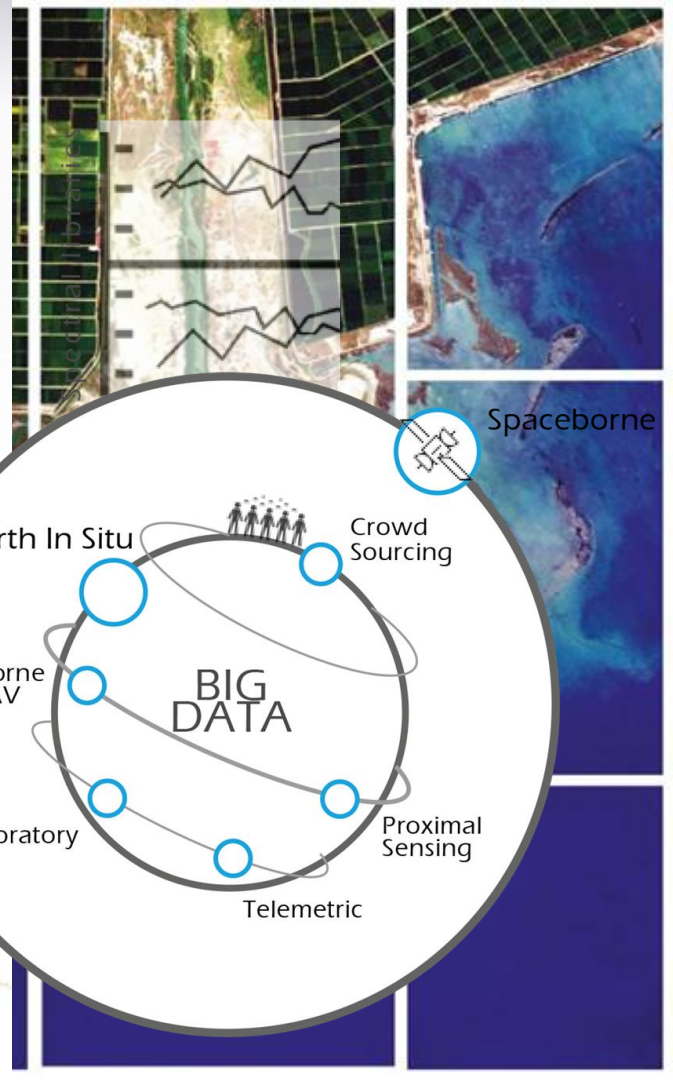
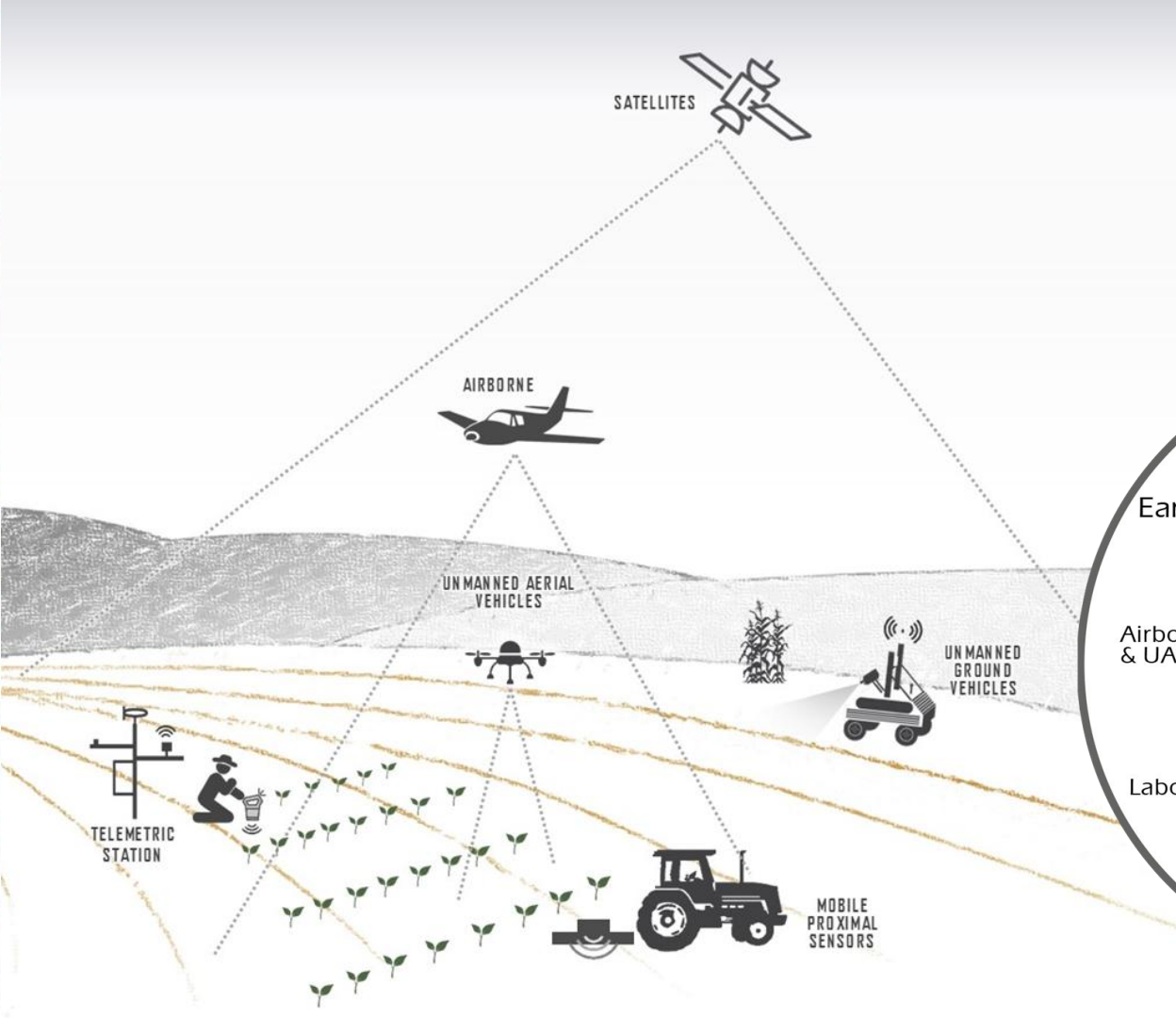
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# DEVELOPMENT OF AN INTEGRATED NATIONAL INFRASTRUCTURE

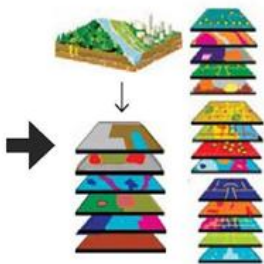




## System of Systems



i-BEC's  
Data Hub



Data Fusion  
& Integration



Software as a  
Service [SaaS]



Services  
we offer



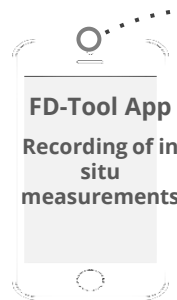
# CROWDSOURCING WITH FIELD DIAGNOSTIC TOOLBOX



## Earth Observation services

A set of field sensors for the measurement of soil & plant indicators with the aim of evaluating Good Agricultural Practices and determining the Life Cycle Assessment of agricultural products.

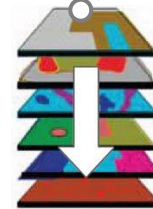
Support the agronomist-consultant, or the producer for the proper management of the field.



Android application



Remote Central Database Management System



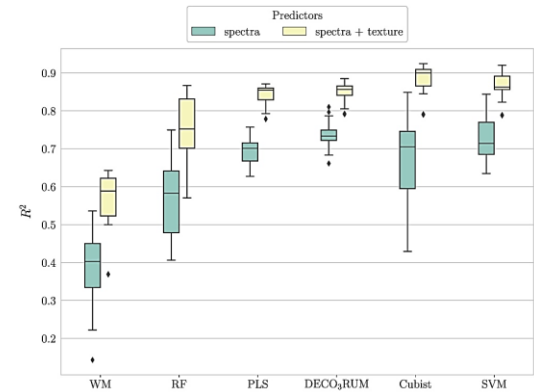
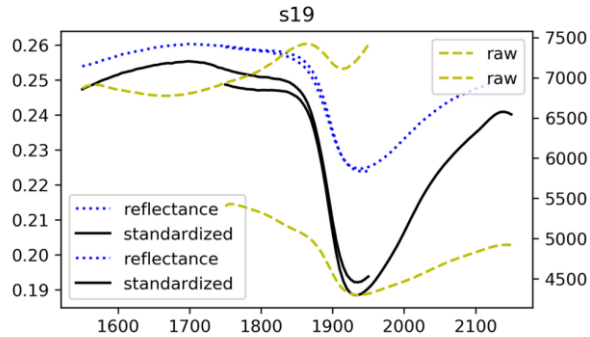
Data fusion



Services

# Soil sensing system

- ▶ Novel spectral sensors (MEMS) 1.750 – 2.150 nm combined with Artificial Intelligence algorithms
- ▶ Harmonized soil spectral libraries for the entire Balkan peninsula (>6000 )
- ▶ Real time predictions with high accuracy and low cost.



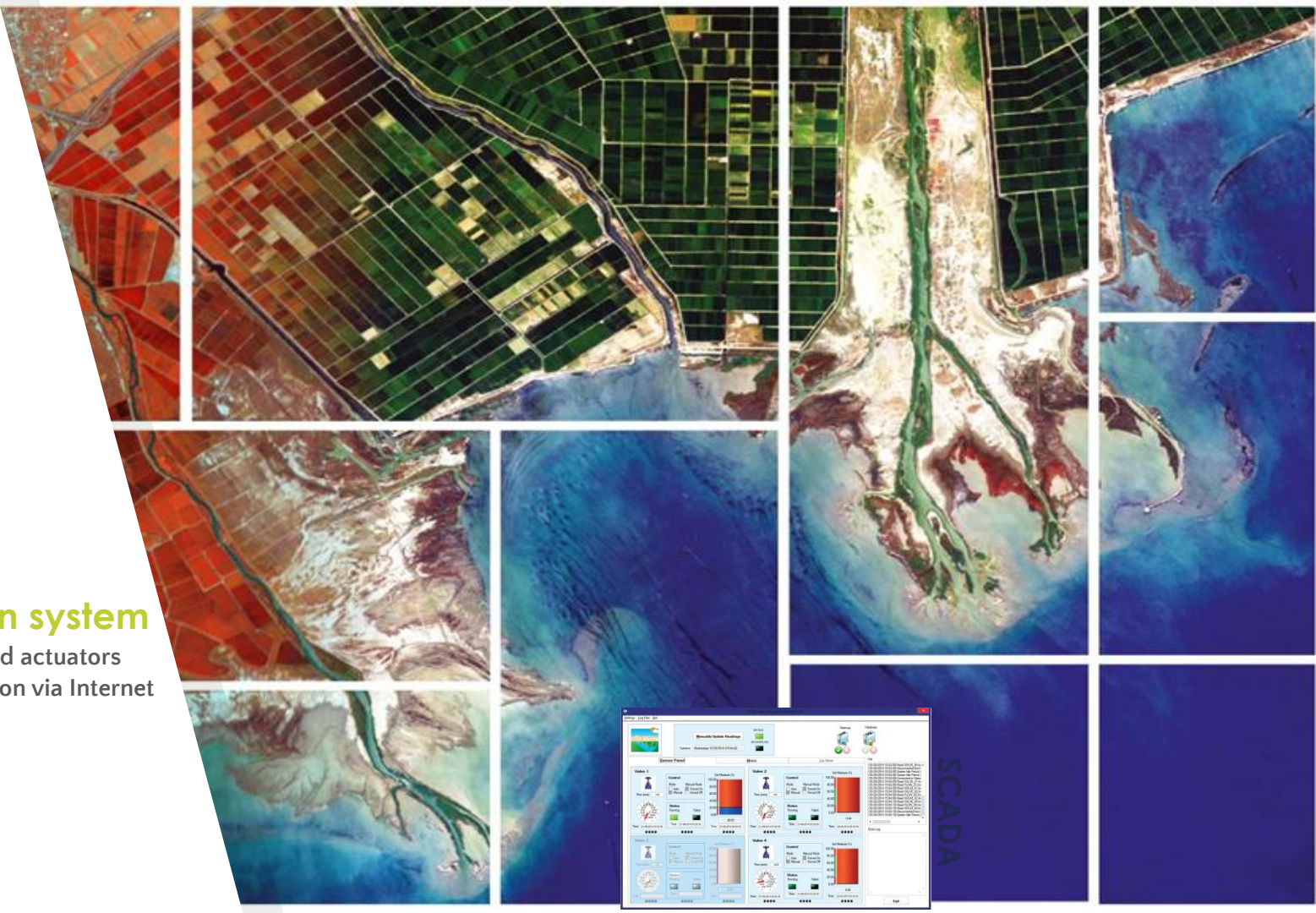


## IN-SITU DATA WITH IoT



## Smart irrigation system

using smart sensors and actuators  
with wireless connection via Internet  
of Things



SCADA

# SPACEBORNE DATA ACQUISITION AND PROCESSING

- DATA CUBE -



# General Idea

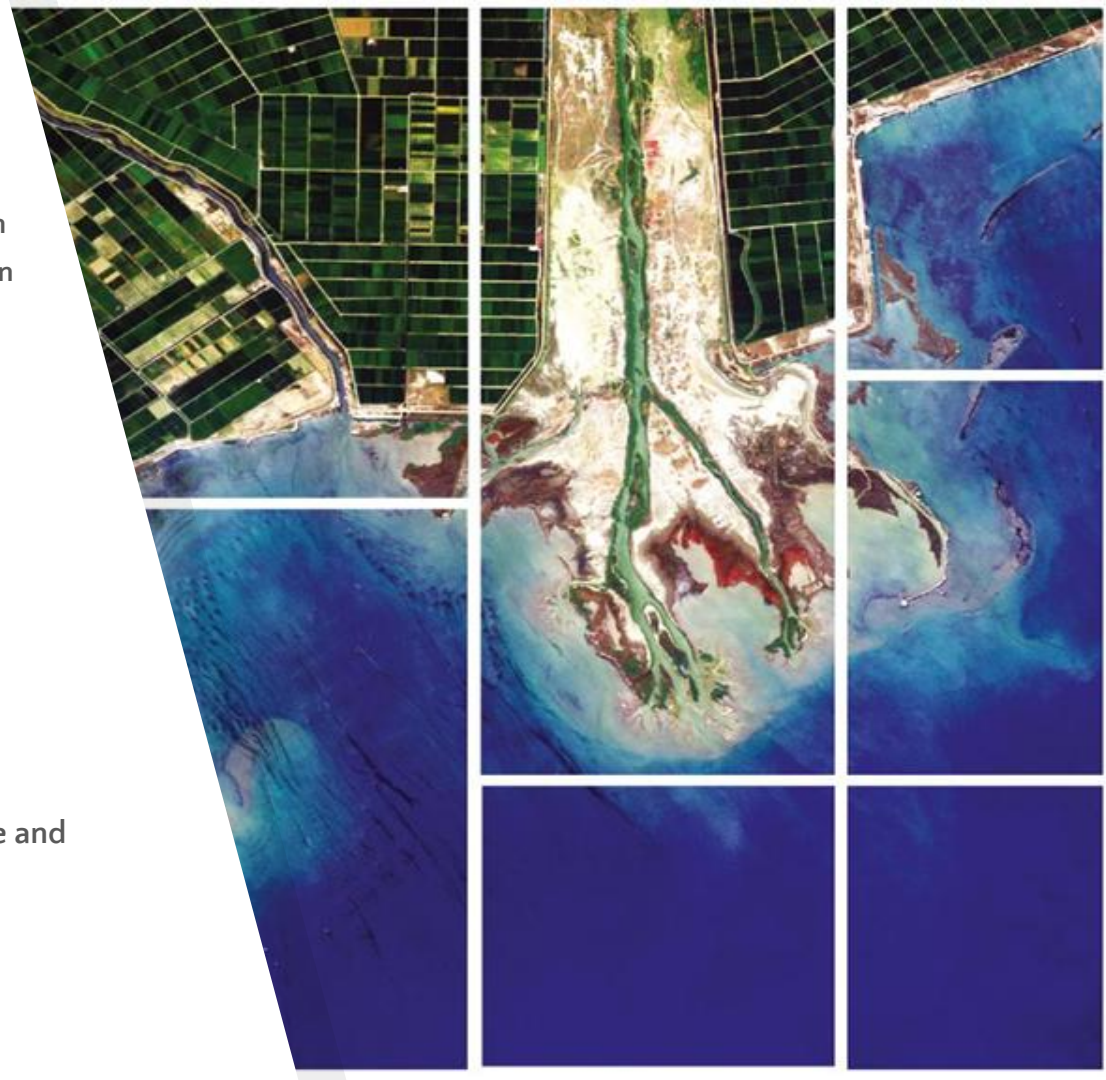
A data architecture solution for efficient data collection and management hosted by i-Bec in close collaboration with CEOS and CSIRO

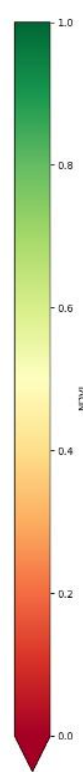
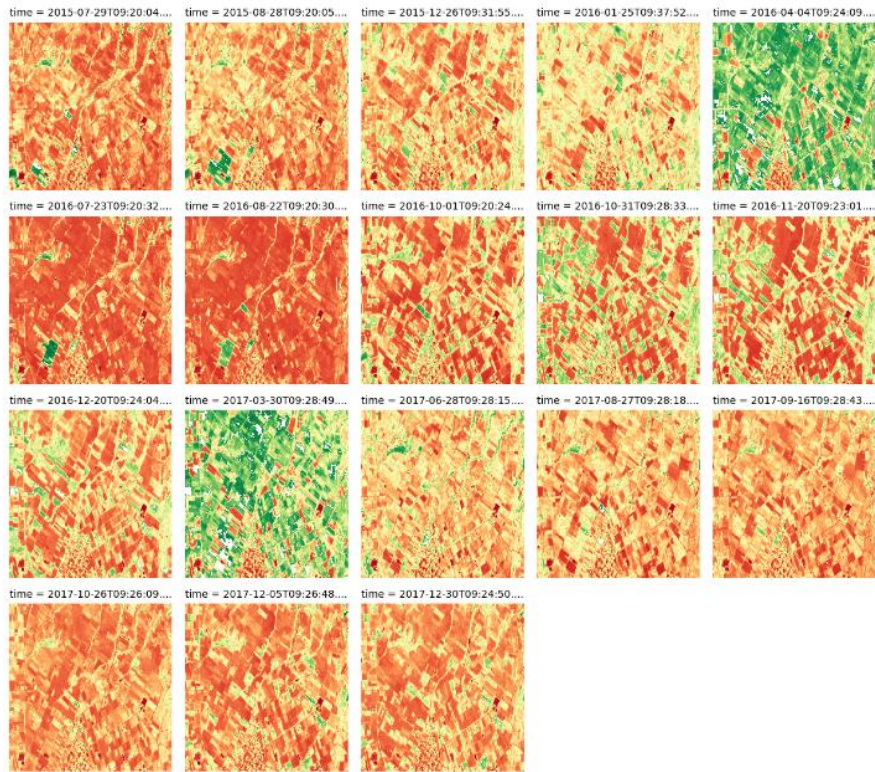
## Advantages of soil analysis data

- ▶ Extended coverage
- ▶ High spatial resolution[10m Sentinel-2]
- ▶ Short revisiting time
- ▶ Open access

## Advantages of DataCube

- ▶ Continuous support in interactive data science and scientific computing
- ▶ Support of multiple spaceborne sensors
- ▶ Long and multivariate timeseries analysis
- ▶ Easy Software as a Service development

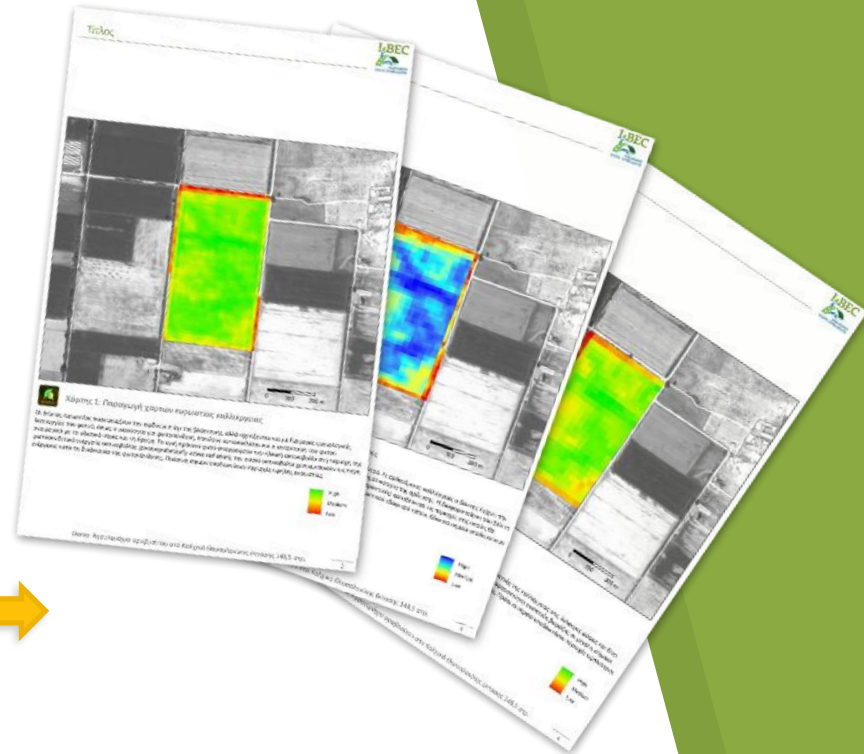




## DEVELOPMENT OF NATIONAL LIBRARIES: CROPS - PHENOLOGICAL STAGE

NDVI timeseries at Central Macedonia District [7/2015-12/2017]

We translate the Earth Observation data into personalized information in the language of the producer (eg Crop status per phenological stage)



## Potential of the Application of DataCube in agriculture

- ▶ Easy monitoring of crop evolution by satellite including quantity and quality of production
- ▶ Land use recording and comparison with previous recordings
- ▶ Prediction and visualization of soil properties of crops related to agriculture [composition, organic matter, nutrients] as well as their evolution
- ▶ Timely and valid forecast of production and possibility of calculating the CO<sub>2</sub> balance



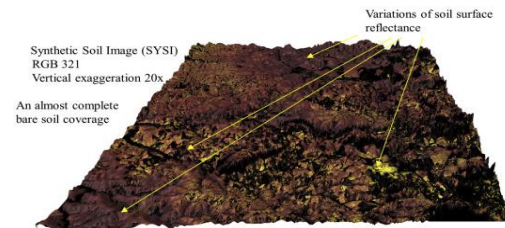
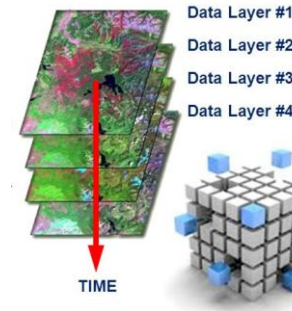
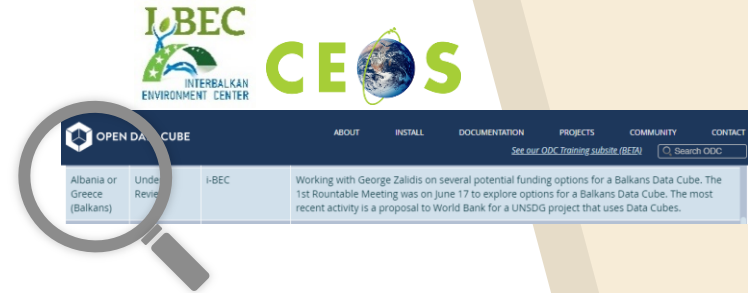
# Data Fusion

## Earth Observation



# Integrated geo-environmental monitoring approach with Earth Observation tools

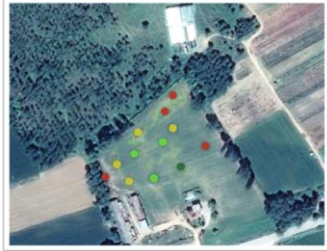
- ▶ Data Mining (CEOS Data Cube) for pixel retrieval of bare soil (analysis ready-to-use time series such as NDVI and NBR2) -> synthetic bare soil mosaic product to avoid vegetation coverage
- ▶ Utilization of the existing spectral soil / cultivation libraries in coordinated activities for the exploitation of the current infrastructure (ecosystems based on the GLOSOLAN FAO Initiative)
- ▶ Conversion of the calibration models into deep learning techniques from large spectral libraries into spectral reflectance from Sentinel-2 images





# ADVISORY SERVICES USING EARTH OBSERVATION

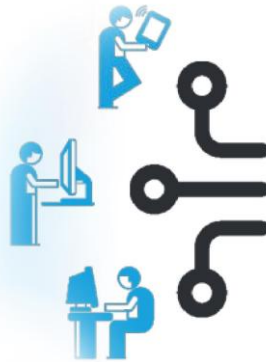




Conversion of pointwise in situ measurements into a map of management zones

### Physicochemical Properties

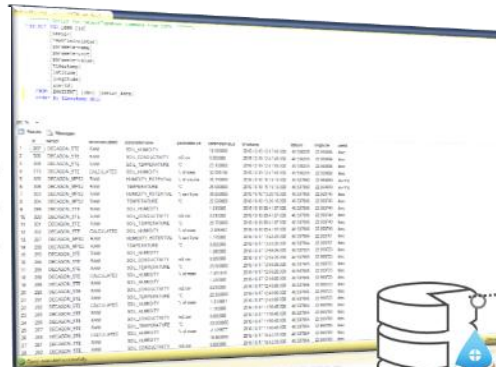
- Structure
- Soil Moisture
- Electrical Conductivity
- pH
- N-NO3
- P-PO4
- K
- CaCO3
- Organic Matter



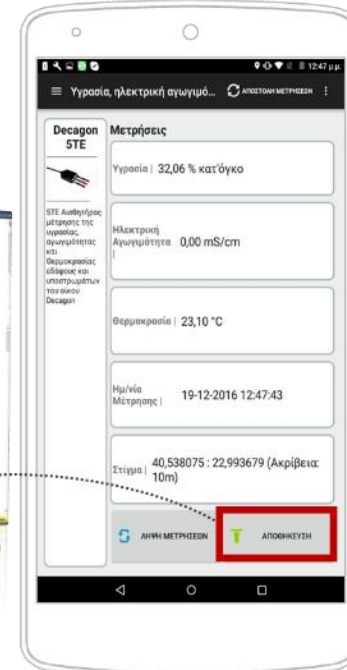
Interactive Control Room

## Consulting services for cultivation

- ▶ "Soil Health" and protection of soil degradation
- ▶ Application of Codes of good agricultural practice in real time
- ▶ Advisory tool for agronomists and producers

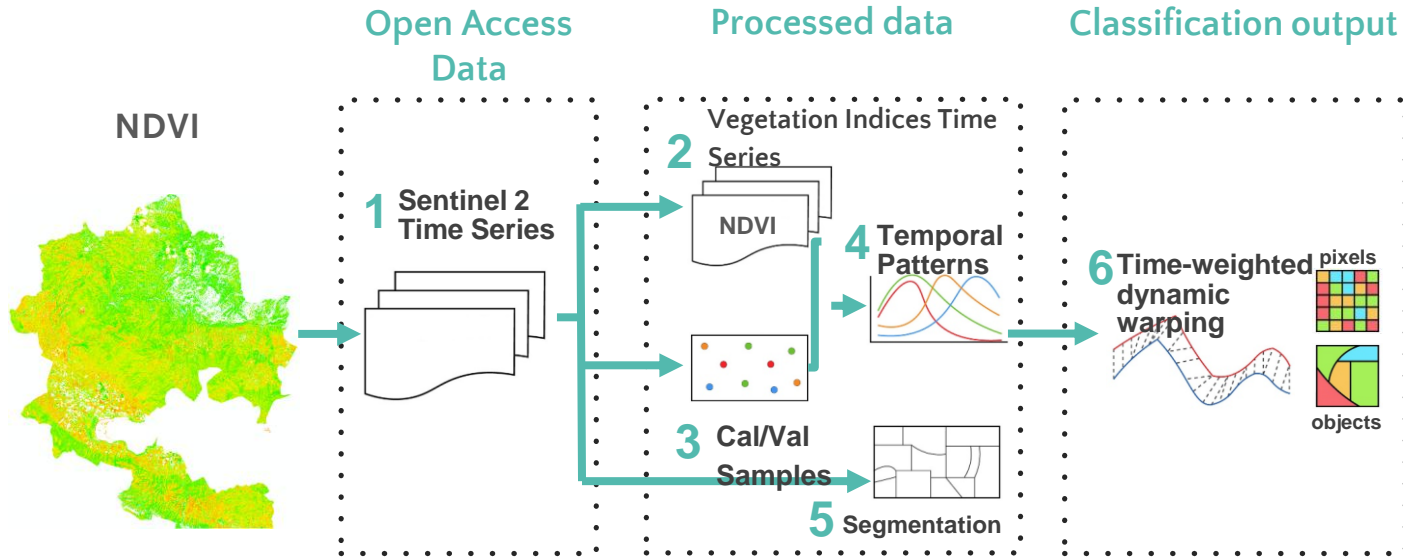


Ασύρματη Διασύνδεση με Κεντρική Βάση

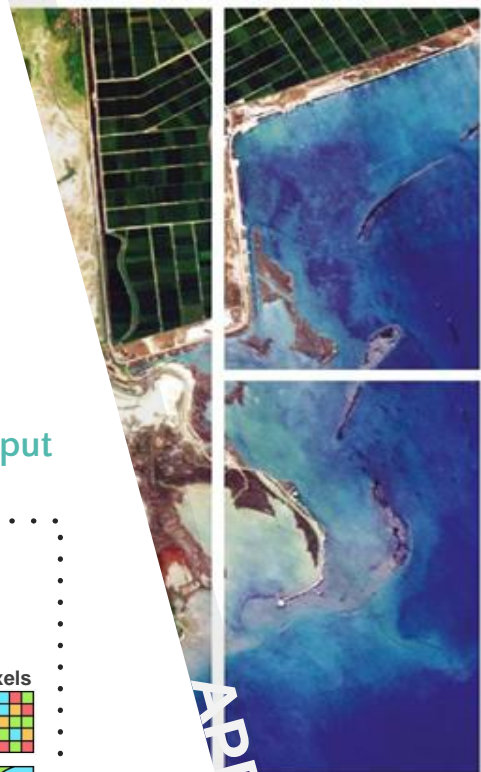


# Consulting on grazing land and livestock

- 4 land categories [Forests, forest meadows, shrub meadows, meadows]
- Traceability by type of grazing land



APPROACH



**REDUCED CARBON FOOTPRINT LABELING**  
FOR AGRI-FOOD PRODUCTS  
- AG CLUSTER -



## Innovative carbon footprint identification system with Earth Observation data

### Carbon footprint certification label for peach and kiwi

- ▶ Reduction of inputs for the protection of the environment per soil-climatic zone
- ▶ Reducing CO<sub>2</sub> emissions and mitigating the effects of climate change
- ▶ Recording with scientific and experimental methods of environmental parameters and consequences and strategical planning on a large scale
- ▶ Increased benefits for the consumer
- ▶ Timely placement of certification in the market, in the face of competition
- ▶ Highlighting the competitive advantages of Greek products
- ▶ Traceability



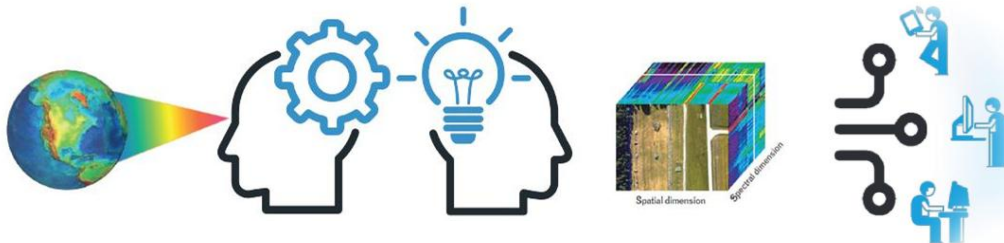
# OPERATION OF A NATIONAL EARTH OBSERVATION ECOSYSTEM



# National Intelligent Agriculture Ecosystem: Development & operation

## OPEN NATIONAL EARTH OBSERVATION DATA

Calibration, Common Global Standards, Interoperability



Data feeds and  
services to end  
users



Data and service  
documentation  
fields



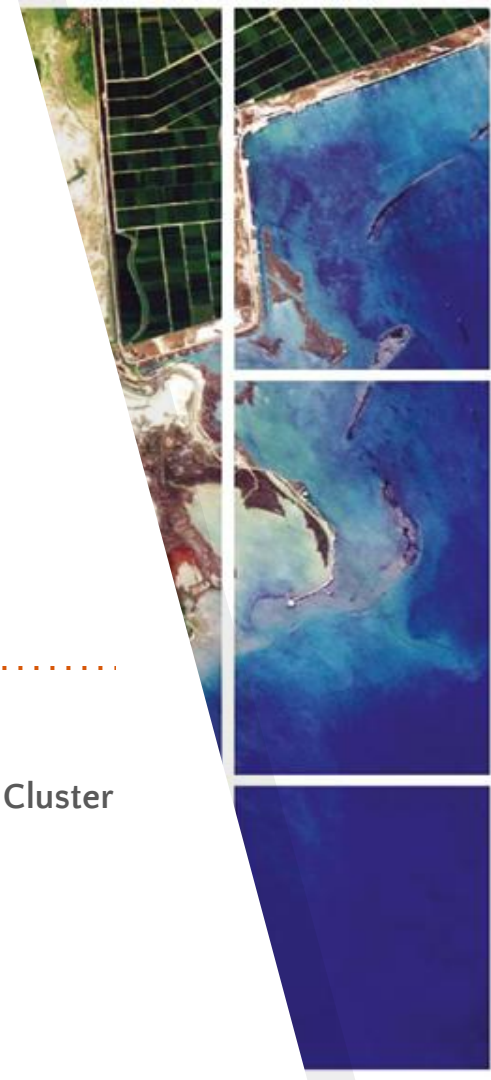
Agricultural  
Consultants



Cluster

### SUSTAINABILITY CRITERIA

1. Flexible and functional ecosystem
2. Debugged and operationally Unified Infrastructure



## Earth Observation Data:

Their role in the digital transformation of Agriculture in Greece with a vision to increase the competitiveness of Greek products in the agri-food chain

The main challenge of the sustainability of intelligent agriculture, ie the continuous proper and uninterrupted operation of existing infrastructure, can be ensured through the partnership of public, science and entrepreneurship (Public - Private Partnerships).

A necessary condition is the creation of an infrastructure for the provision and processing of open Earth Observation data that will ensure its operation and maintenance with the participation of the private sector.

Data flows, feeds and services towards end users.





## Operational Objectives



Capacity Building and Networking  
at Local and Global level



Initiatives and Projects Development,  
Implementation and Sustainability



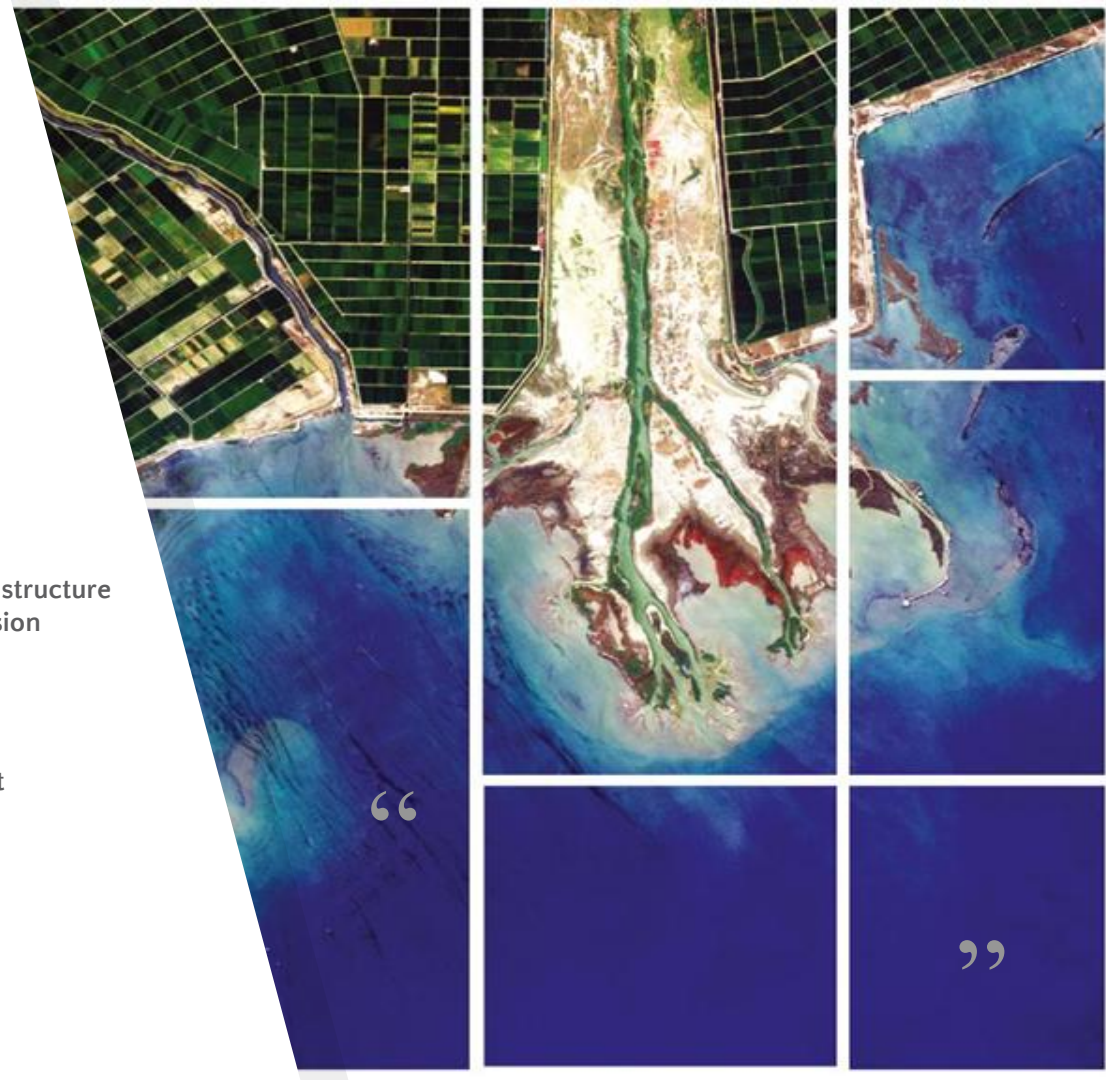
Strategic infrastructure planning  
Maintenance and integration of strategic infrastructure  
design for reliable and continuous data provision

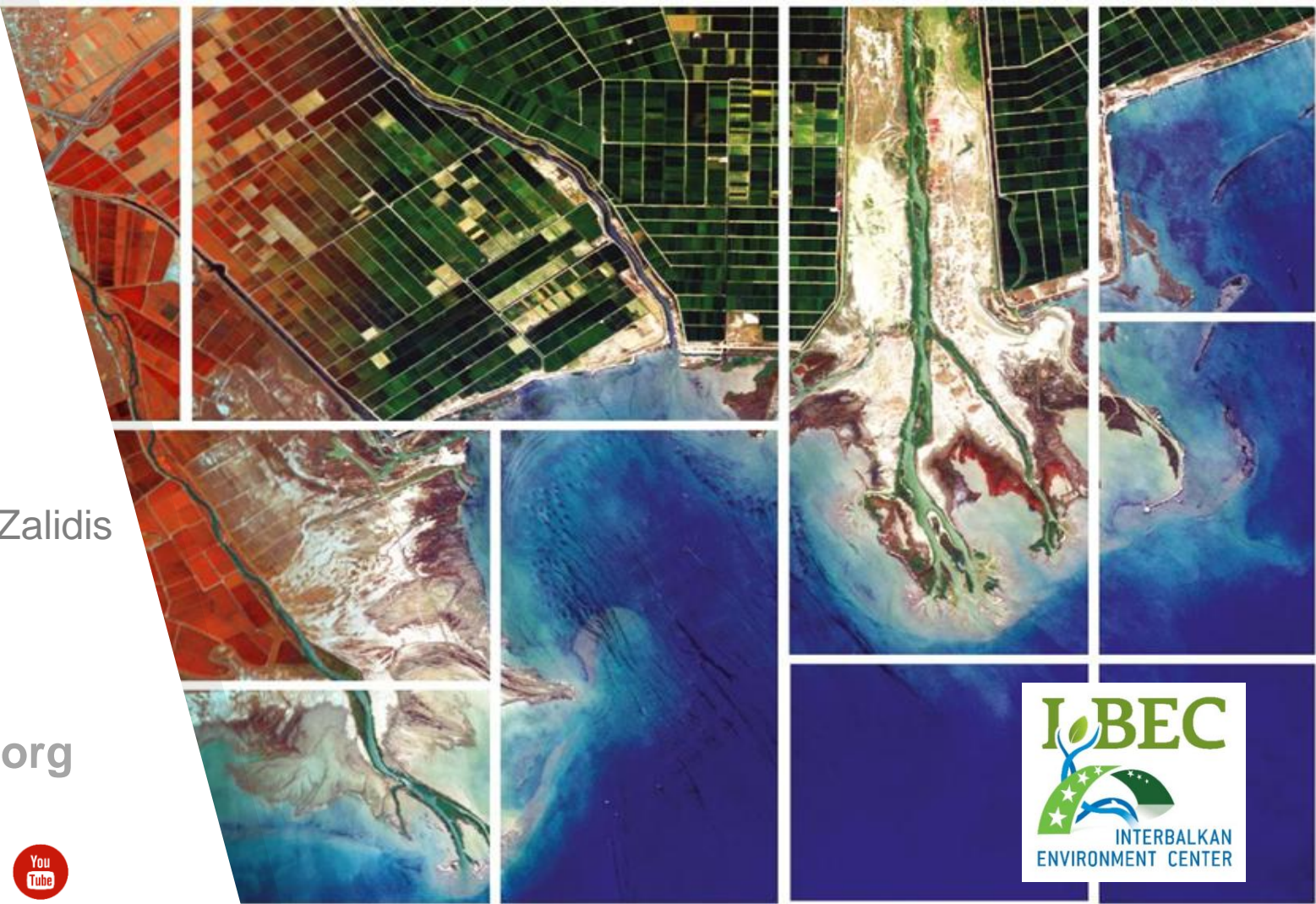


Development of new products  
Innovative solutions for product development



Providing reliable services  
Serving as the central data hub, through data  
fusion, and the control center





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