
# Improving SAR satellite capability with AI/ML for civil market development

NARUO KANEMOTO

*Space Shift, Inc. (Tokyo, Japan)*

*kanemoto@spcsft.com*

# Corporate profile

| | |
|---|---|
| Company name | Space Shift Co., Ltd. |
| CEO | Naruo Kanemoto |
| Capital | 274 million JPY |
| Year of establishment | December 2009 |
| Location | Inspired.Lab, 6th floor, Otemachi Building<br>1-6-1 Otemachi, Chiyoda, Tokyo 100-0004<br>Japan |
| Web site | https://www.spcsft.com/ |
| Business fields | Development of software for satellite data analysis, business related to the analysis of satellite data, consulting related to space business |

Raised $5M as a series-A investment round（February 2021）

SPARX

Feburuary 16, 2021

For Immediate Release

SPARX Group Co., Ltd.
President and Group CEO Shuhei Abe
(TSE1: 8739)

**SPARX's Space Frontier Fund Invests in Space Shift, a Developer of Satellite Data Analytics Systems**
—Exploring the World through Space and AI—

TOKYO—February 16, 2021—SPARX Innovation for the Future Co., Ltd. (SIF)—a subsidiary of SPARX Group Co., Ltd. (SPARX; TSE1: 8739)—today announced that its Space Frontier Fund, established in June 2020, has invested in Space Shift, Inc., a developer of software that uses AI analytics to extract a wealth of information from Earth observation satellite data. Space Shift plans to use this capital to advance its AI development by dramatically improving its systems and specializing in data analytics for synthetic aperture radar (SAR)* satellites.

*Synthetic aperture radar (SAR): A radar that emits radio waves from satellite antennas to measure the observable ground surface objects that reflect those radio waves.
It measures the size and surface characteristics of objects based on these reflected radio waves.

Portfolio Company Outline

In 2009, Space Shift CEO Naruo Kanemoto founded the firm to develop commercial satellite data analytics software and services. With the recent increase in microsatellite performance, the US government's lifting of the ban on the commercial use of SAR data, and AI's advancement for speeding up the development of data analytics tools, a market has emerged for utilizing satellite data acquired from micro SAR constellations. Space Shift aims to help realize a more efficient society by dramatically improving analytics' accuracy through AI-based high-speed automated processing of SAR satellite data, in an attempt to understand the total volume and scope of all production.

For more details on Space Shift, visit their website at https://www.spcsft.com/.

Source: https://ssl4.eir-parts.net/doc/8739/tdnet/1936117/00.pdf

# Corporate profile

# Mission & Vision

SPACE SHIFT

**2,000~3,000 units of earth observation satellites will plan to be launched in 5 years over the world.**
**Big data and real-time data of earth will be available more easily and quickly in near future.**

## “Unraveling the World with Space and AI”

- Extraction of **more information** via AI’s surpassing cognitive ability
- Construction of global **digital twins**
- Visualization of **correlation** of various phenomena

Contribution of **realizing sustainable society**

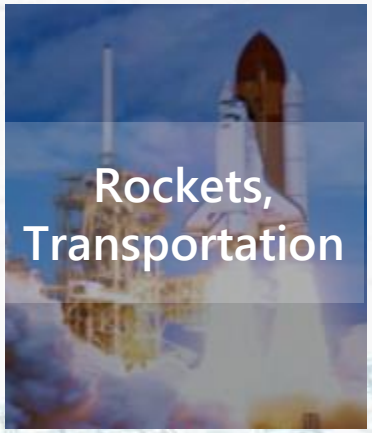
through **“the optimization of human activities and natural environment”**

by utilizing satellite data analysis

# Developing technologies

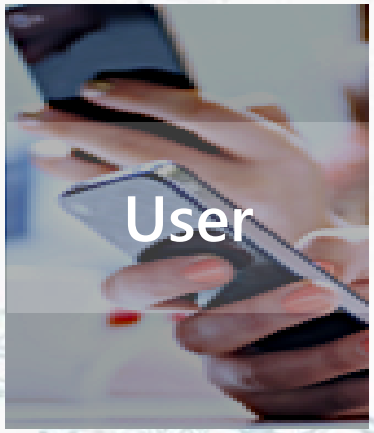
SPACE SHIFT

Technologies to utilize satellite data efficiently are still under development.
The key to spread the utilization of satellite data is making the huge data “valuable information”.










Focusing on developing software for the analysis of satellite data with a high accuracy

Developing AI’s analysis technology of SAR satellite data
which is normally difficult to be analyzed

Preparing essential technologies to use satellite data easily & efficiently for users

# Developing technologies

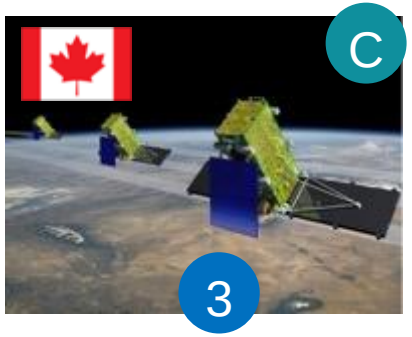
SPACE SHIFT

LARGE Satellites


COSMO-SkyMed


Sentinel 1A-1D


TerraSAR-X, TandemX, PAZ




Radarsat Constellation


ALOS2,ALOS4

**150-200** micro-SAR satellites will be launched by around 2025

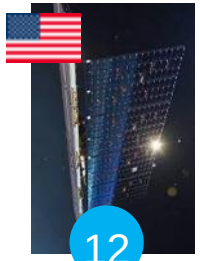
Most of big cities around the world can be observed in near real time with all of satellites.
Our software enables "**Virtual Constellation**" with automatic analysis.

Small Satellite constellations

Capella Space


ICEYE


Meta AEROSPACE

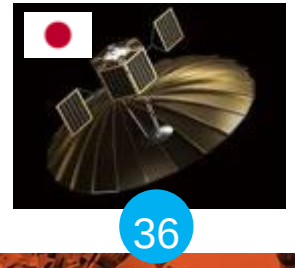



PredaSAR


UMBRA


Synspective


iQPS






n Planned number of satellites

# Developing technologies

SPACE SHIFT

LARGE Satellites


COSMO-SkyMed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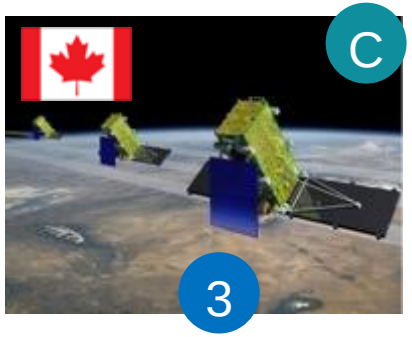


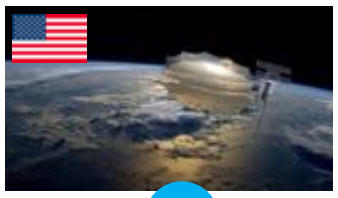

Radarsat Constellation


ALOS2,ALOS4

**Develop Algorithms workable with all of SAR satellites**
**= Satellite Middleware approach**

Small Satellite constellations

Capella Space




ICEYE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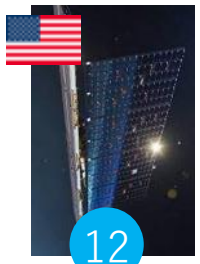


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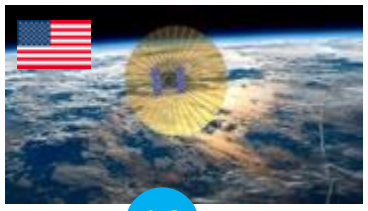
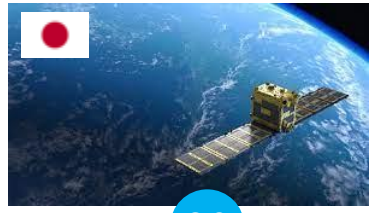
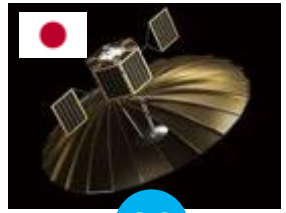



Synspective




iQPS






n Planned number of satellites

# Algorithm Provider

We can provide our capability to solve your problems in any positions. Please feel free to contact us if you want to collaborate with us!


License our algorithms to your platform or products


Collaborative research with your expertise


As an algorithm vendor to your businesses

# Business model


Licensing

**Satellite data platform**

**Existing cloud services**

**Satellite Providers**

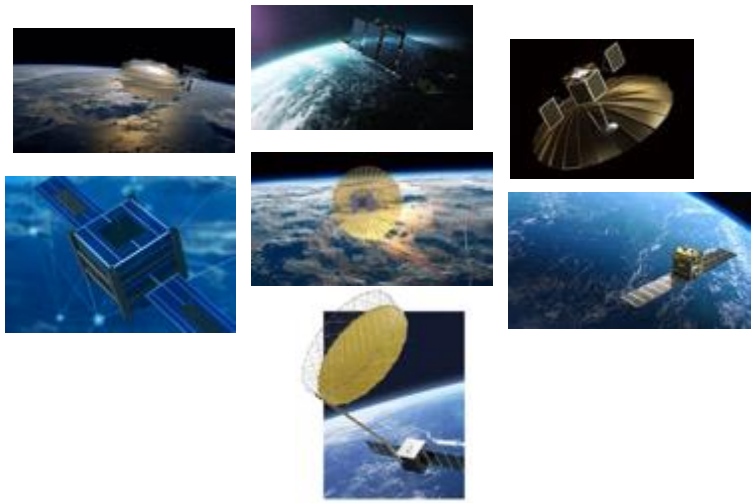
# Business model

SAR data is
- Very large volume (xxGB)
- Power consumption for processing and downlink

Licensing

Satellite Providers

Onboard Processing



- Reduce drastically the volume of data
- Very energy effective algorithm
- Very fast processing with low power CPU

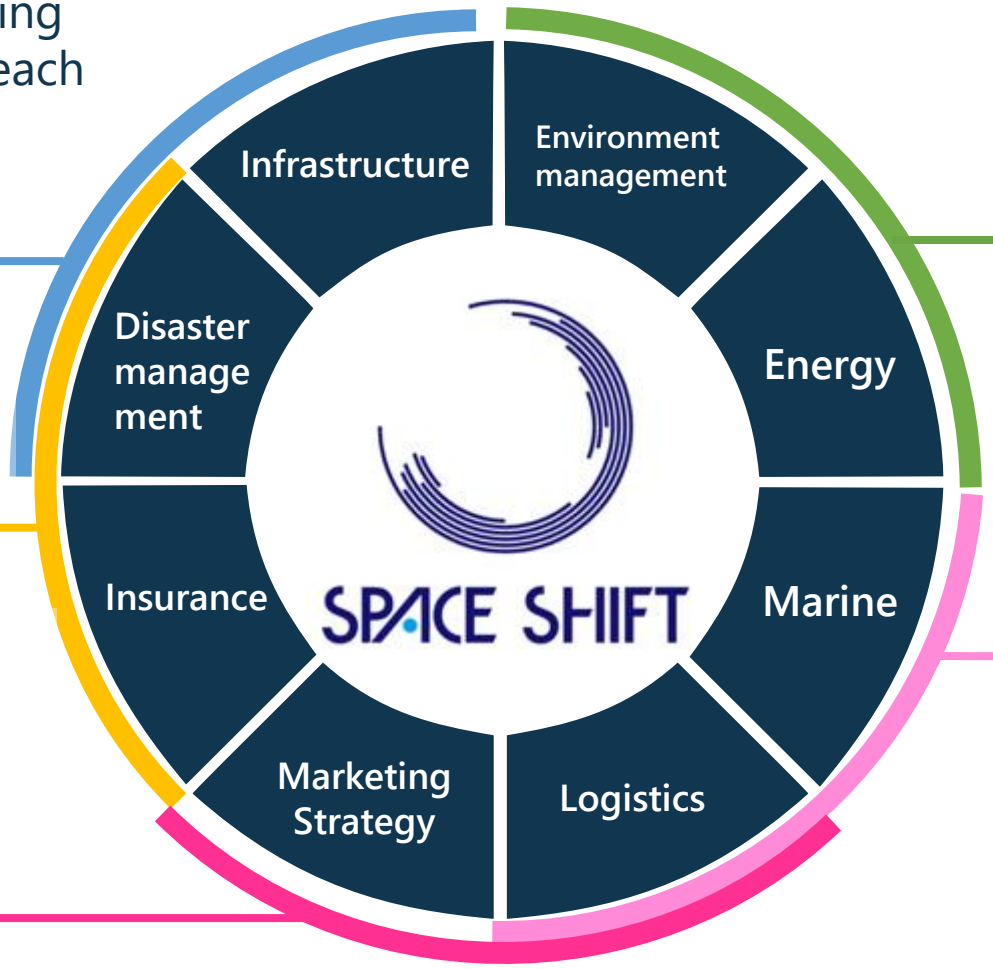
# Our solution and applicable fields

**Comparing SAR satellite data of two periods can observe minute changes on earth.**
**Space Shift supports various business fields by serving “InSAR Analysis” and “Change Detection”.**

- Land displacement monitoring
- Displacement detection of each buildings
  (buildings, tunnels, bridges)
- New building detection

- Flood damage detection
- Disaster info providing service

- Crop growth monitoring
- Price prediction from crop’s growth status
- Traffic volume analysis
- People-Flow analysis



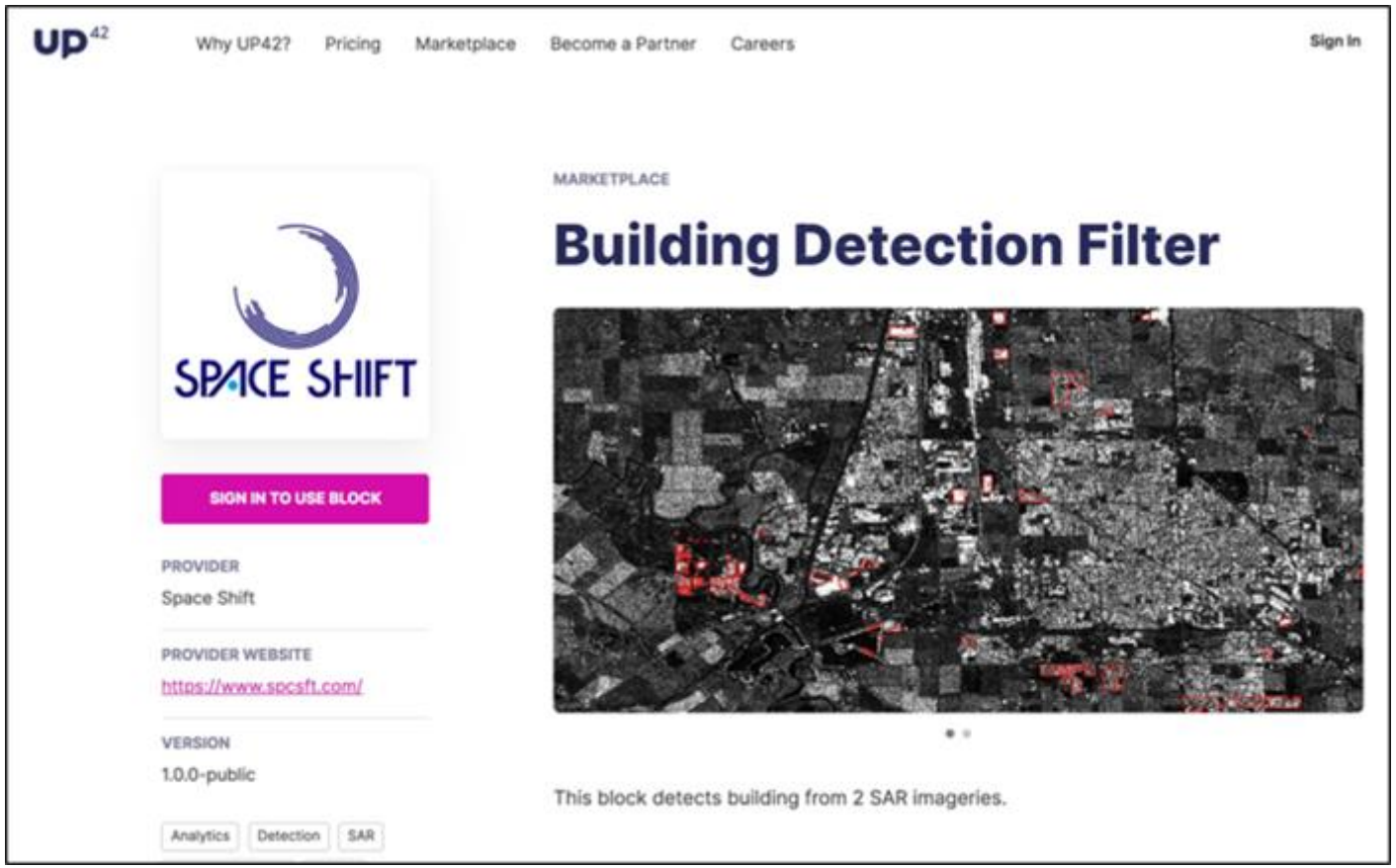

- Oil slick detection
- Forest monitoring

- Ship detection
- Illegal ship estimation

# Examples of Our solution

SPACE SHIFT

## New Building Detection




AIRBUS GROUP

×

SPACE SHIFT

Our Algorithm has been offered as a service on the satellite data platform operated by UP42 (an AIRBUS company).

This technology can be used for highly accurate situation monitoring in areas lacking ground data, such as emerging countries and depopulated areas, as well as for forecasting economic indicators by observing urbanization trends.

# Examples of Our solution

SPACE SHIFT

Central Austin area
Coordinates: W97°41'51.53", N30°17'45.34"

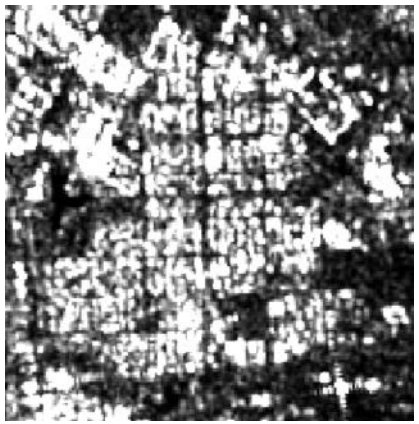
**Prediction**
Mar18 2015 – Oct12 2021

June 2015


July 2021


Mar 2015

Oct 2021



# Examples of Our solution

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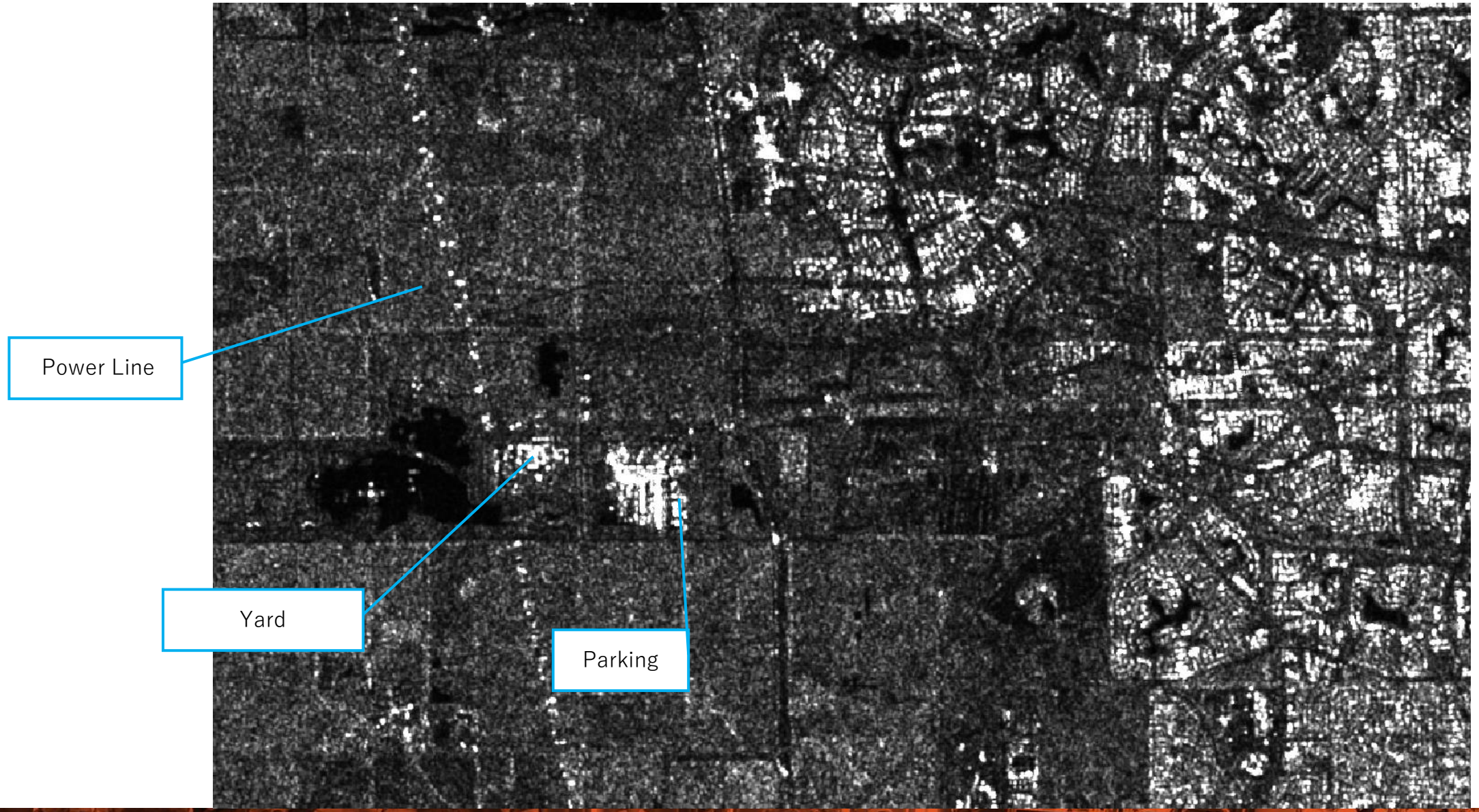
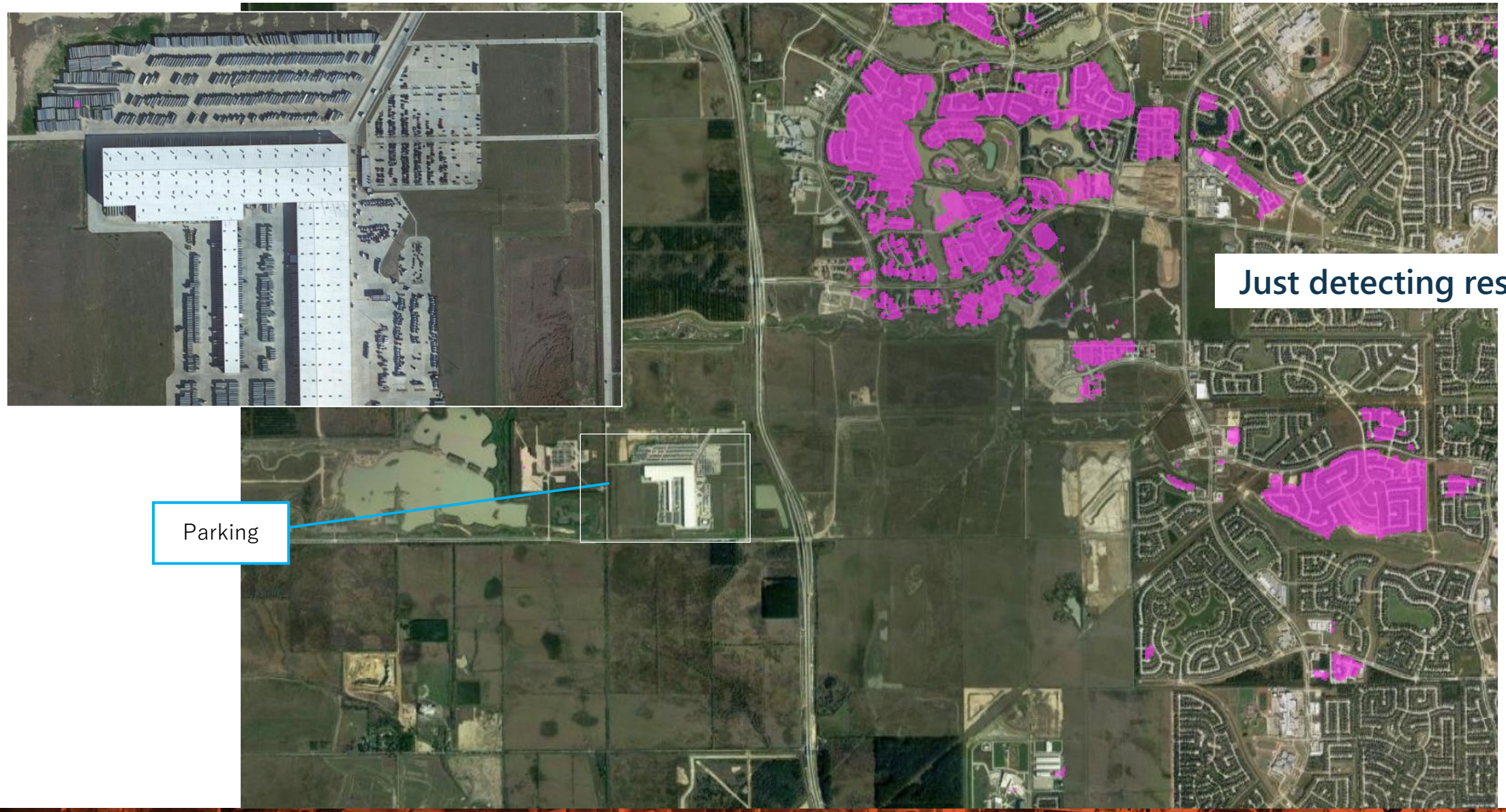


# Examples of Our solution



OmniSci Immerse

omni·sci DASHBOARDS DATA MANAGER HELP

Filter set
Default Filter Set (1)

# global analysis USA 2016-2021 v5 th05

ga_usa_v505 · 371,624 of 371,624

Refresh + Add Chart

## new building detection in USA


## POLYGON

371,624

## Sum of Area

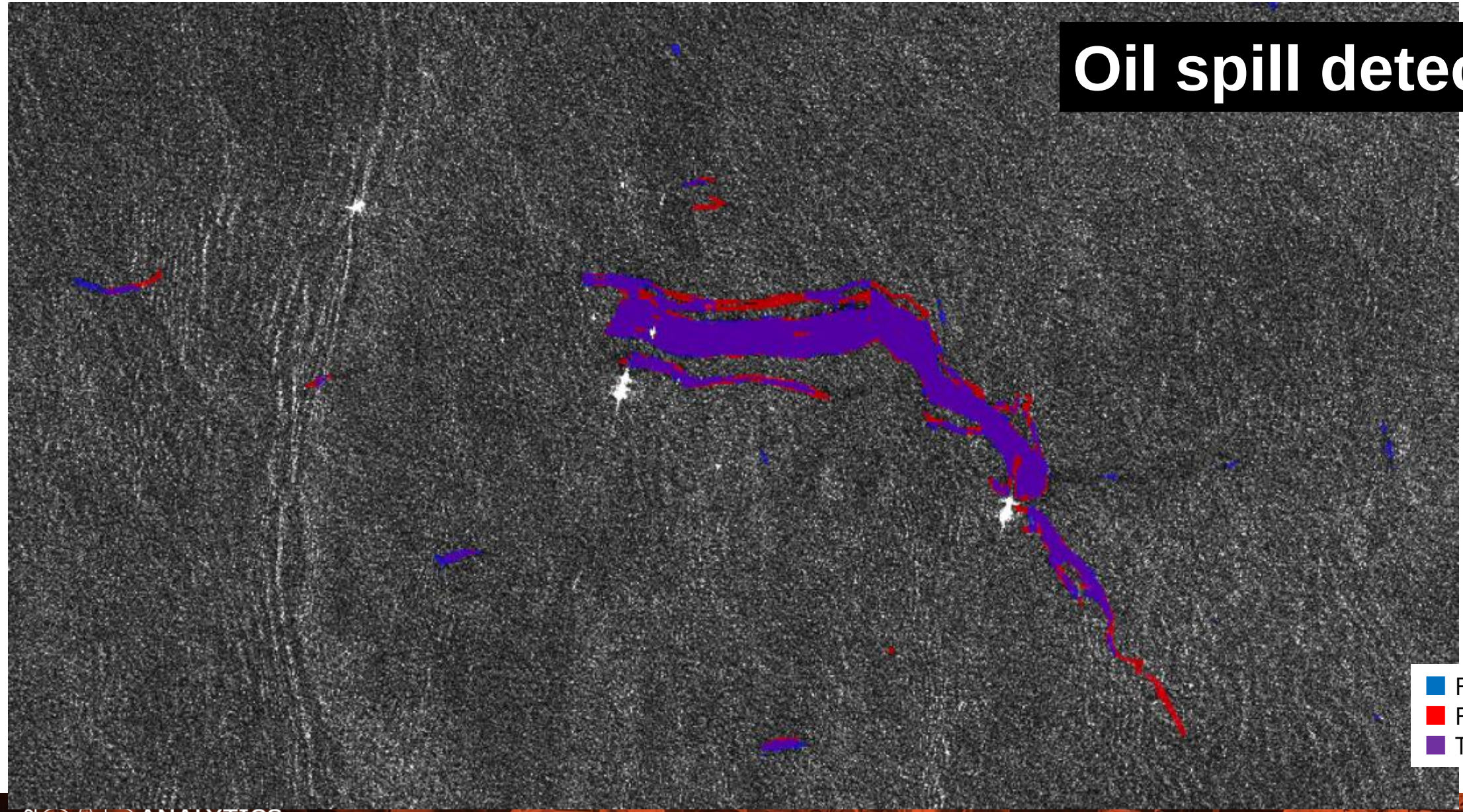
3,014.84

| BIN sar_observation_start_date (auto) | BIN sar_observation_end_date (auto) |
|---|---|
| 2020-10-05 | 2021-01-02 |
| 2019-01-14 | 2021-01-06 |
| 2019-01-07 | 2021-01-11 |
| 2018-10-08 | 2021-01-02 |
| 2018-08-20 | 2021-01-02 |
| 2018-02-26 | 2021-01-10 |
| 2017-05-15 | 2021-01-06 |
| 2017-04-10 | 2021-01-08 |
| 2017-04-03 | 2021-01-01 |
| 2017-03-13 | 2021-01-09 |
| 2017-02-27 | 2021-01-07 |
| 2017-02-27 | 2021-01-01 |
| 2017-02-27 | 2021-01-04 |
| 2017-02-27 | 2021-01-08 |
| 2017-02-20 | 2021-01-11 |
| 2017-02-20 | 2021-01-07 |

Page 1

# Examples of Our solution

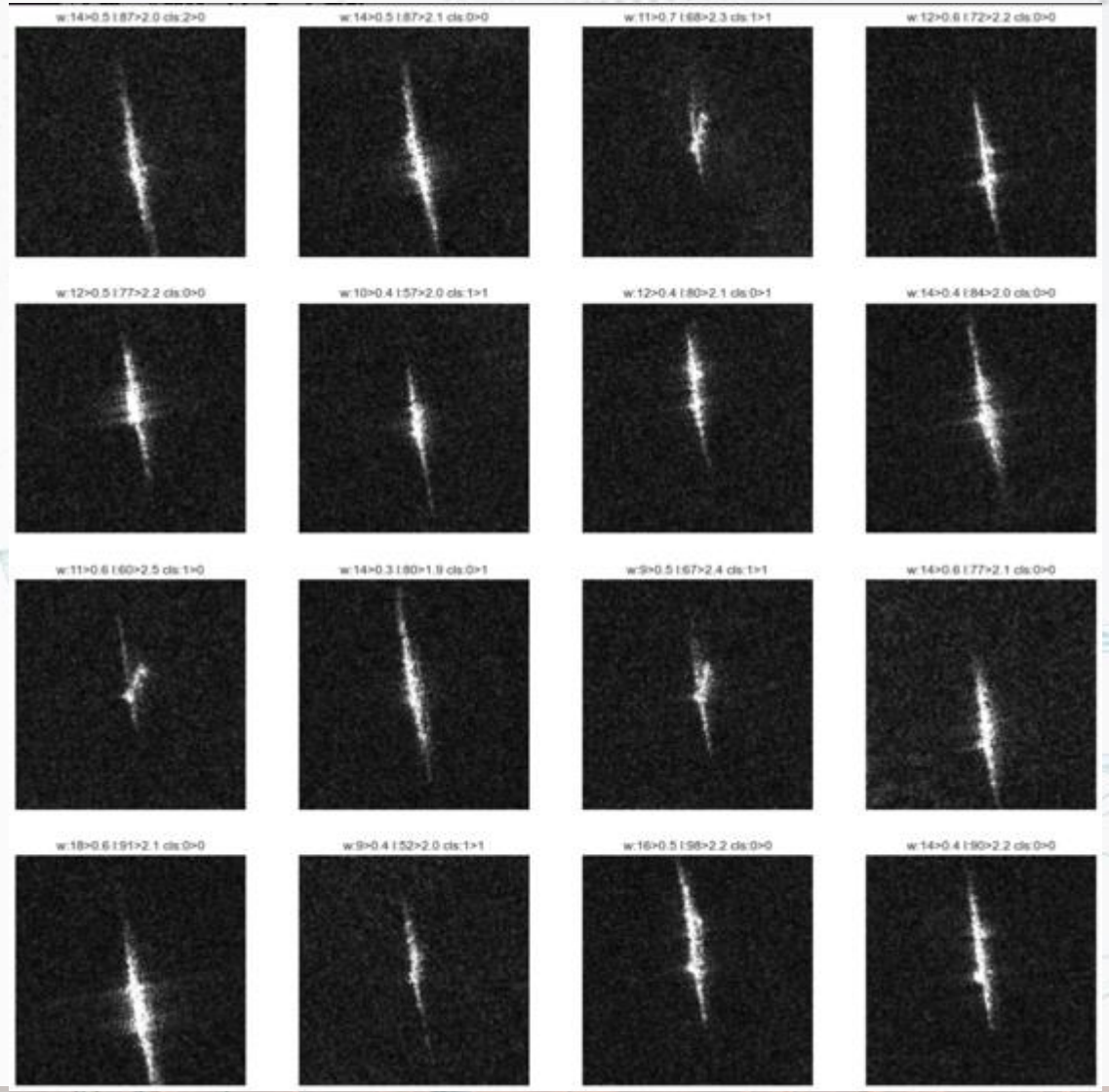
SPACE SHIFT



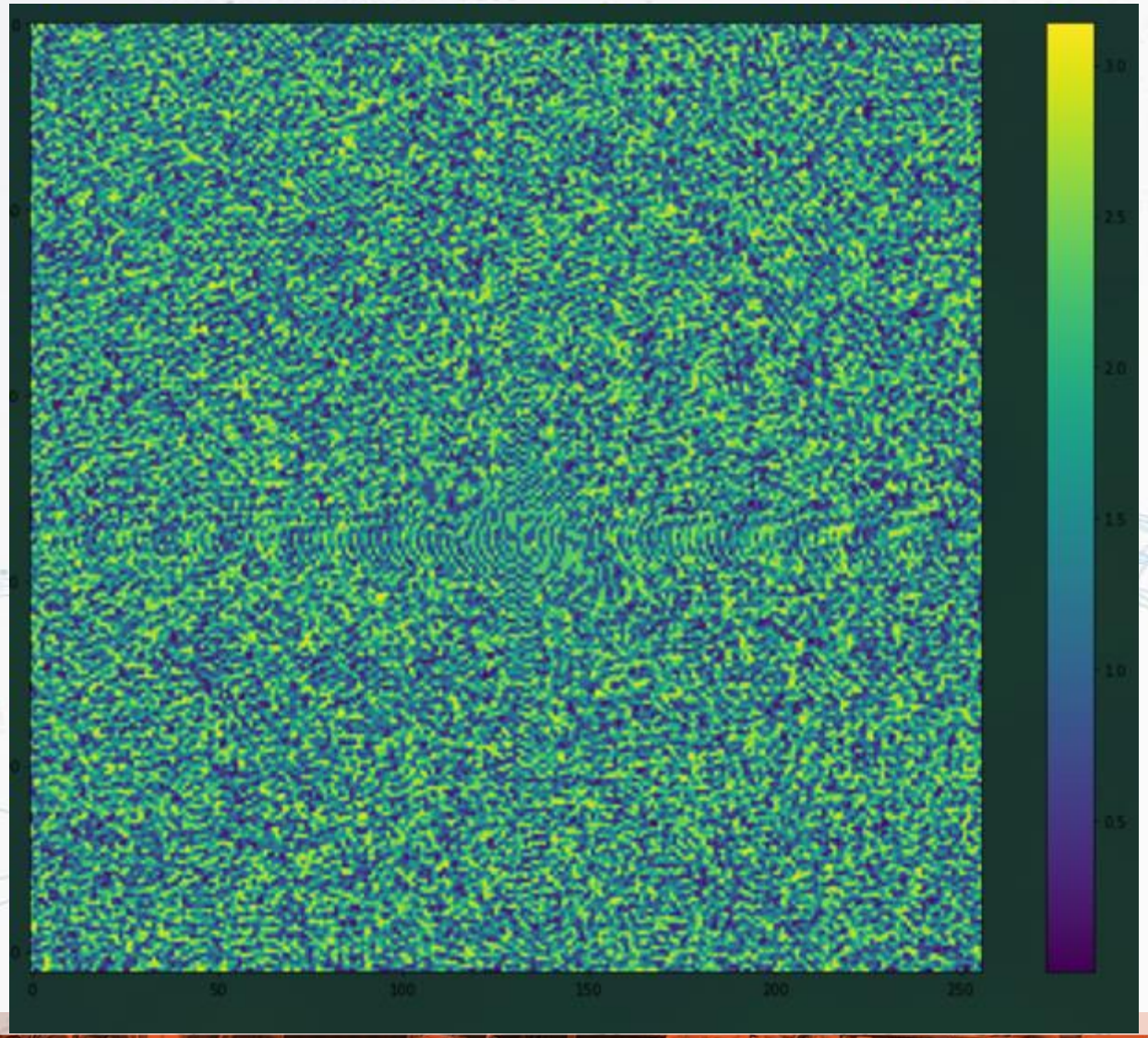
# Examples of Our solution

SPACE SHIFT

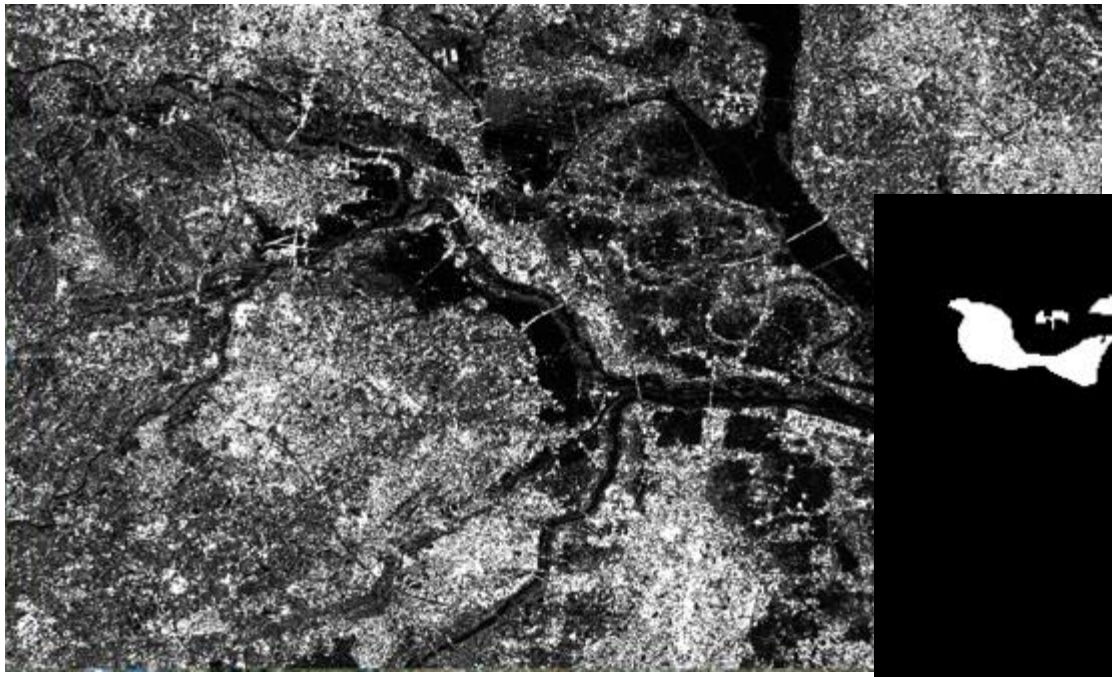
Vessel Detection and classification

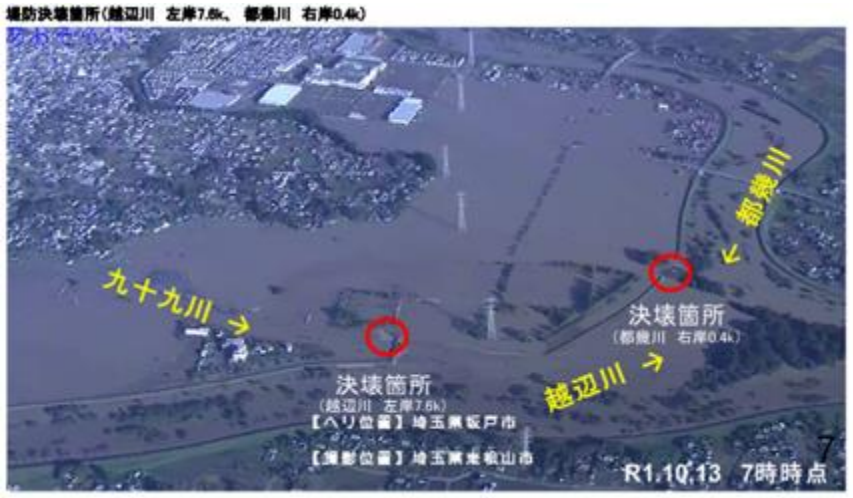


Detection with SLC / Raw Data



SPACE SHIFT



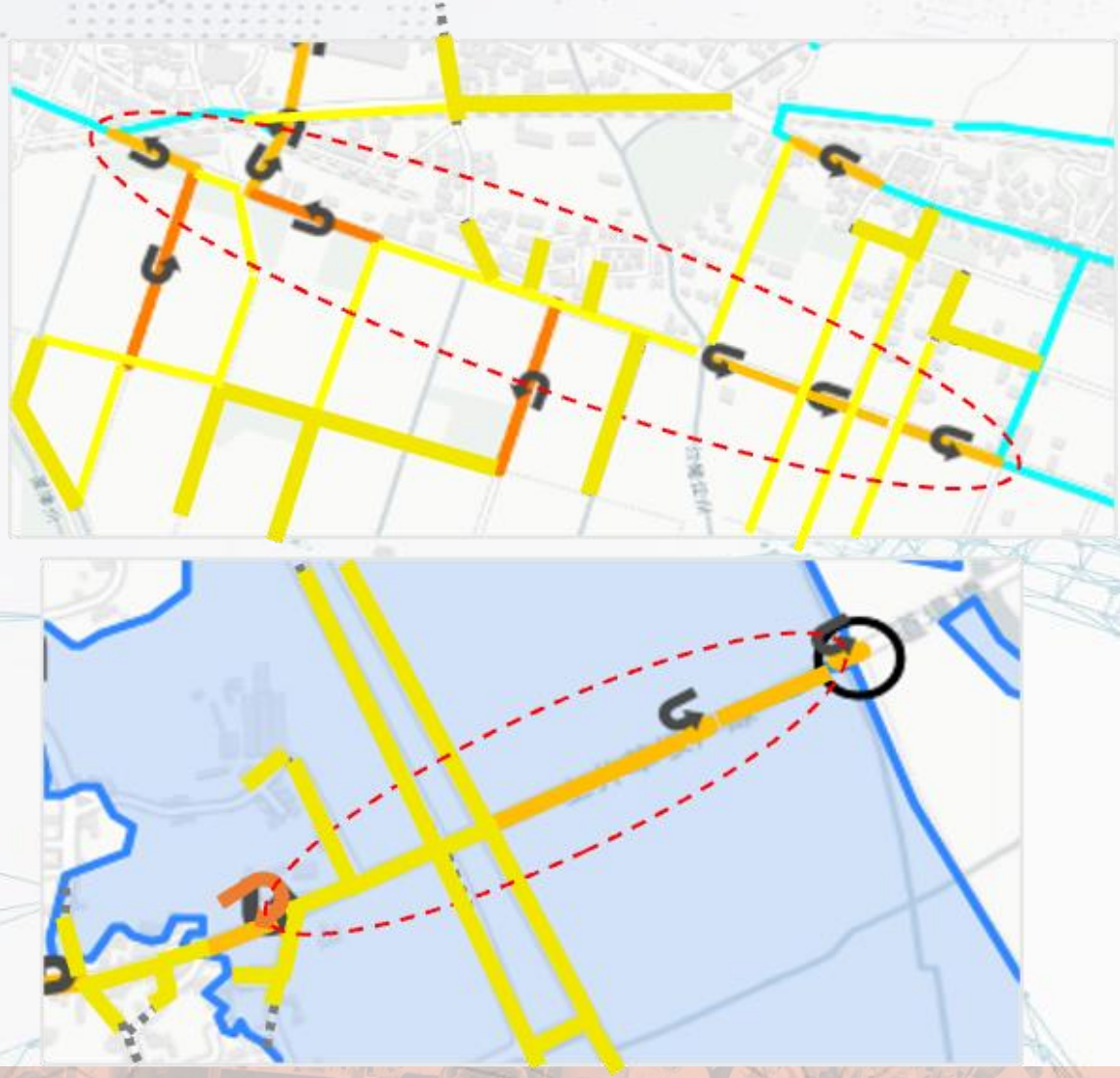



# Flood area analysis with TOYOTA

TOYOTA

# Examples of Our solution

X



# Utilization for vegetable distribution forecasting

Broadcasting cooking source commercials at a time when cabbage prices are falling correlates with higher product sales. Based on the amount of cabbage shipments predicted by satellite data analysis, we assisted an advertising company in developing a plan for broadcasting TV commercials.

**Supply chain**

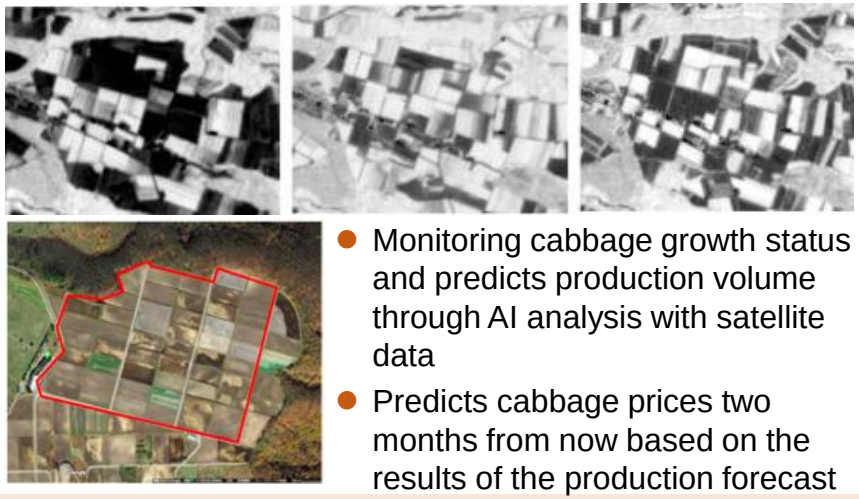
**Production**

**Harvesting**

**Logistics**

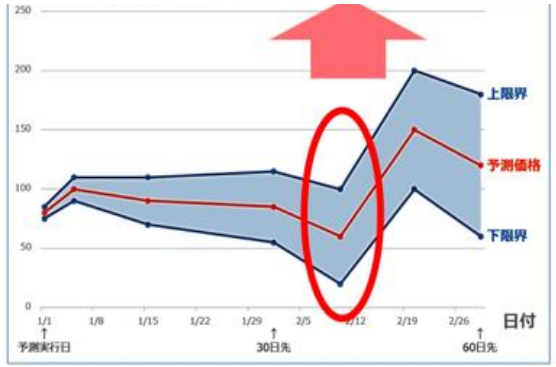
**Product marketing**

**Satellite data analysis**



- Monitoring cabbage growth status and predicts production volume through AI analysis with satellite data
- Predicts cabbage prices two months from now based on the results of the production forecast

**Predicting when cabbage prices are low and planning the timing of commercial broadcasting**




**Provides useful information to supply chain stakeholders in addition to advertising companies**

**Agricultural distributor**

Are there any areas that are likely to be overproduced?
How much area is planted?
How much area is being planted?

What is the production status of agricultural products related to your products?
I want to increase sales through efficient commercial placement.

cooking source company

In addition to determining when to place commercials, the ability to understand production conditions in other regions can be used to make decisions such as shifting the timing of your harvesting, planting, or shifting to other crops that are in high demand. And the optimization of the distribution of agricultural products contributes to the reduction of food loss.

# Utilization for vegetable distribution forecasting

- Total Production Forecasting for Primary Industries
- Production Volume Optimization/Distribution Control/Consumption control

Hyper Spectral | Optical | SAR

Total Production Volume

Optical | SAR

Harvesting status

Ground data

Market price

Ground data

Marketing products related to the crops

Feed back

Farmer

What is the situation in other areas?

When should we ship to maximize profit?

Distributor

Are there any areas of potential overproduction?

How many acres will be planted this year?

I want to monitor production status in real time.

Ad Agency

I need to predict the circulating price two months from now.

I want to make harvest forecasts that weather models cannot predict.

I'd like to plan and market an ad for a related product at a time when prices are going down.

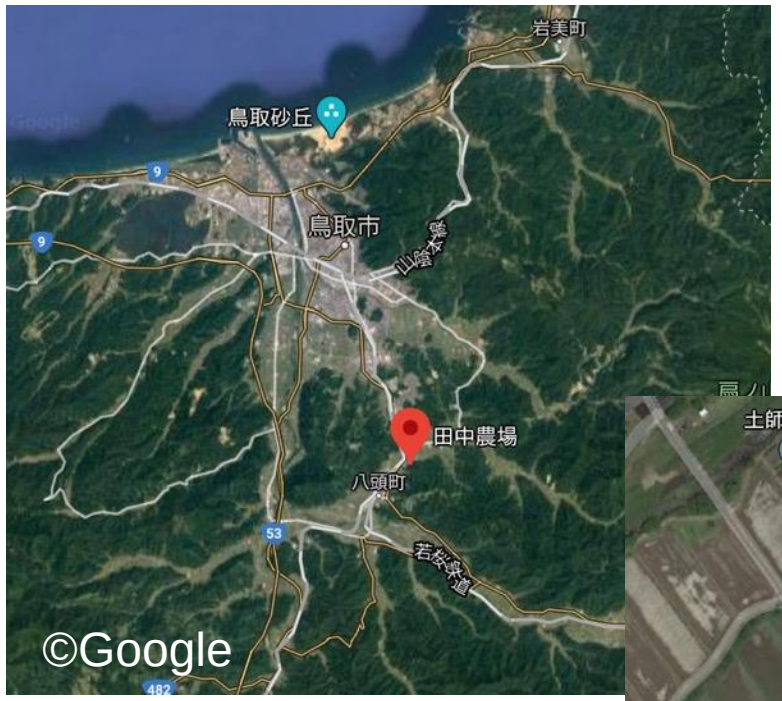
Food Company

I want to increase sales through efficient commercial placement.

**Utilizing Satellite Data Analysis Improving the Efficiency of Crop Distribution**

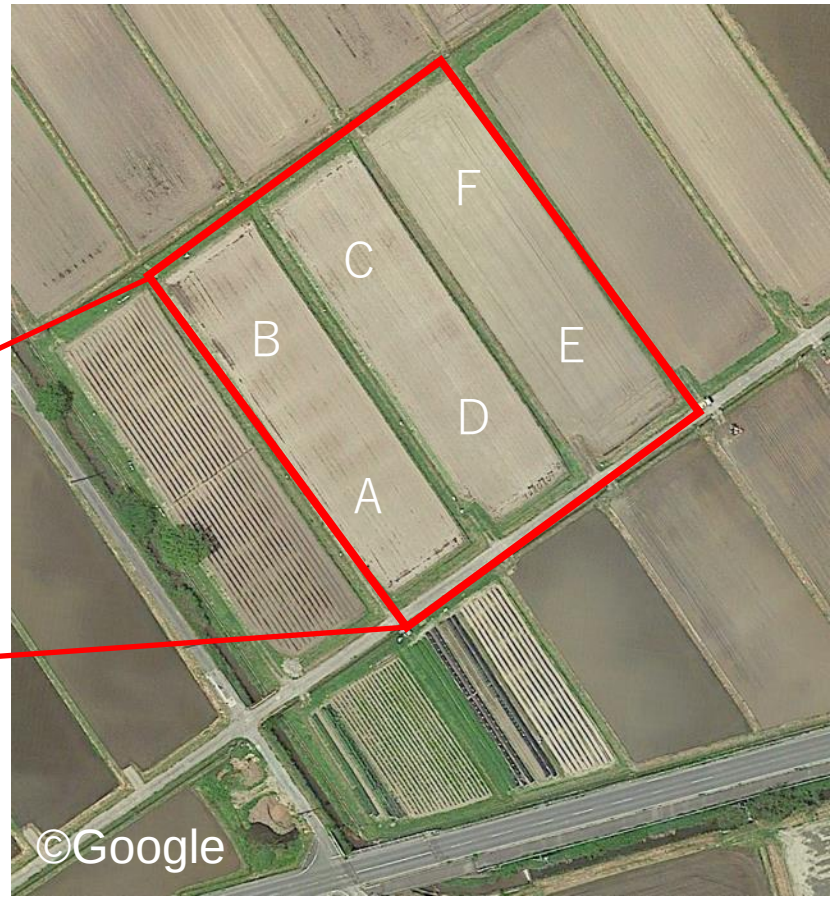
**Different use values for different stakeholders**

# SAR analysis of green onion growth using actual farm



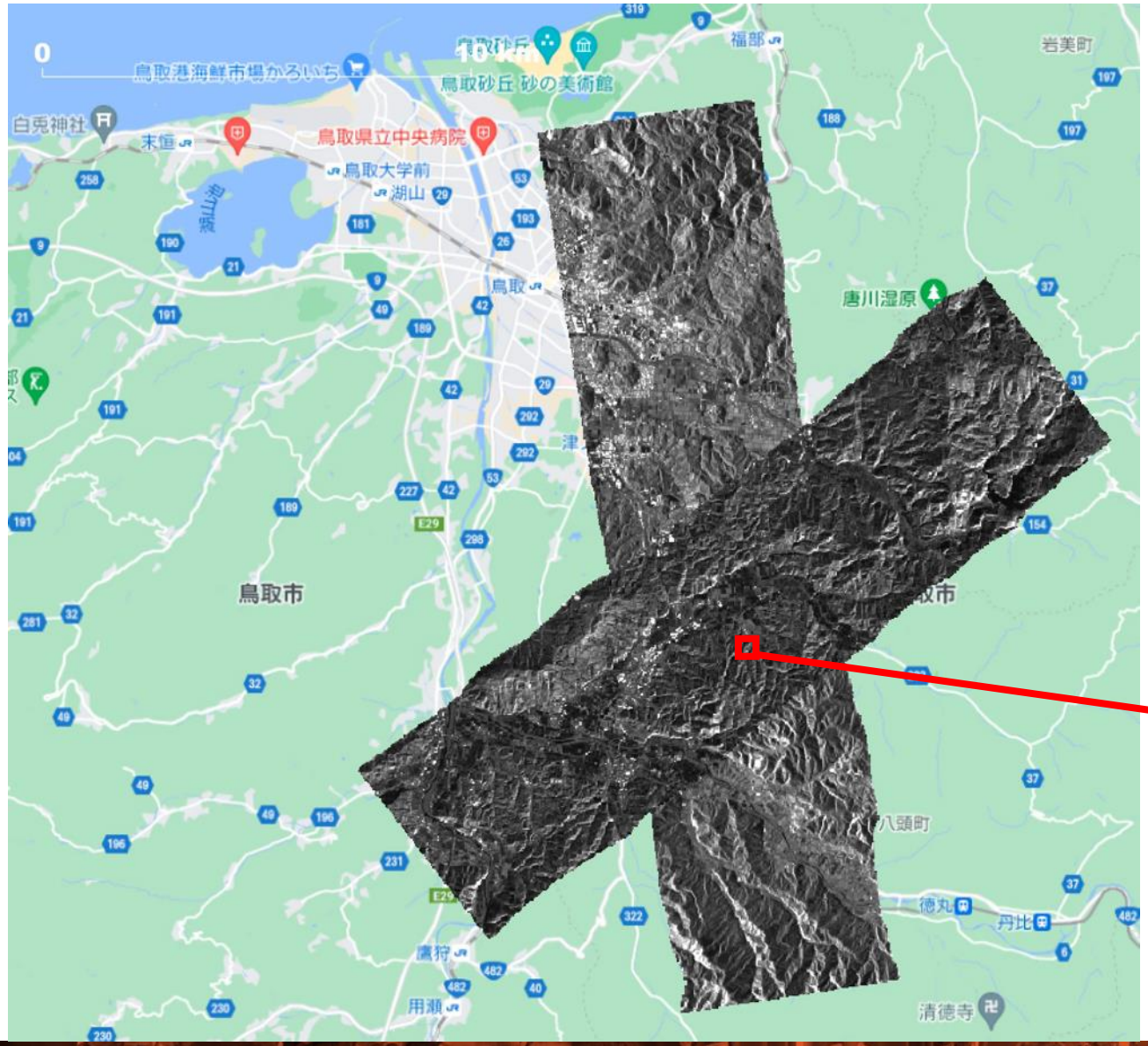

Tanaka Farm
田中農場

Observed field (Approx. 10,000m$^2$)

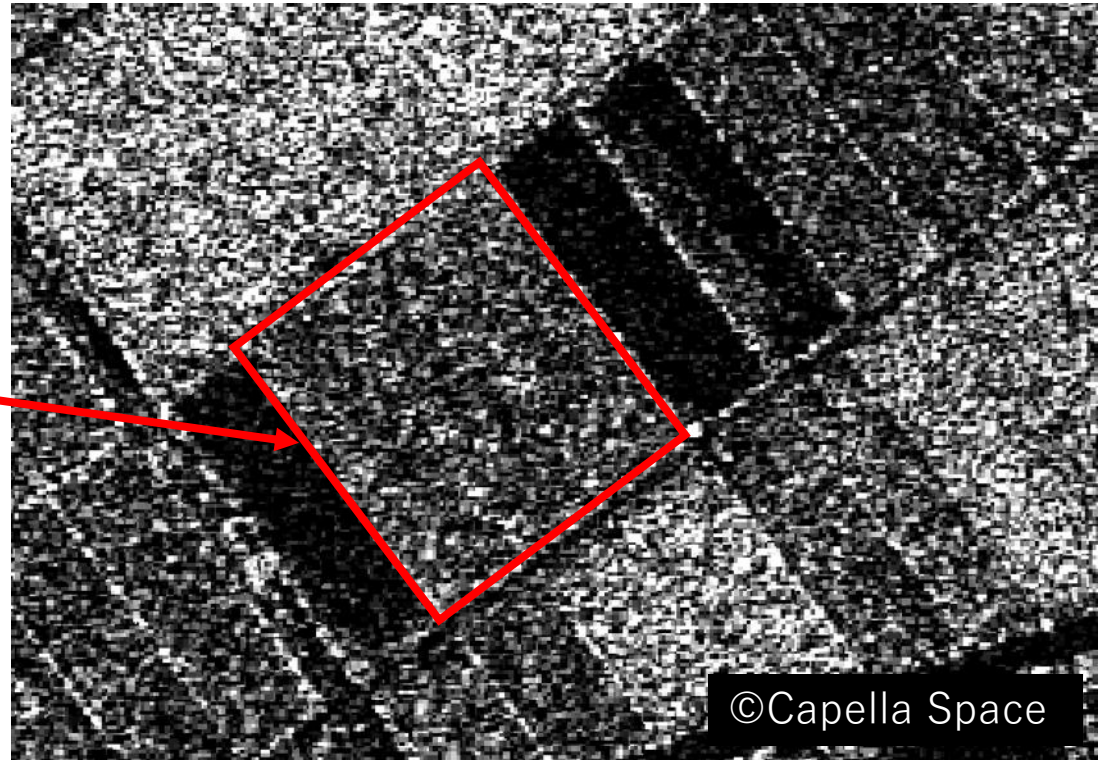



# SAR analysis of green onion growth using actual farm

SPACE SHIFT




Tasking with Capella Space
SAR satellite




3m GSD

# SAR analysis of green onion growth using actual farm

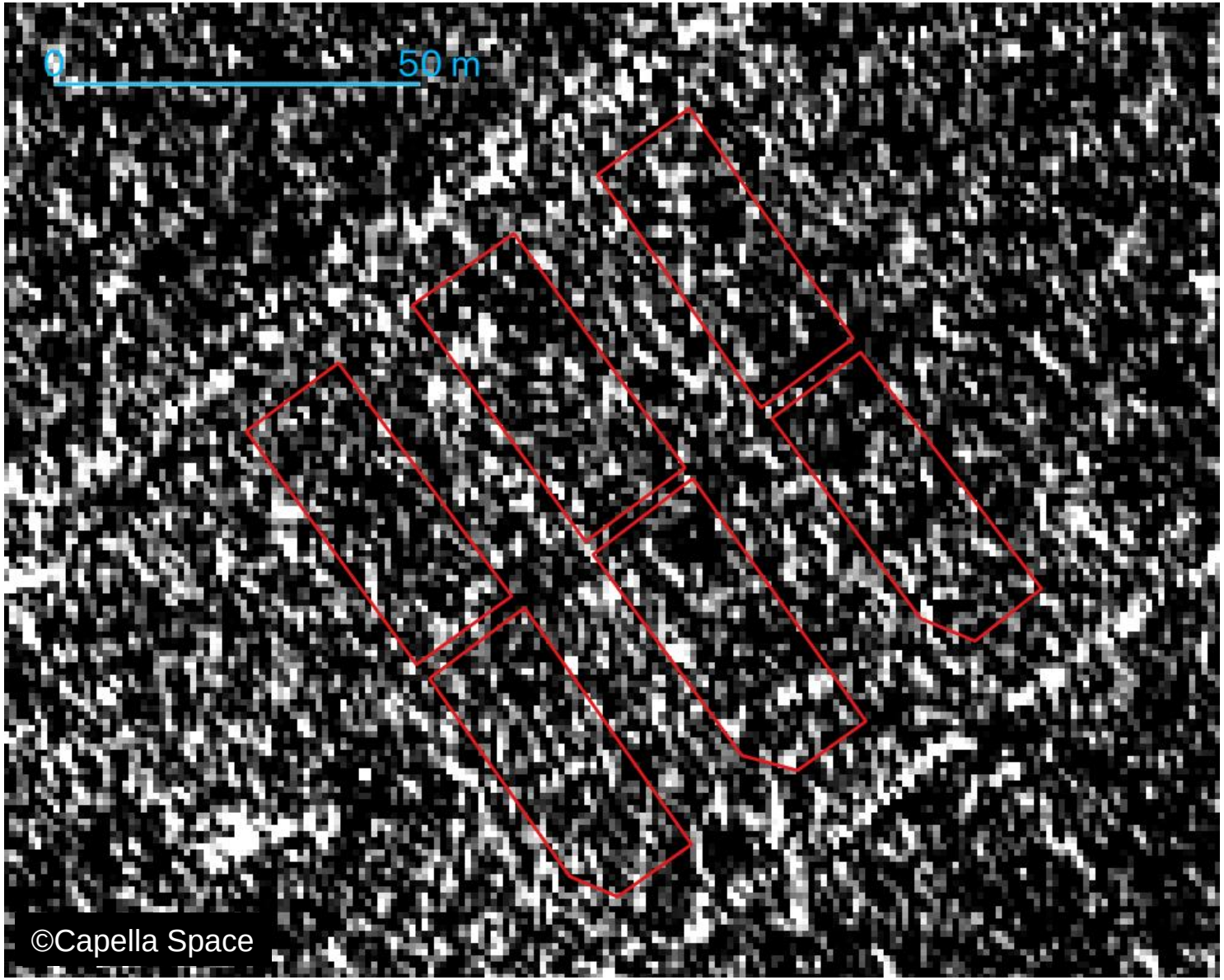
Measure and record the length and width

Measuring spectrum with a spectrometer to measure growth with leaf color

Take photo of the entire area from the tall pole near the field

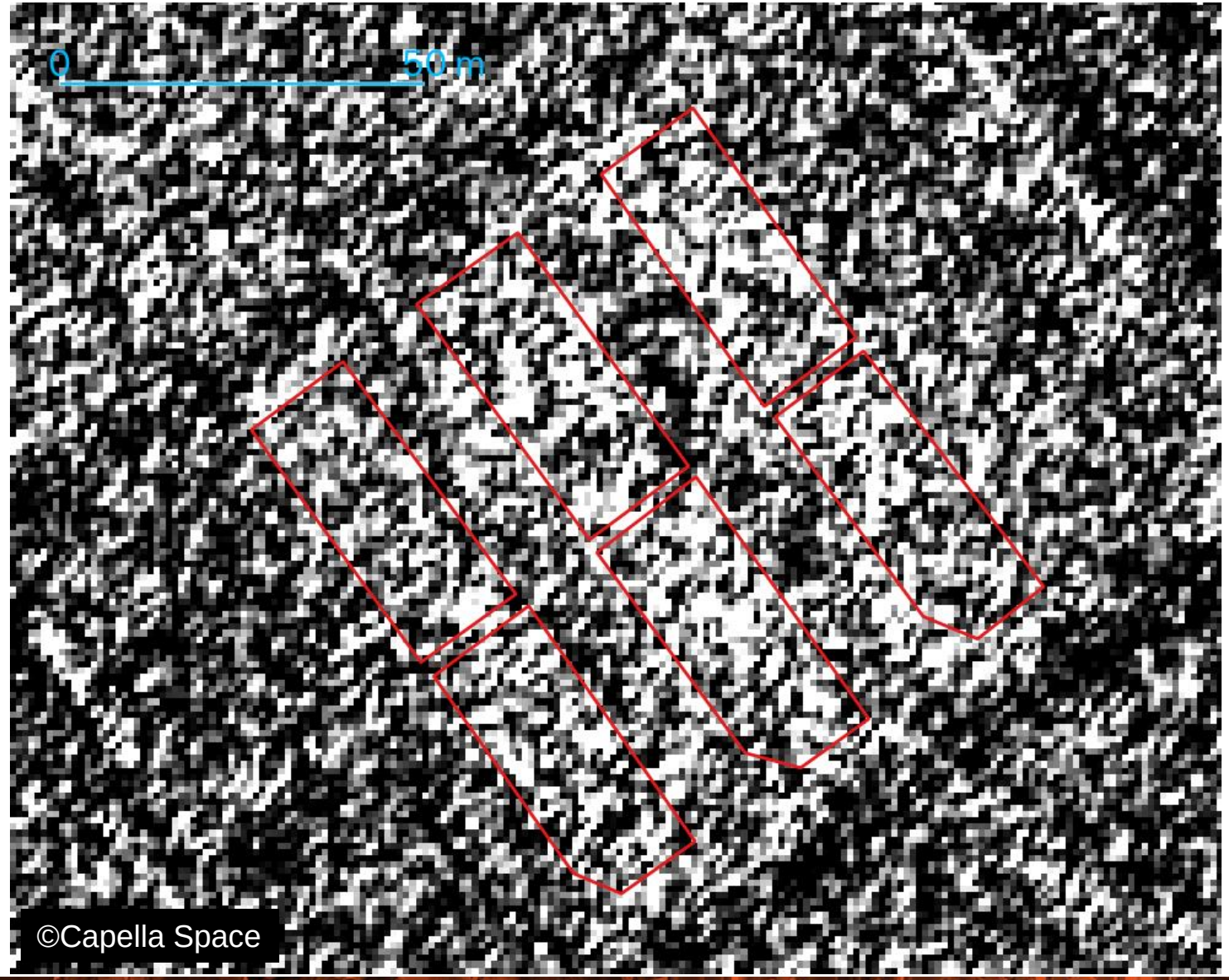
Taken photo

# Actual SAR image and ground photo(6/10)




←Pixels are darker in earlier stage

# Actual SAR image and ground photo(9/13)




← Pixels are coming brighter as the vegetable growth

# Utilization for vegetable distribution forecasting

# Utilization for vegetable distribution forecasting

SPACE SHIFT

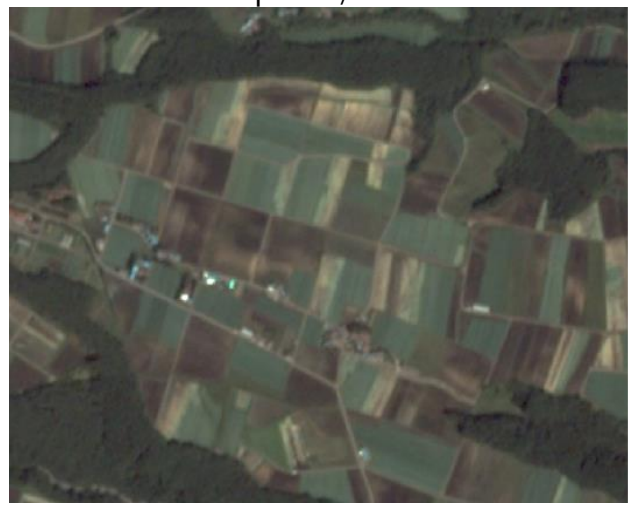
Growth of cabbage filed observed by optical satellite

Jun 20, 2017

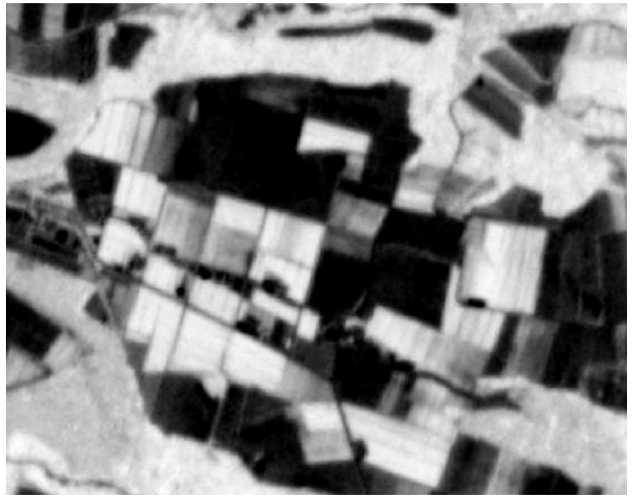
July 20, 2017

Just one data between these 2 periods

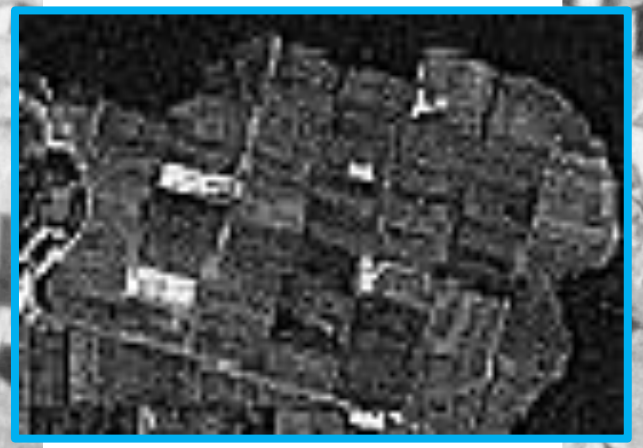
Sep 10, 2017

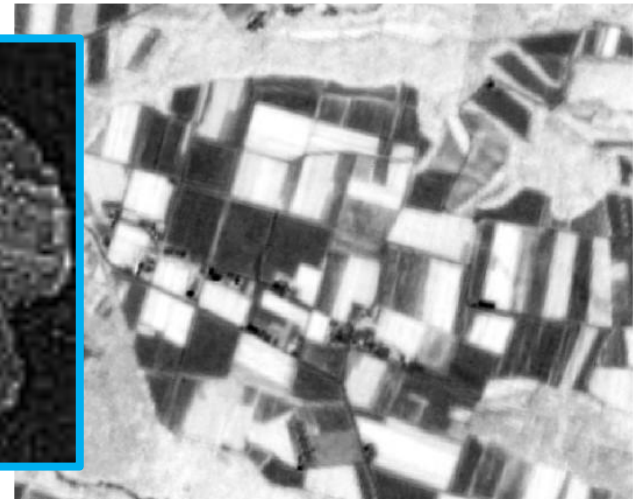


NDVI processed images



Interpolating with SAR data





# Thank you!

**Contact**
Space Shift, Inc. Founder / CEO
Naruo Kanemoto
kanemoto@spcsft.com