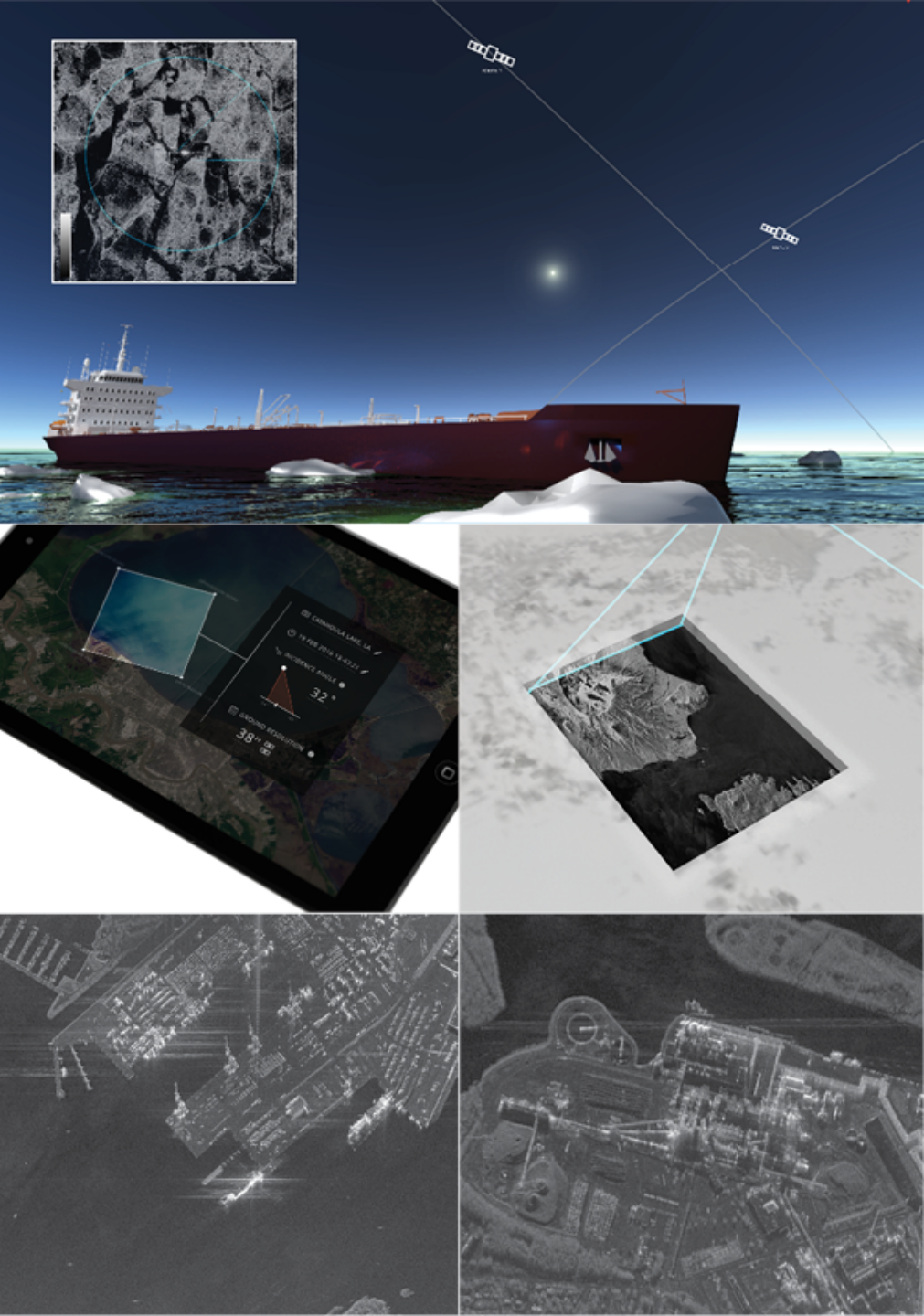




## 2nd AEC Top of the World Arctic Broadband Summit

New Developments in Synthetic Aperture Radar (SAR) and microsatellite systems

15.6.2017 // Tuomas Korpela // ICEYE Oy // Sales Director and Senior Advisor



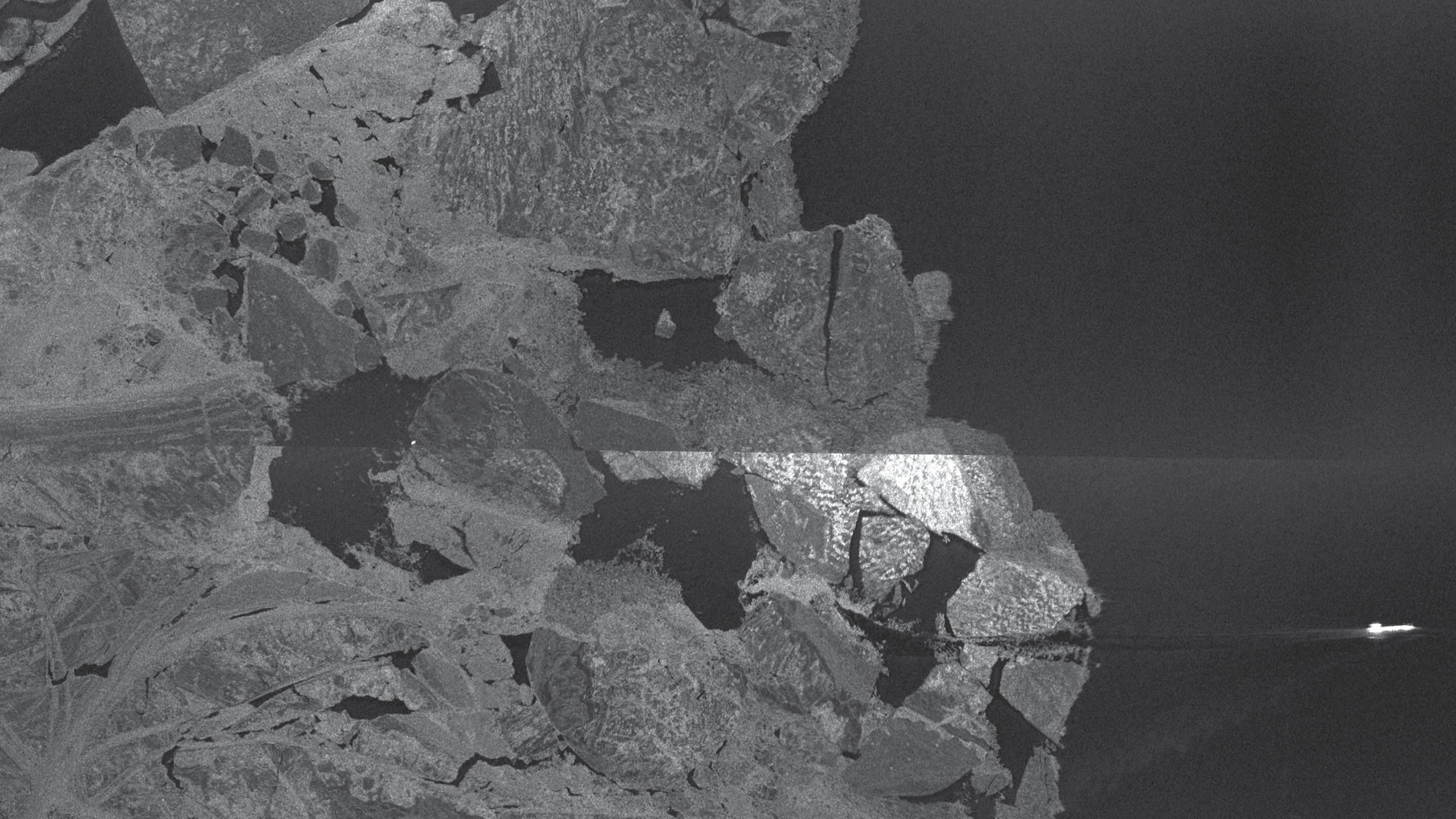
# ICEYE SAR imaging radar services

Unlike, optical camera based satellites, radar allows imaging through clouds and darkness

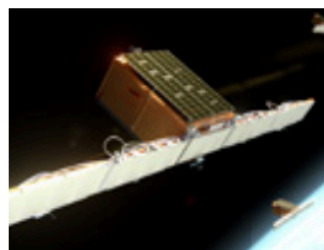
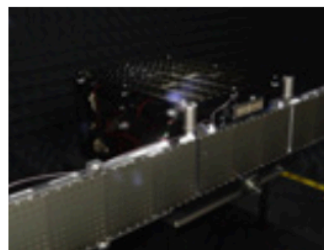
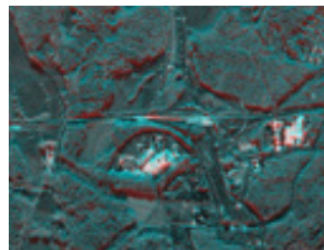
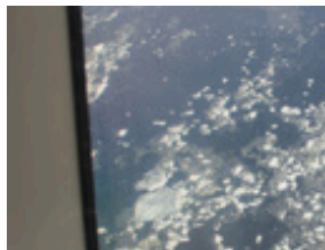
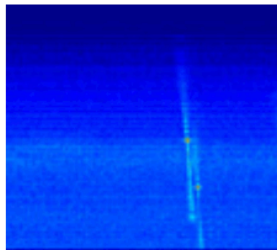
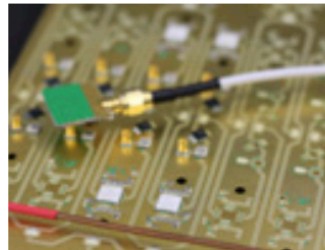
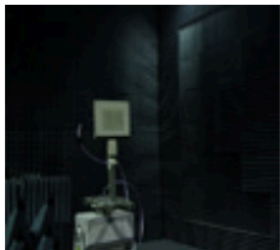
- Images are available 24-7-365
- E.g. emergency situations often happen in stormy conditions

**ICEYE**









2012 – 2014

2015

2016

2017

**A"** Aalto University  
Center for  
Entrepreneurship

**A!** Aalto University  
School of Electrical  
Engineering

**Tekes**



**true ventures**

**Founder.org**



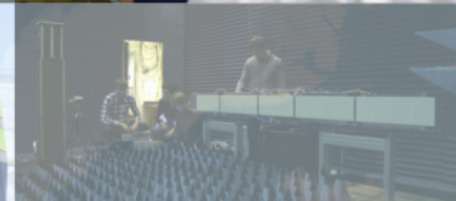
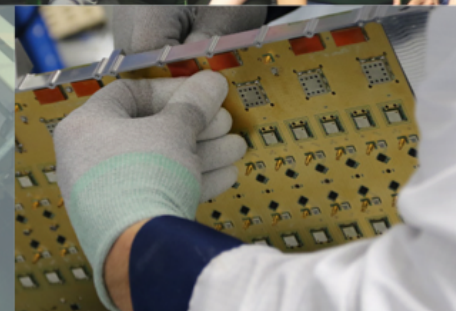
**ICEYE**



# Team & Background

We have 30-person engineering team composed of dynamic young talent and expert advice.

- Working on SAR technologies since 2012
- Spun out of university 2014
- Financed by Venture Capital and public grants



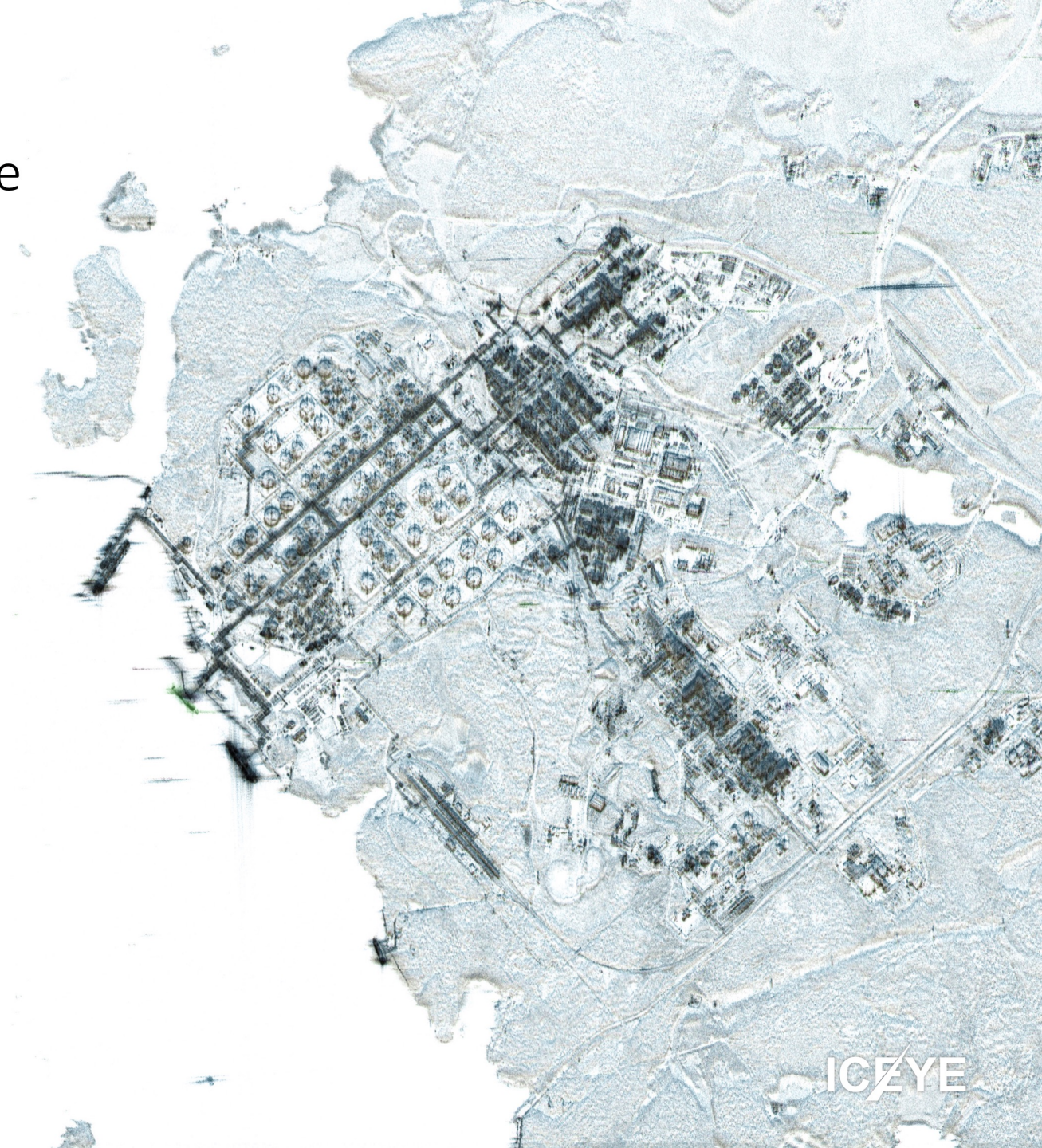


# Iceye delivers space-based intelligence faster and at a fraction of the cost

We provide Synthetic Aperture Radar (SAR) imaging and SAR-based information. With our assets, we can provide all-day and all-weather access anywhere on the globe.

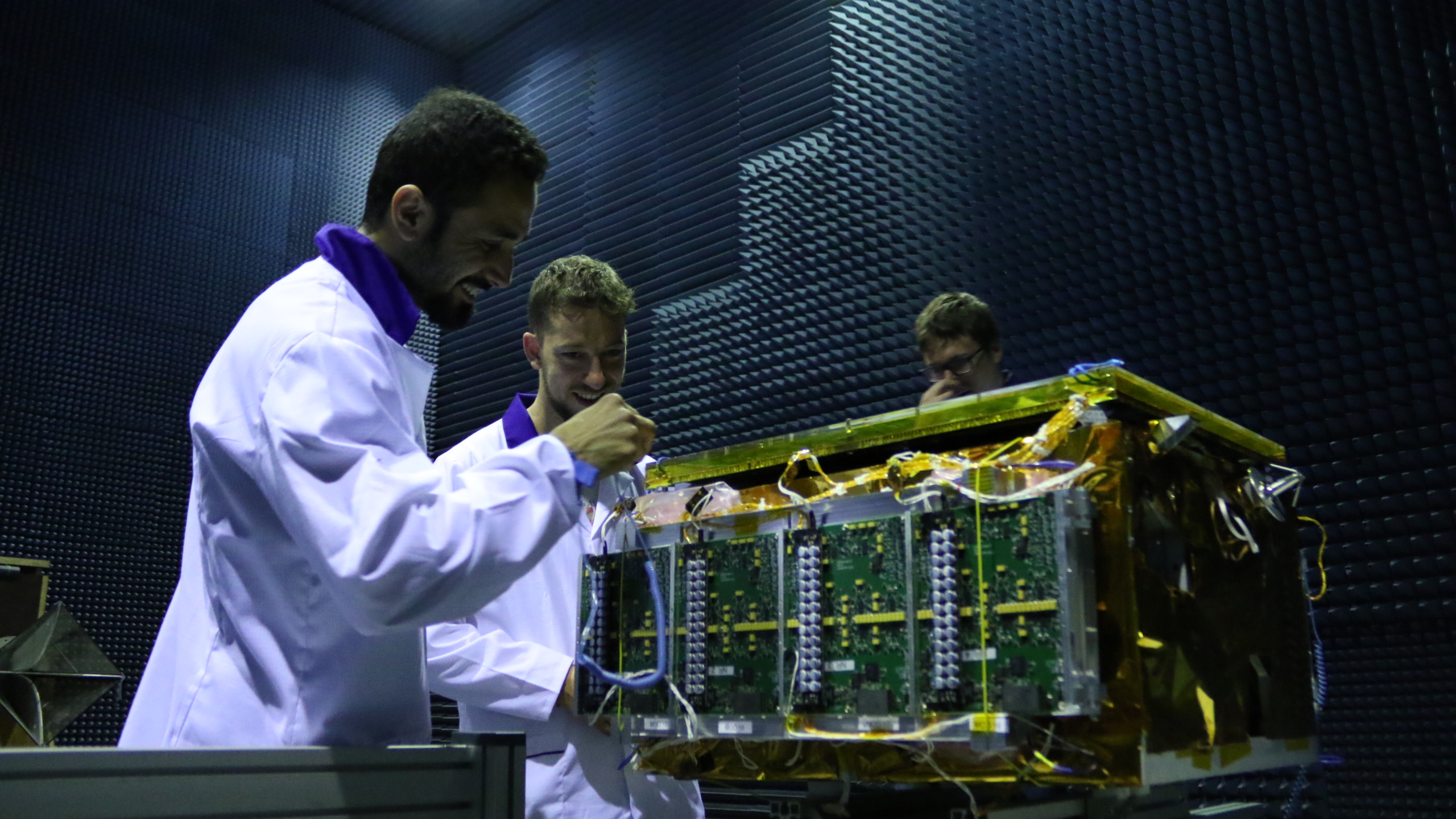
Iceye's constellation of SAR microsatellites enables

- Quick access
- Frequent revisits
- Large area coverage



ICEYE







# New approach to space technology



ICEYE  
0.4x0.4x3m  
~50kg

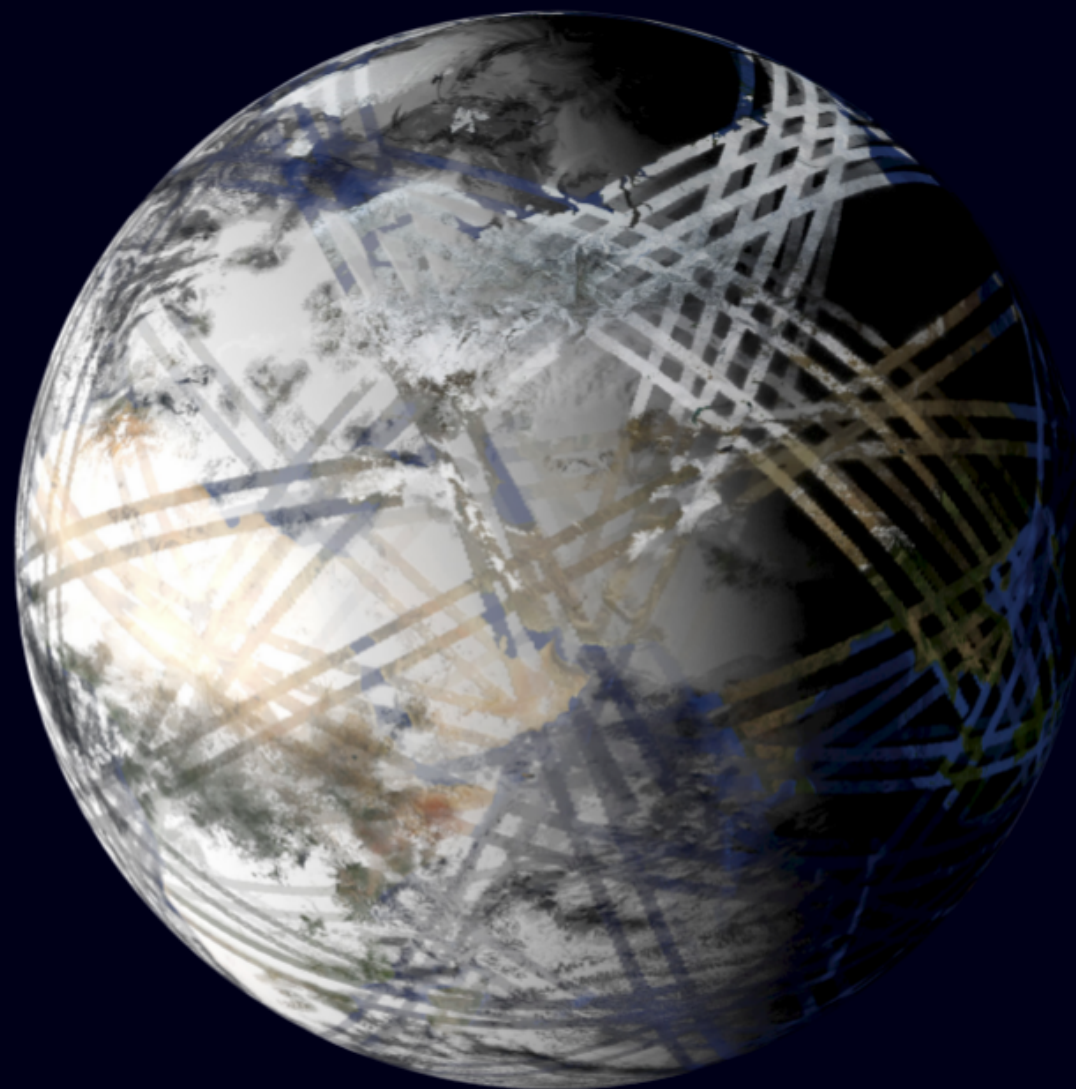
Off-the-shelf components and small size  
**100x lower cost per unit**

Building satellites with standard off-the-shelf electronics is possible. Trading off small amount of reliability and lifetime allows for dramatic reduction of cost and quicker technology update cycle.



Microsatellite constellation  
**Near real-time imaging with down to 1h response**

Low cost of single unit makes it possible to create constellations of tens of satellites enabling massive improvement in temporal resolution.





Worldwide Use Case Examples – 50 km x 100 km image size, 3 m resolution, 2–4h refresh interval

## FREQUENT IMAGING



Ship tracking for illegal fishing  
Governmental organizations



Tactical sea ice monitoring  
Oil / shipping industry



Oil spill monitoring  
Governmental organizations



Logistics activity monitoring  
Hedge funds / Shipping

## QUICK RESPONSE



Disaster relief mapping  
Governmental organizations



Flood damage prevention  
Insurance industry



Business impact assessment  
Financial industry



Search & Rescue  
Shipping / governmental

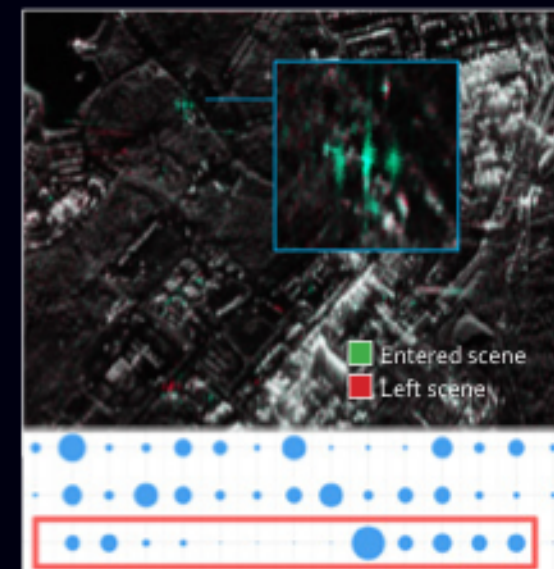
IoT style delivery: End-user / B2B partner will access ICEYE constellation via Web-interface & API



USER GUI and API FOR  
CONSTELLATION TASKING

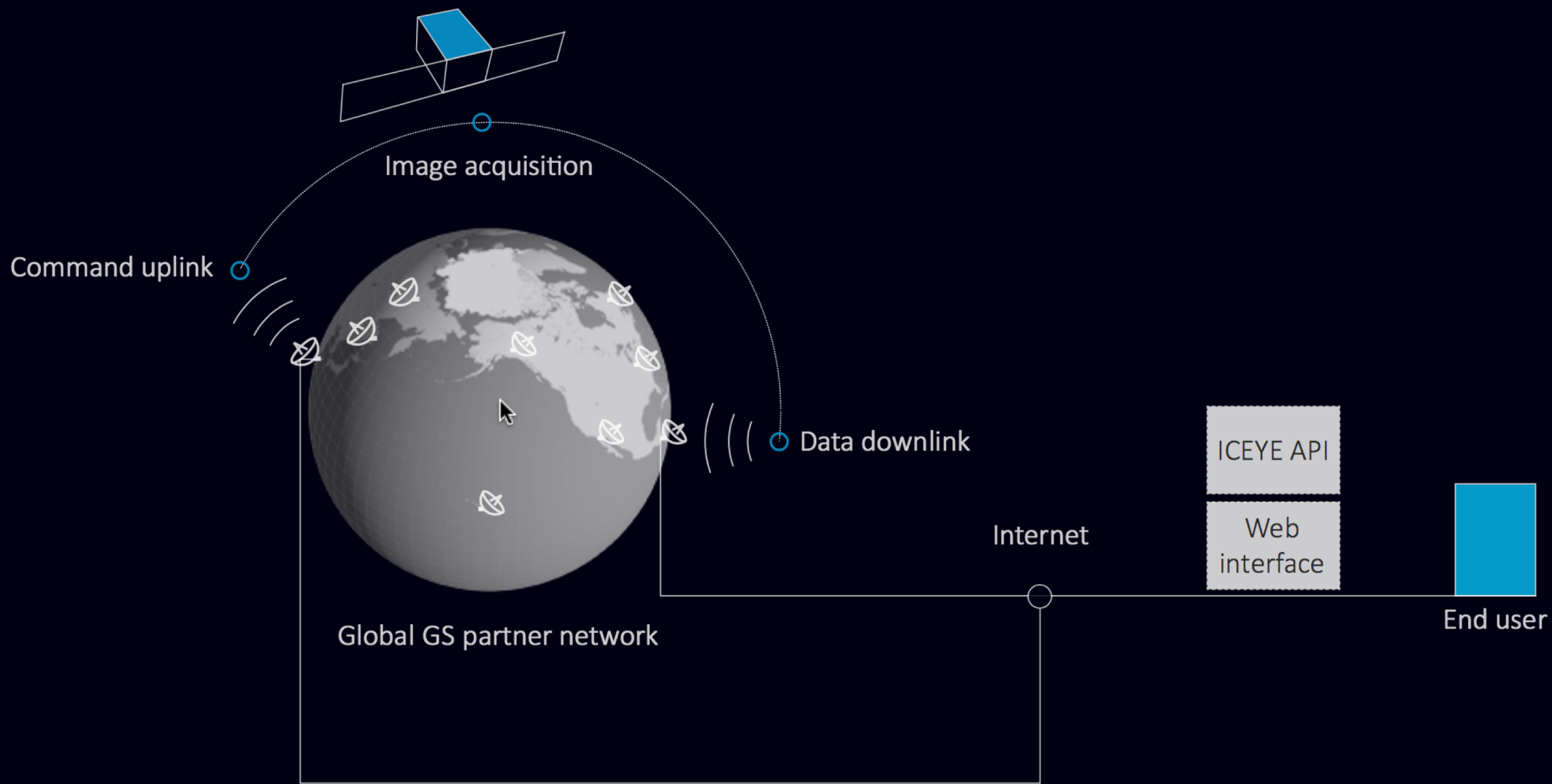


NEAR REAL-TIME IMAGE  
DATA & PLATFORM



ANALYTICS &  
INFORMATION PRODUCTS





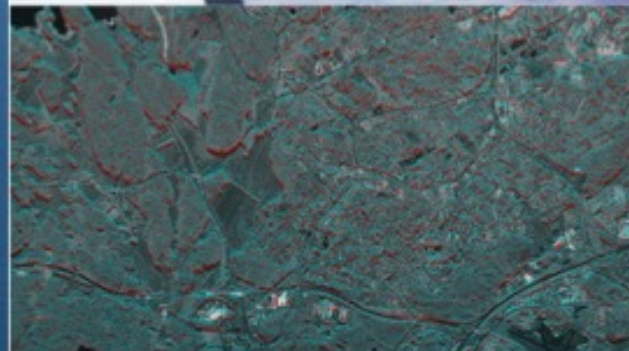
End-to-end encryption



# COMPANY - Technology

## AERIAL TESTING PROGRAM

Multiple airborne installations of the Iceye SAR instrument have been flown, effecting faster iterations, and ultimate confidence in the instrument and data processing chain functionality.

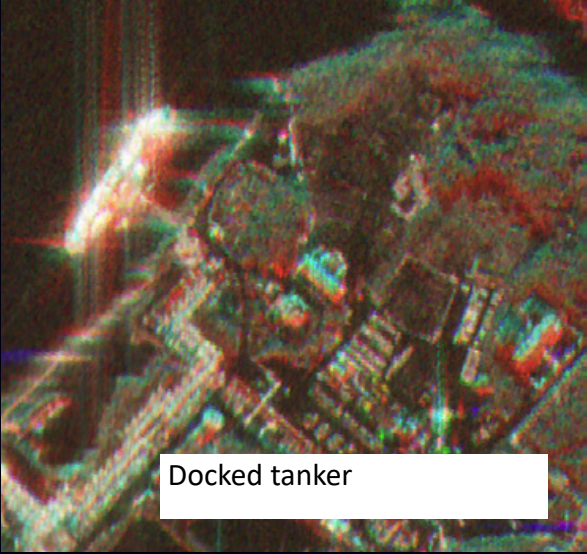


CONFIDENTIAL

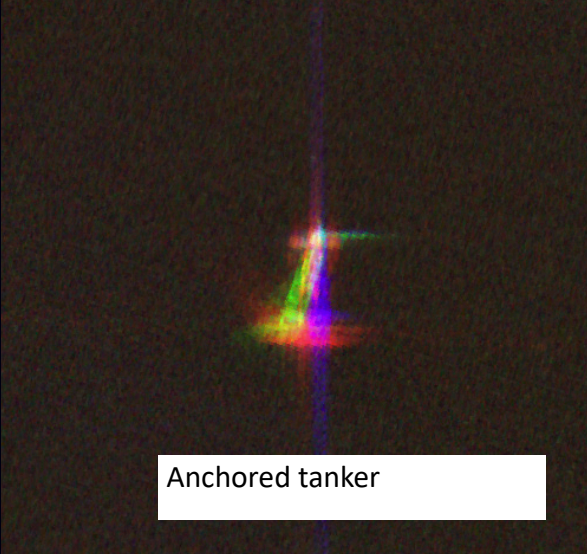


High temporal resolution / multitemporal data

(ICEYE proto SAR flights @ 40,000ft, 170m/s)



Docked tanker



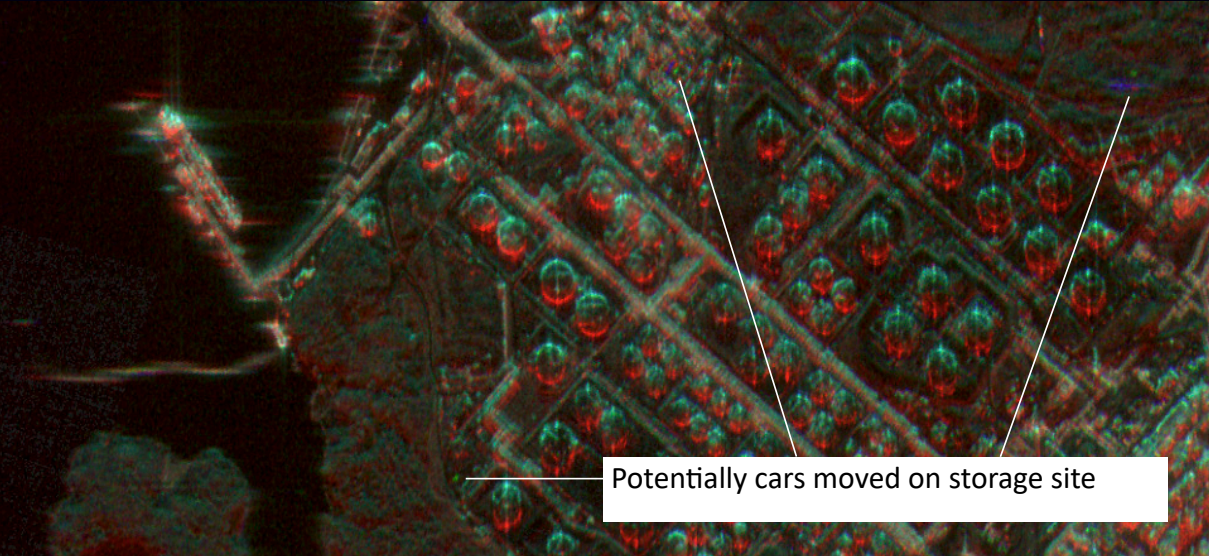
Anchored tanker



No change in cars parked



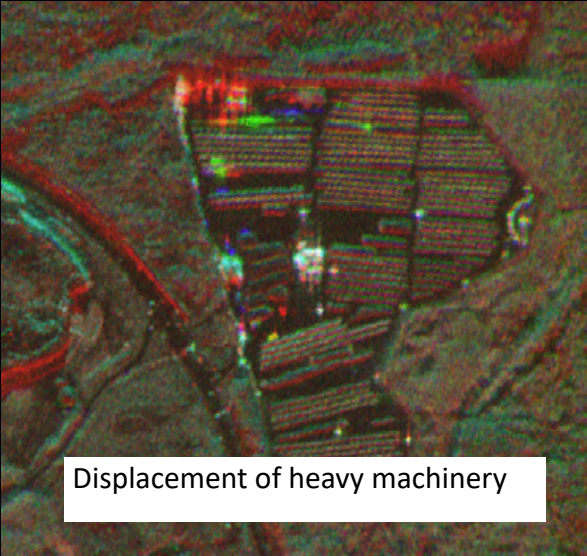
Trucks leaving terminal



Potentially cars moved on storage site



No major activity at work site



Displacement of heavy machinery





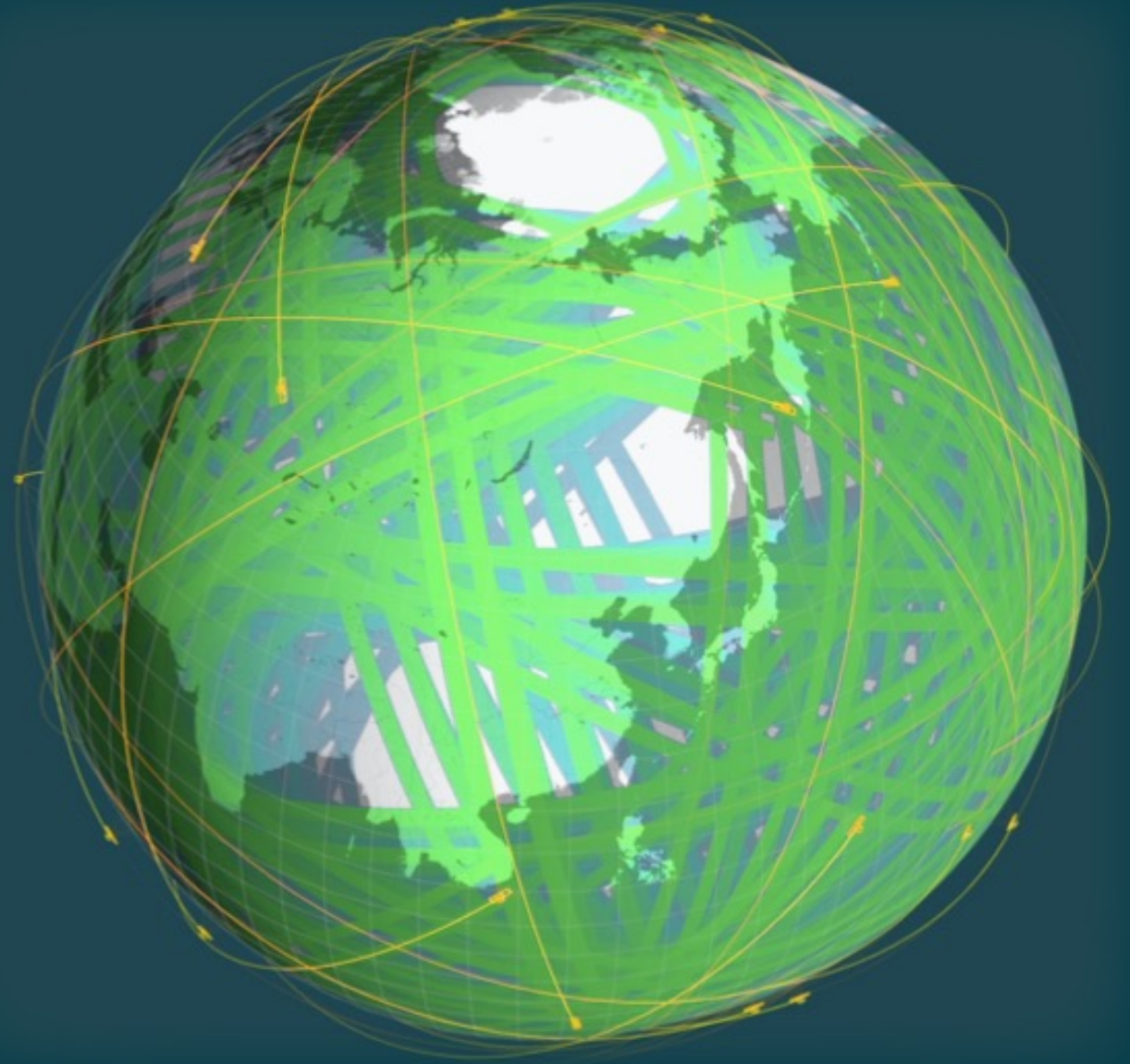


# Constellation performance

We are launching a constellation of 18 satellites, starting with 3 Phase 1 satellites 2017-2018.

Full constellation performance:

- Global response / revisit of 3h
- 50x100km frames at 3x3m resolution
- 1500 acquisition in a day

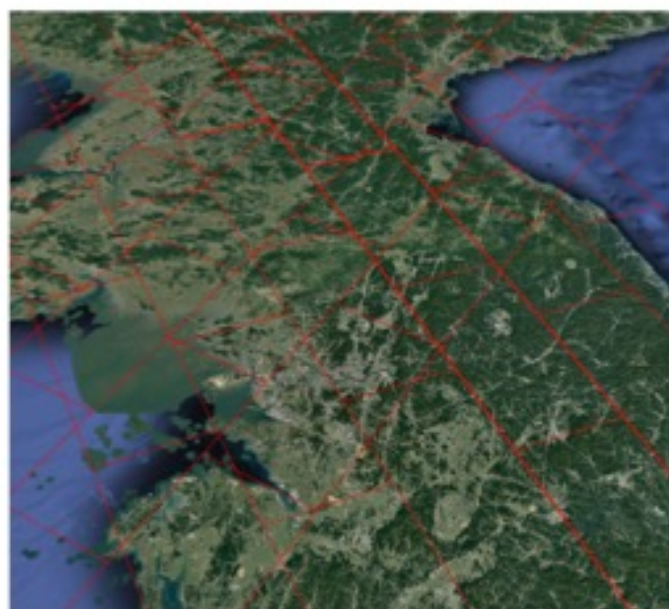




## Example capabilities

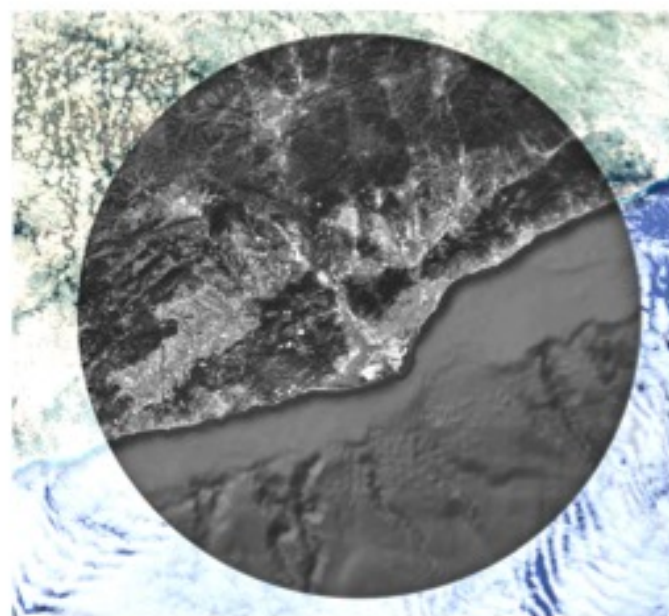
### Mosaic capture

Cover an entire state like California twice a day at 3m resolution



### Spot area capture

Capture 100+ target areas every 3 hours or perform new acquisition of arbitrary target within one hour of request



### Persistent monitoring

A set of population centers collected for archive access

City	Avg time between acquisitions
Tokyo	2.4h
Singapore	2.4h
Moscow	2.5h
Barcelona	2.1h
New York	2.1h

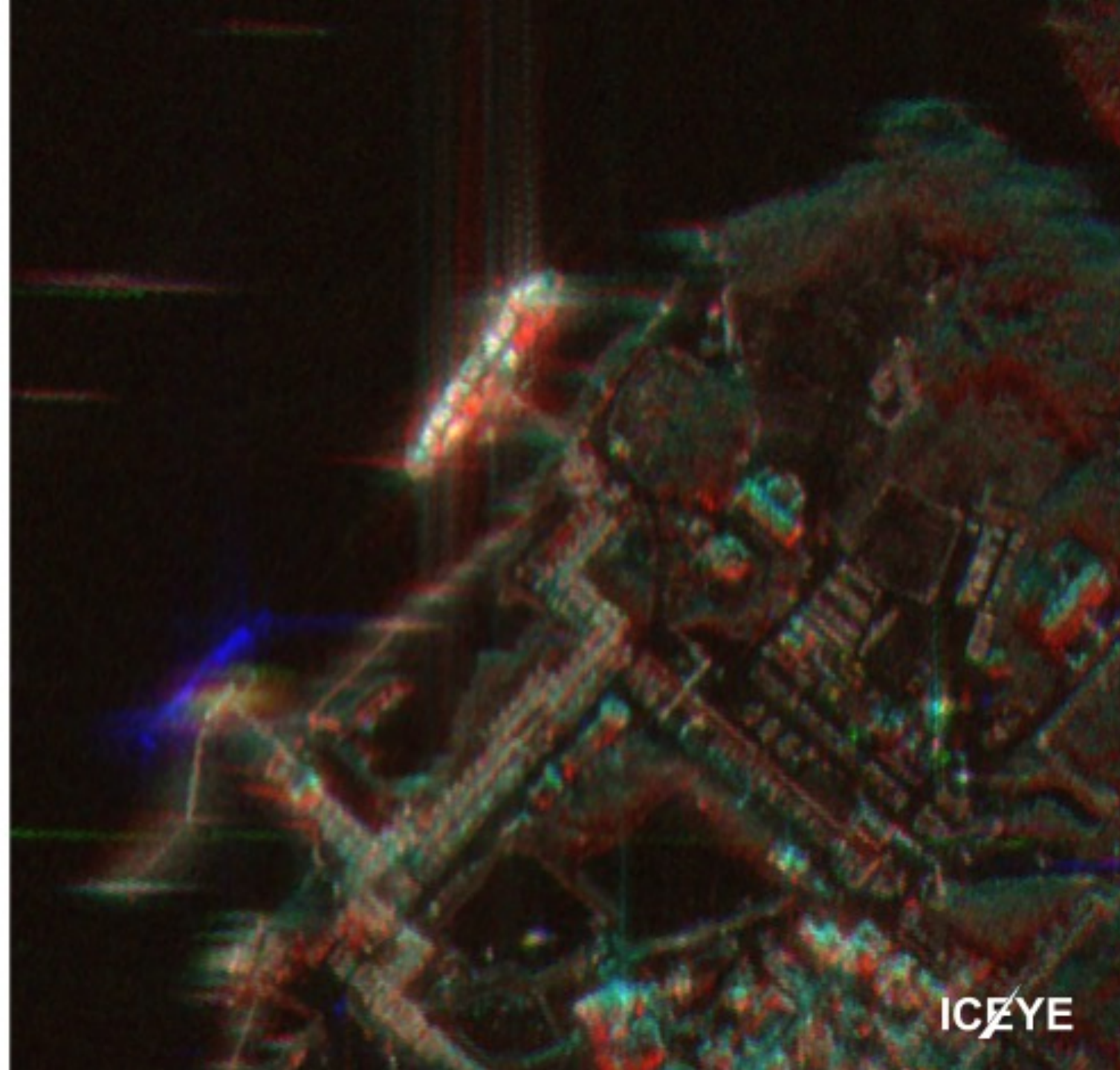


# SAR data analysis

Demonstrated Deep Learning  
implementations

Full constellation performace:

- Change detection
- Activity monitoring
- Day/night activity variation
- Life patterns analysis





# Timeline

- 1st launch 2017
- 3 first satellites within 2018
- 18 satellites by 2020
- < 1m ground resolution starting from 2020

