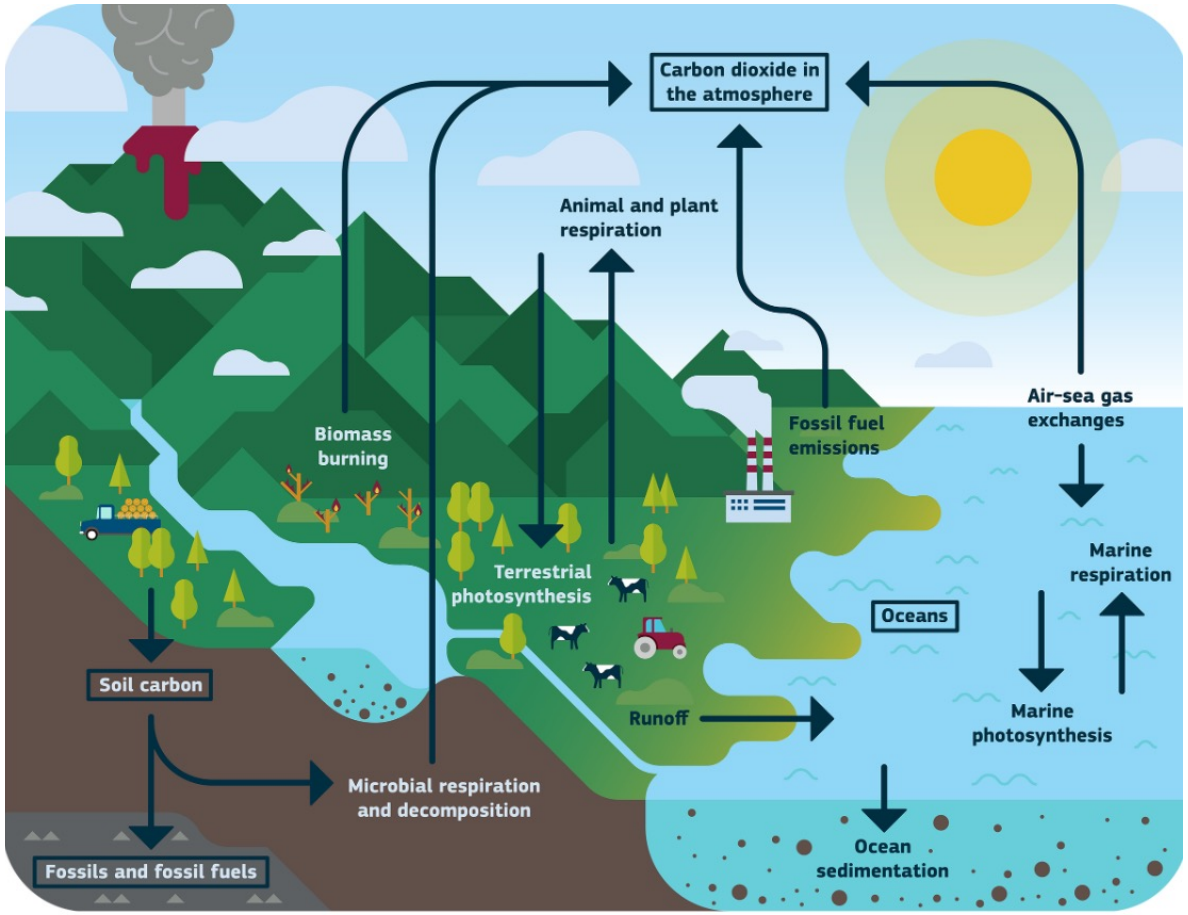
SATLANTIS

Space Technology for Methane Detection

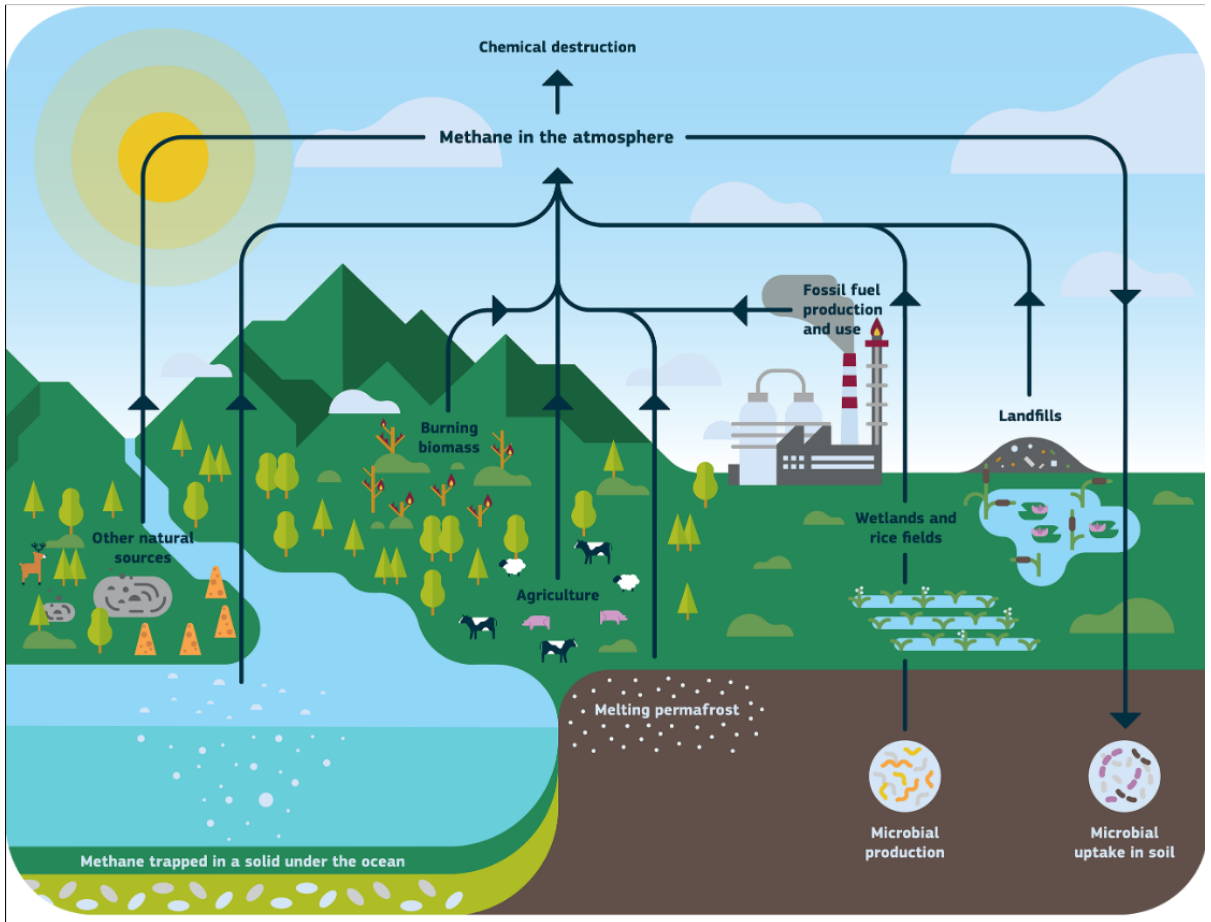
Rotterdam, May 4th 2023

GHG contamination

CO2



CH4



Methane An Overview

25% of today's global warming [1]

is estimated to be caused by anthropogenic methane emissions

2nd most abundant GHG, after **CO2**

AGRICULTURE & LIVESTOCK	FOSSIL FUEL OPERATIONS	LANDIFLLS & WASTE	BIOFUELS & BIOMASS
24%	20%	11%	6%

[2]

Oil & Gas

Transmission, Storage and Distribution stages are significant contributors to supply chain emissions

Emission sources

- **Vents** from pipework, compressors and gas-driven pneumatic devices.
- **Methane leaks** (*e.g., in the US the gas transmission network comprises 485,000 km of pipelines*)

[1] UNEP
[2] Global Methane Assessment

Methane The Challenge

Impact on Climate Change

Methane is the ***second most abundant*** GHG after CO_2.

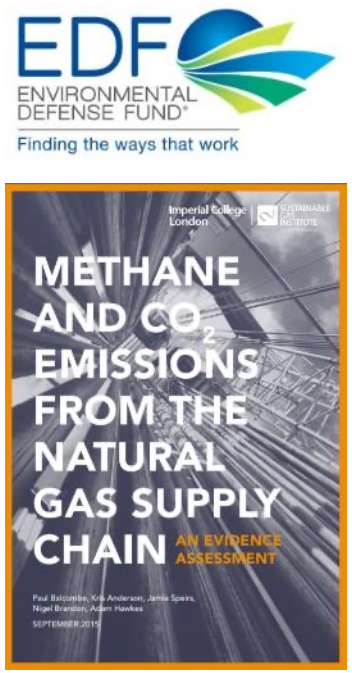
It is *more efficient at trapping radiation than CO_2.* ***~80x more powerful than CO2*** in a 20-year period due to its lifetime in the atmosphere.

Impact on International Policies

Methane emissions ***reduction is a priority*** for Governments & Environmental Agencies.

Large uncertainties

- 60% of CH4 comes from human activity (~1/3 from fossil fuels)
- Emission measurements remain ***highly uncertain***.
- Issue highlighted by high impact science studies (from top international institutions).



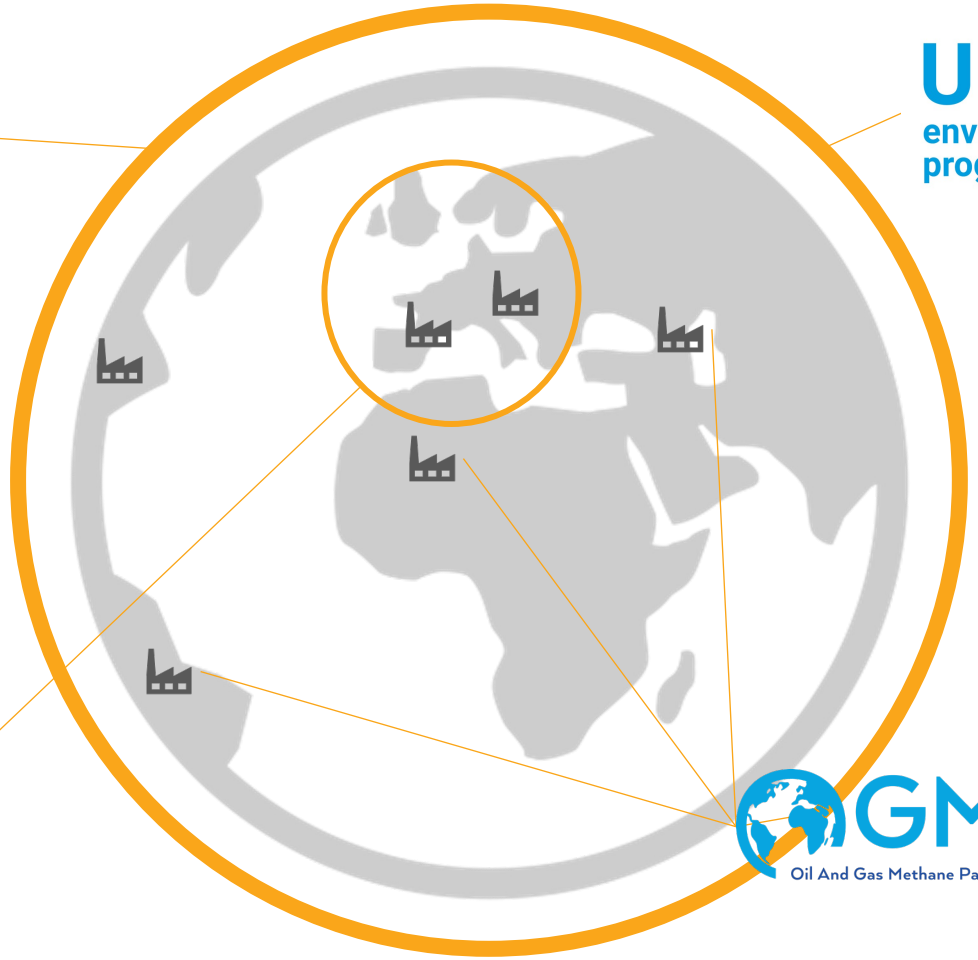
Methane Regulation

COP27

Global Methane Pledge

30% CH_4 emissions reduction by **2030**

Global Methane Pledge



UN environment programme

IMEO

Full public transparency on emissions

gather data from**:**

- OGMP 2.0 reporting
- Scientific studies
- **Remote sensing data**
- National inventories

The EU **strict rules** to reduce GHG emissions and become **climate-neutral by 2050**

European Commission

OGMP Oil And Gas Methane Partnership 2.0

OGMP (2.0)

Measurement-based **reporting framework**

WHY SATELLITES for Methane?

Methane Monitoring

Recurrent measurements

Regular revisits of the same target as the satellite orbits the Earth, increased with the agility mode

Large scale observations

Surveillance of large areas of the Earth surface in a single snapshot, thanks to high altitudes and suitable detectors

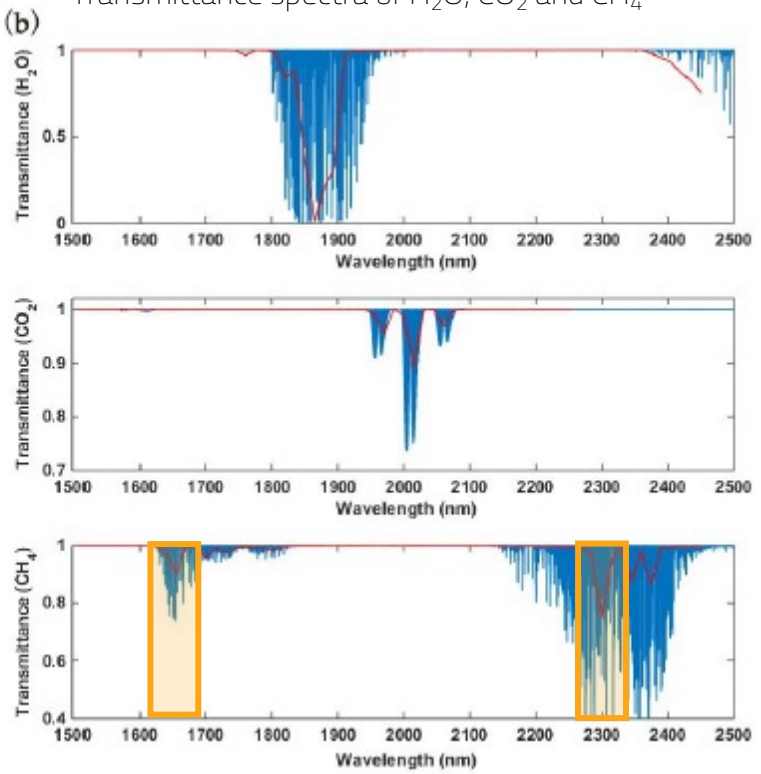
Remote areas

Its global coverage enables observing geographic areas difficult to access or far from urban areas

HOW?

Need for **deep absorption bands** with **minimal interference** from other components (H2O, CO2…)

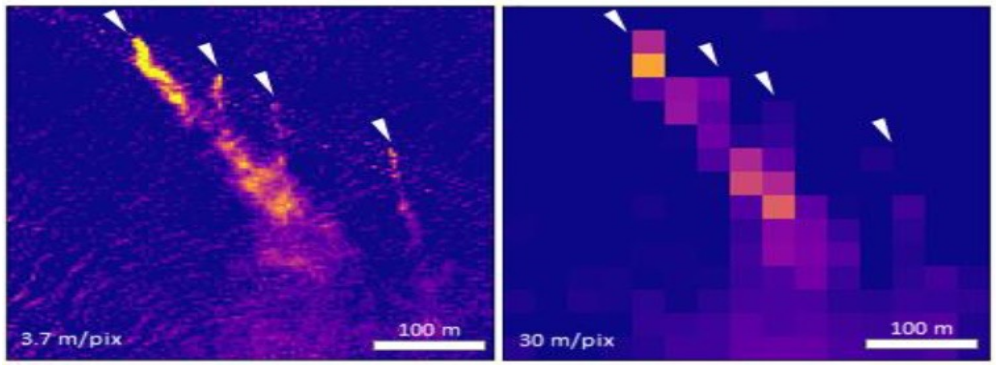
Transmittance spectra of H_2O, CO_2 and CH_4 [1]



Methane is detectable by its absorption of radiation in:
SWIR: around **1.65µm and 2.3µm**

[1] Xiao et al. 2020

We can measure Methane



METHANE

CH4

1660 nm

Current spectral range: **450 -1700 nm**
Up to **2500nm** under Development

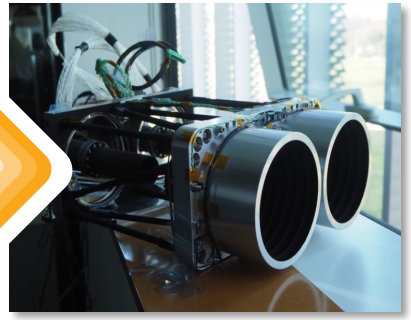
Increased resolution permits accurate measurement

1600 nm

1700 nm

Passion for Space and Excellency

SATLANTIS is a Spanish technological SME funded in 2014, supported by a strong **Public-Private alliance.**



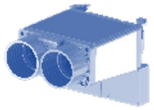
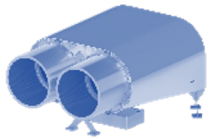
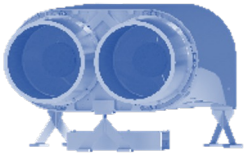
We focus on the **language of light,** capturing **critical spectral information** through software, hardware and services for **remote sensing applications**

We build Small Sat Full Solutions, around the iSIM-technology, to answer **End-users' needs and challenges**

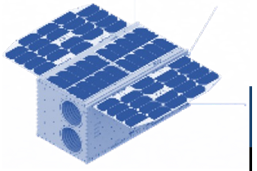
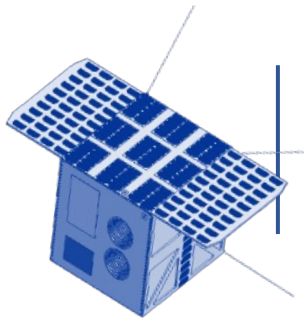
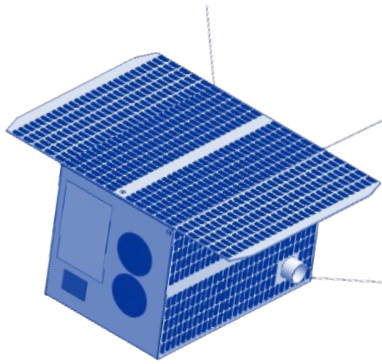
SATLANTIS

iSIM family Portfolio

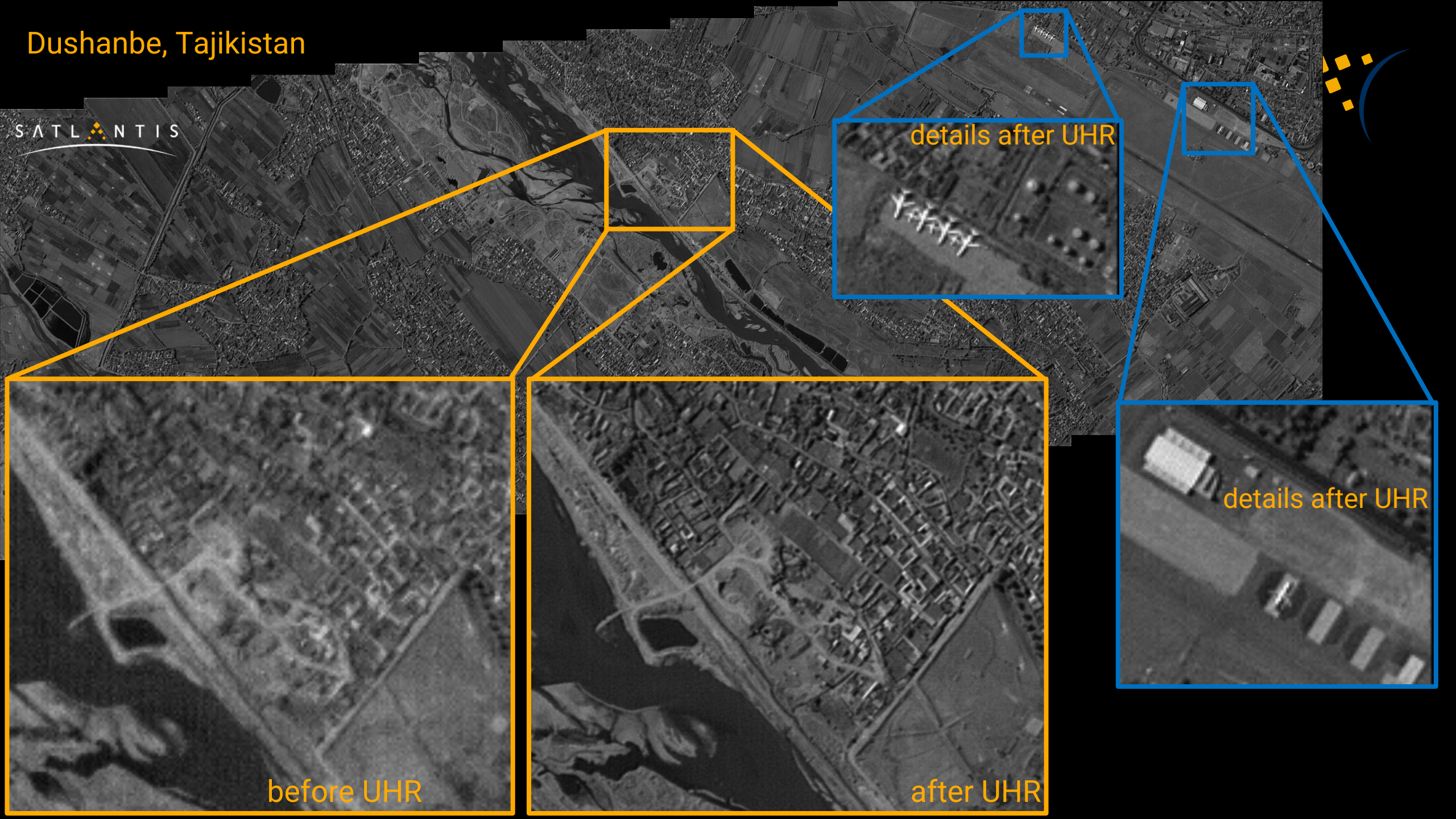
PAYLOADS

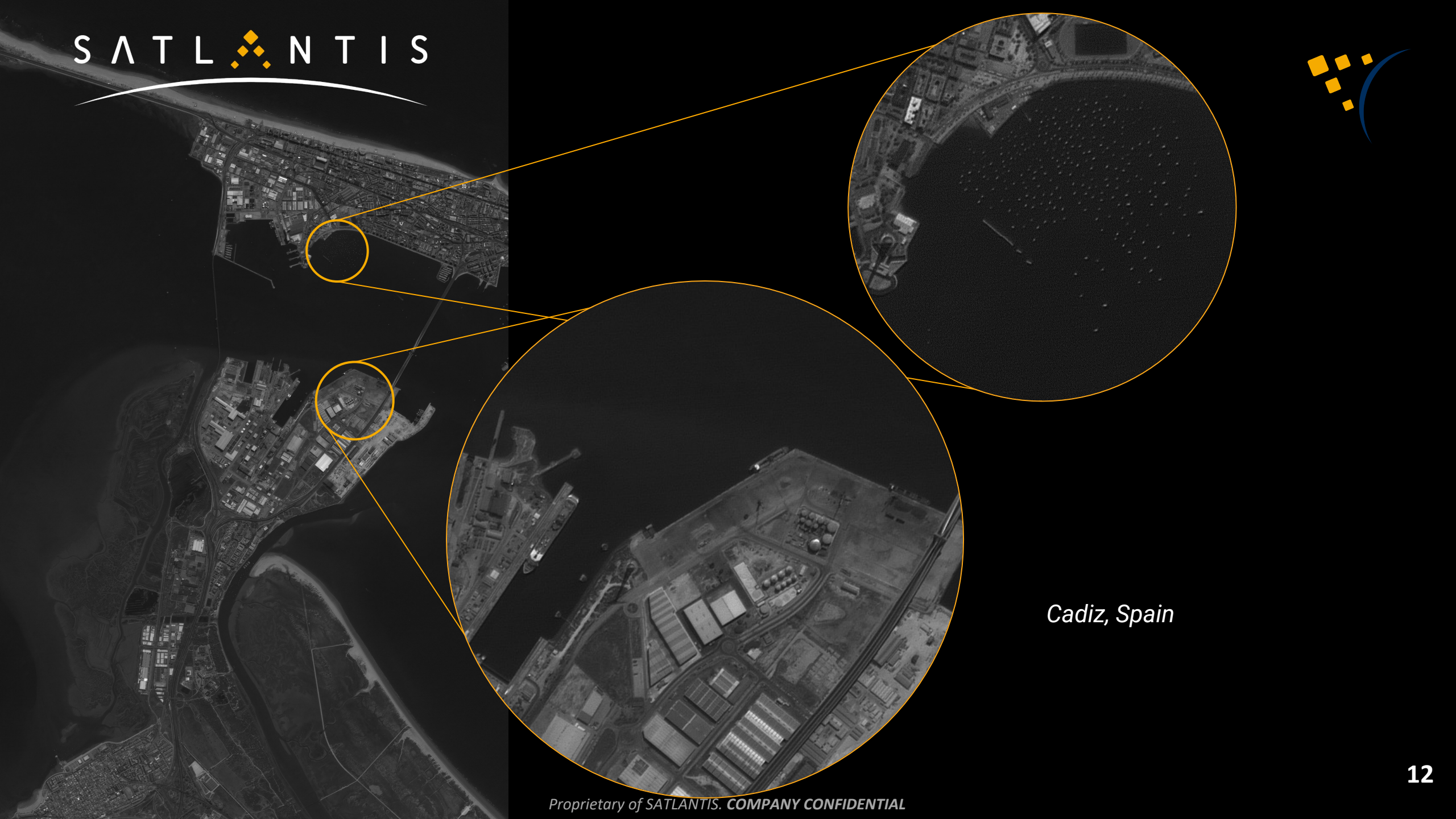
	iSIM-90	iSIM-170	iSIM-300
			
HERITAGE	**Validated in space in Q4 2021 (CASPR)**	**Validated in space in Q2 2020 (IOD)**	**Under development**
DUAL-CHANNEL [1]	**< 4 kg** mass - targeted for **12/16U CubeSats**	**< 15 kg** mass - targeted for **MicroSats**	**< 40 kg** mass - targeted for **MiniSats**
SINGLE-CHANNEL [1]	**< 3 kg** mass - targeted for **12/16U CubeSats**	**< 8 kg** mass - targeted for **MicroSats**	**< 20 kg** mass - targeted for **Micro/MiniSats**
IMAGING [2]	PAN & VNIR: **1,65m** SWIR: **4,2m**	PAN & VNIR: **0,8m** SWIR: **2,2m**	PAN & VNIR: **0,50m** [3] SWIR: **2,1m**
SWATH [2]	PAN & VNIR: **13 – 23.5km** [5] SWIR: **8.2km**	PAN & VNIR: **7.5 – 13.5km** [5] SWIR: **4.2km**	PAN & VNIR: **7km** [3] [5]

SATELLITES

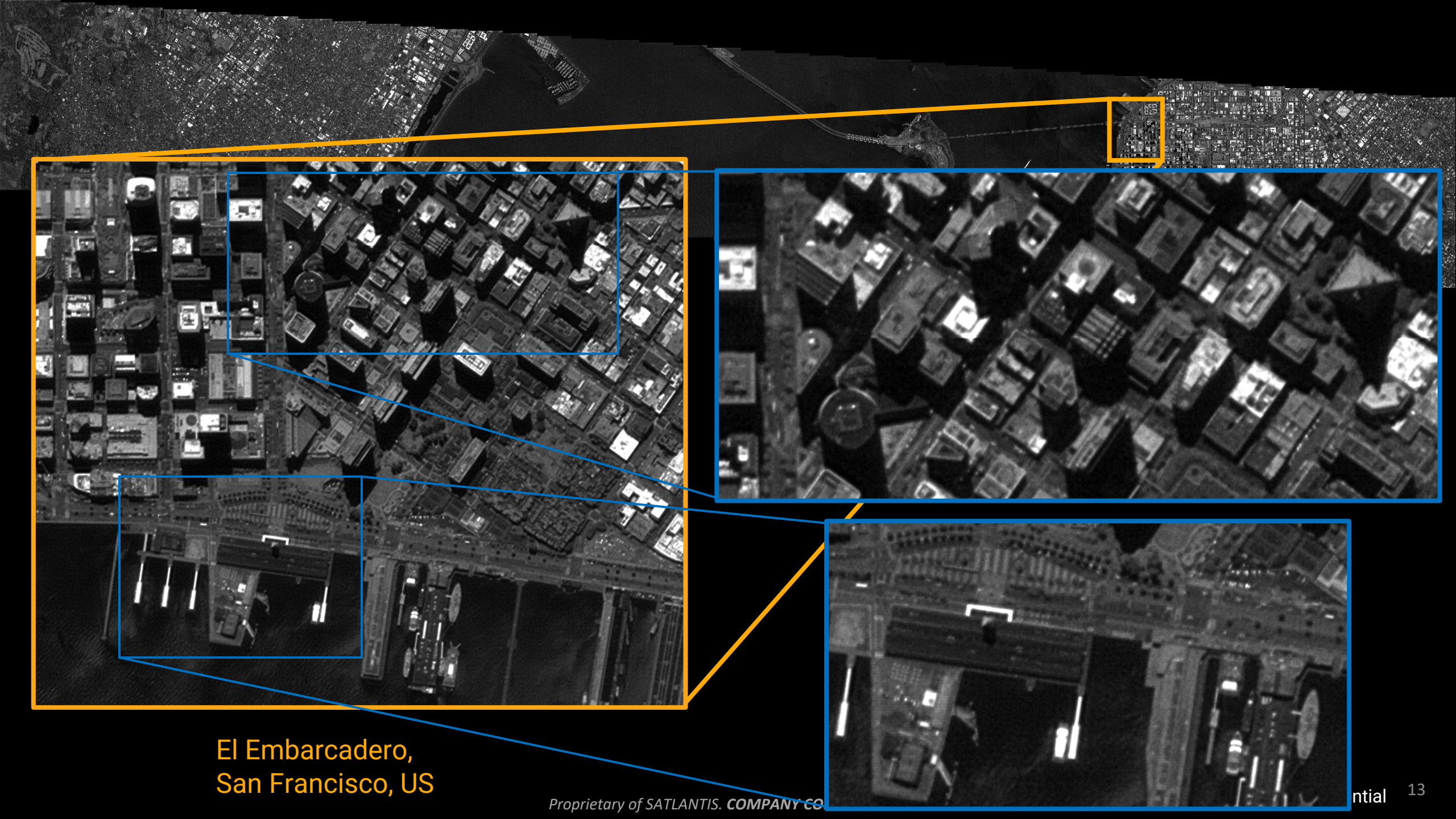
	iSIM-SAT 16U	iSIM-SAT Micro	iSIM-SAT Mini
			
HERITAGE	**Validation in space in Q2 2022**		
SATELLITE	**16U CubeSat (17.9 kg)**	**MicroSat (~60/80 kg)**	**MiniSat (~ 120 kg)**
PAYLOAD	**iSIM-90**	**iSIM-170**	**iSIM-300**
SENSOR-BUS [4]	Agility: 1°/s in 30° off-nadir Downlink: 98 Mbps	Agility: 1°/s in 30° off-nadir Downlink: 500 Mbps	
	LEAD TIME **6-12 months**	LEAD TIME **12-16 months**	LEAD TIME **24 months**

(1) Including payload electronics
(2) At 500km reference altitude
(3) At 450km reference altitude
(4) Capabilities are upgradable by sensor-bus specification improvement
(5) Panoramic configuration


Dushanbe, Tajikistan
SATLANTIS
details after UHR
details after UHR
before UHR
after UHR

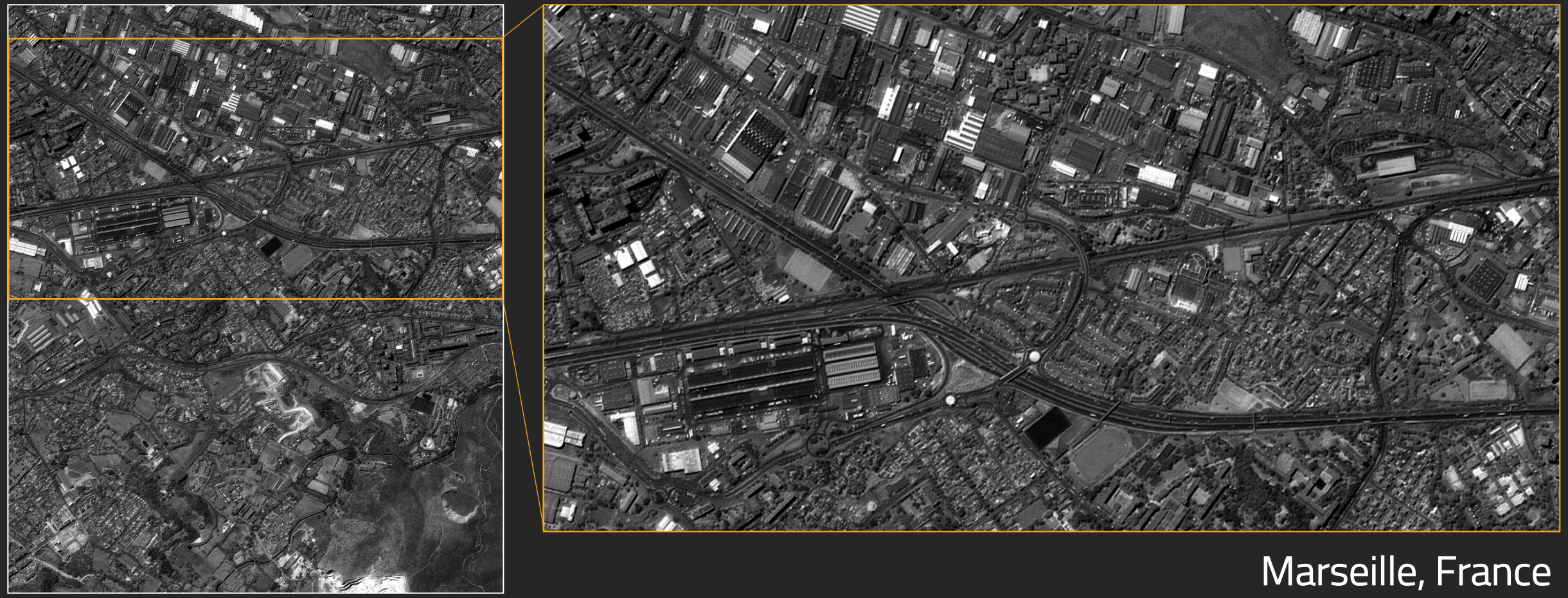


Cadiz, Spain



El Embarcadero,
San Francisco, US

SATLANTIS

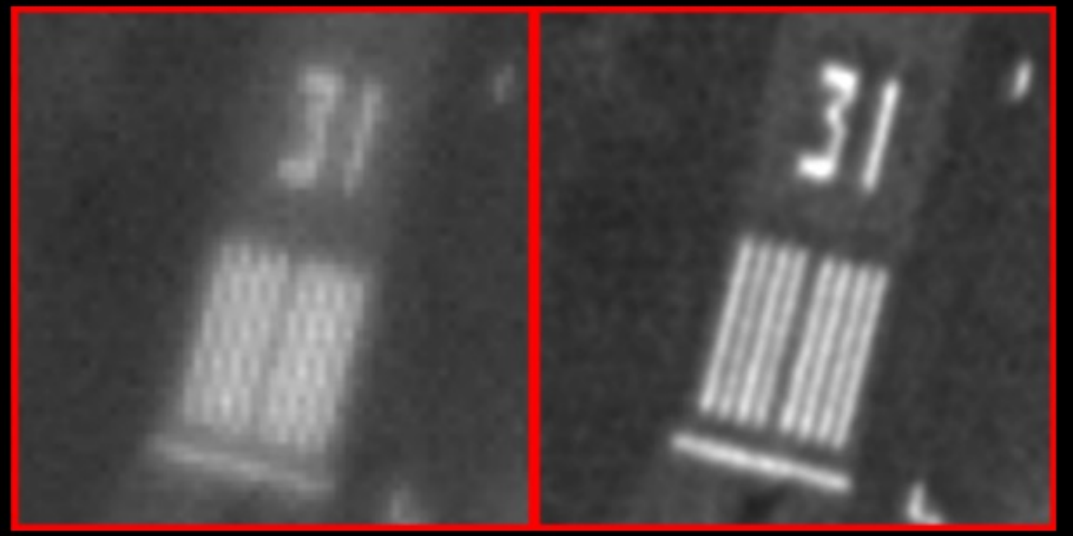


Marseille, France

SATLANTIS

Ultra High-Resolution Technique

Aérodrome Le Luc Le Cannet, France



EO Missions: Current Contracted & Planned

2020

M1 - IOD
Jaxa launch to ISS
+Ultra High Resolution
+Video

Q2-2020

M2 - CASPR
DoD / NASA launch to ISS
+Multispectrality
+Agility

Q4-2021

2022

M3 – ArmSAT1
Launch of first iSIM-SAT
16U-CubeSat
+ iSIM-90 VNIR

Q2-2022

2023

M4 - MANTIS
iSIM-90 VNIR
+Mission for **Oil&Gas infrastructures**
+European Space Agency-CubeSat

Q4-2023

Methane Detection & Quantification missions

2023

M5 - GEI-SAT **Precursor**
Launch of ISIM-SAT
16U CubeSat for **CH4**
+ iSIM-90 VNIR-SWIR

Q2-2023

M6 - HORACIO
Launch of iSIM-SAT
16U-CubeSat
+ iSIM-90 VNIR-SWIR

Q1-2024

M7 – 2 x GARAI
Launch of ISIM-SAT
MicroSat
+ iSIM-170 & iSIM-90 VNIR-SWIR

Q4-2024

M8 - GEI-SAT **Constellation**
Constellation of 3 MicroSats
Dedicated to **CH4/GHG & Environment**
+ Expanding spectral capabilities (2.5 µm)
2025-26 (TBC)

M9 - **Constellation4EO**
Constellation of **two radar and two VHR optical satellites**.
Partnership with ICEYE

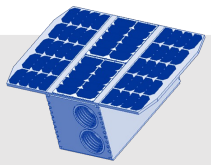
GEISAT Constellation

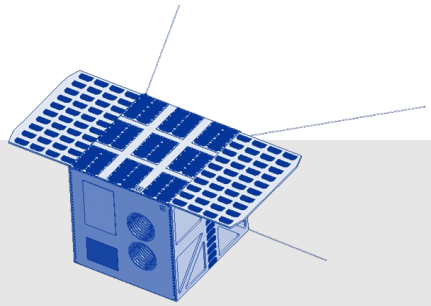
Mission objective

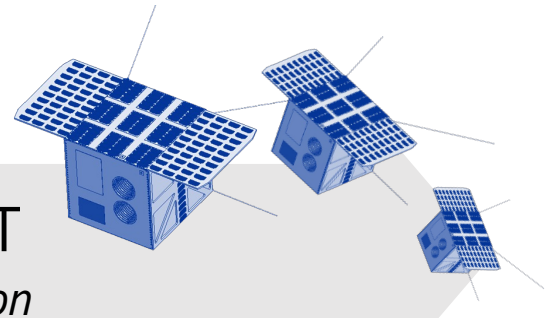
Perform atmospheric **CH4 measurements** with **high spatio-temporal resolution** and simultaneous geolocation of source emitters, to be used for the **monitorisation and quantification of methane emissions** in the Oil&Gas industry.

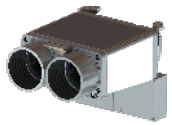
Constellation deployment roadmap

	Q2 2023	Q2 2024	2025/26
	GEI-SAT *Precursor*	GARAI	GEI-SAT *Constellation*
Satellite	16U CubeSat (17.4 kg)	2 Microsat (92 kg)	3 Microsats (92 kg)
Payload	iSIM-90 VNIR + SWIR	iSIM-170 & ISIM-90 VNIR + SWIR	iSIM-170 VNIR + SWIR
Spatial resolution	**VNIR 1.65m; SWIR 13m**	**VNIR 0.8m; SWIR 7m**	**VNIR 0.8m; SWIR 9m**
Spectral range	up to 1700 nm	up to 1700 nm	up to **2500 nm**



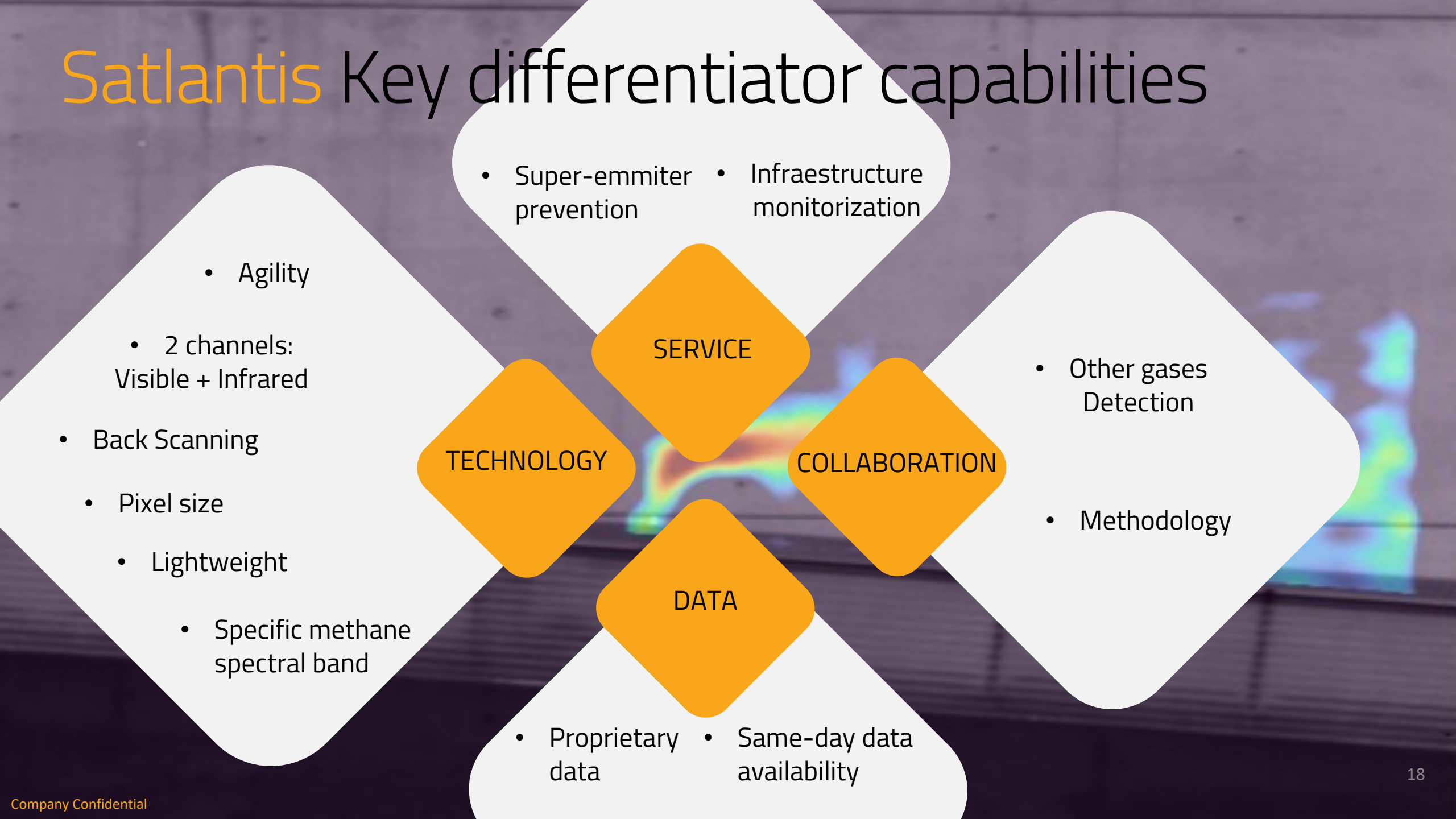






*Orbit to be defined, reference values at **500km***

Satlantis Key differentiator capabilities



SATLANTIS

Guillermo Roselló
Director of International Expansion
rosello@satlantis.com

THANK YOU!

Spain Headquarters
Science Park
University of the Basque Country
Sede Building
48940 Leioa-Bilbao
SPAIN

Satlantis, LLC
Innovation Hub
University of Florida
747 SW 2nd Avenue Suite 235
Gainesville, FL 32601
USA

www.satlantis.com