> UNSEENLABS - Speakers

Speaker

MAËLIG LE-NAIR-DOARÉ

Sales Manager
Europe Middle East & Africa

Speaker

RÉGIS ROUSSEAU

Head of operations

unseenlabs

Pioneer and global leader
in space-based RF detection

Combined Naval Event 2024

THE ADDED-VALUE OF SPACE-BASED RADIOFREQUENCY DETECTION FOR MARITIME DOMAIN AWARENESS

May 23rd, 2024

> Summary

> About Unseenlabs

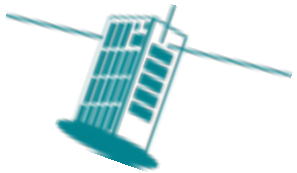
> About Unseenlabs

Who we are

A pioneer and global leader in space-based radio frequency detection

What we do

Detect, locate & track radio frequency signals, delivering mission-critical data and intelligence



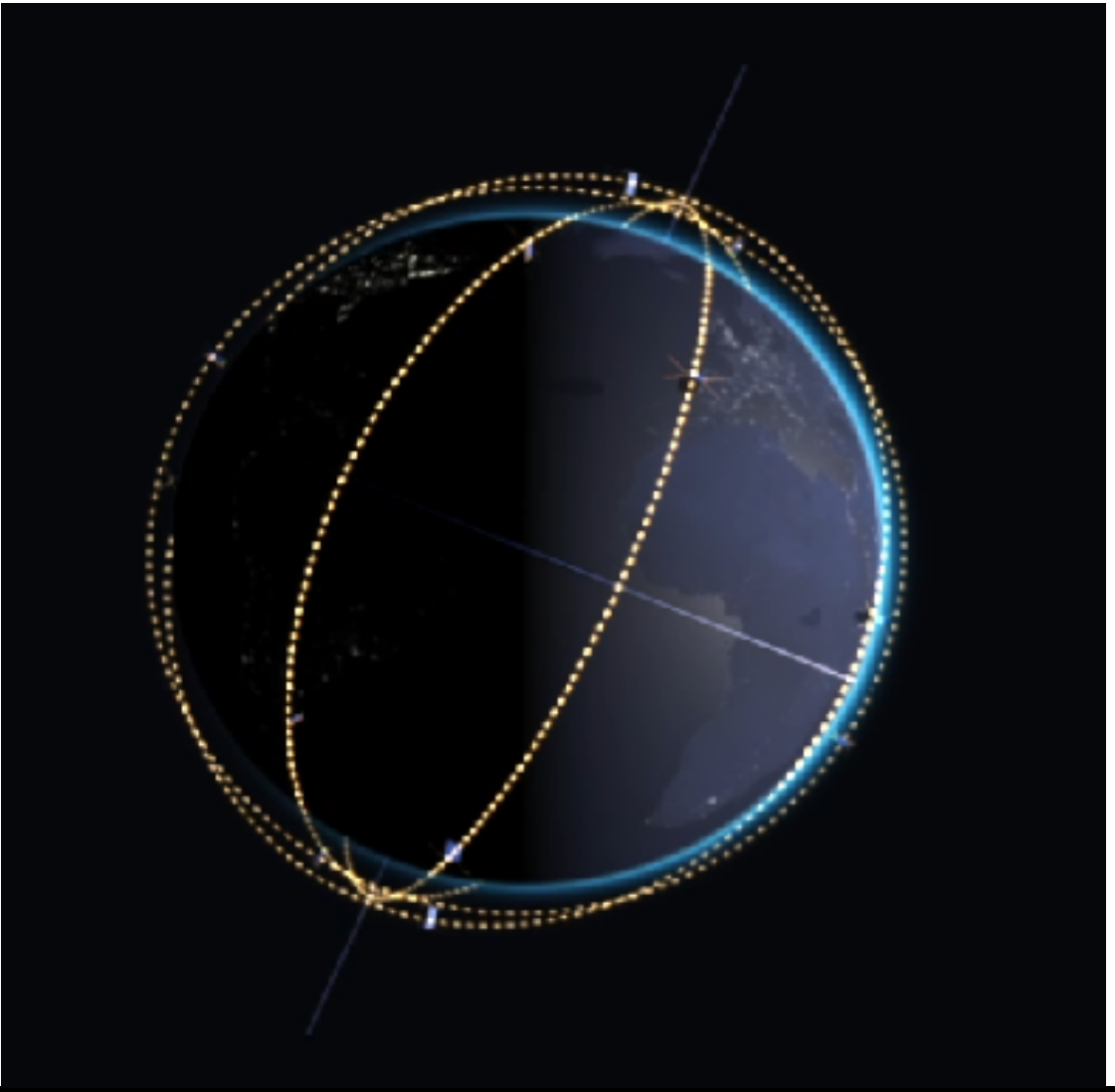
How we do it

Using a global satellite constellation powered by monosatellite technology, coupled with a powerful data engine

Key facts

European company created in 2015 and based in France - Satellites full operational capacity since 2019.
Fast growing business with a €85M series-C fundraising closed in 2024 – 80 people today, over 100 by the end of FY2024

> Q2 2024 satellite constellation



# of satellites	13 monosatellites + 4 more satellites in 2024
Satellite orbit	LEO, approx. 500 Km 1 Satellite in inclined orbit (45°) 12 satellites in SSO (Sun Synchronous Orbit)
Satellite key advantages	Monitoring and tracking capabilities not limited by land, sea, air boundaries
Ground coverage	Collection size: Minimum 200 x 200 Nm (350 x 350 Km) Average 300 x 300 Nm (550 x 550 Km)
Accuracy	Geolocation accuracy: 5*-15-30 kms (high-medium-low) * *up to the kilometer*

> What are the challenges?

> The problem and its challenges

the problem

Unknown vessels locations and missing routes

Critical information is **not** always **in open access**

Onboard security systems can be **tampered**

Fragmented base of **legacy surveillance solutions**

challenges

<2.9% of ocean under **Marine Protected Areas**

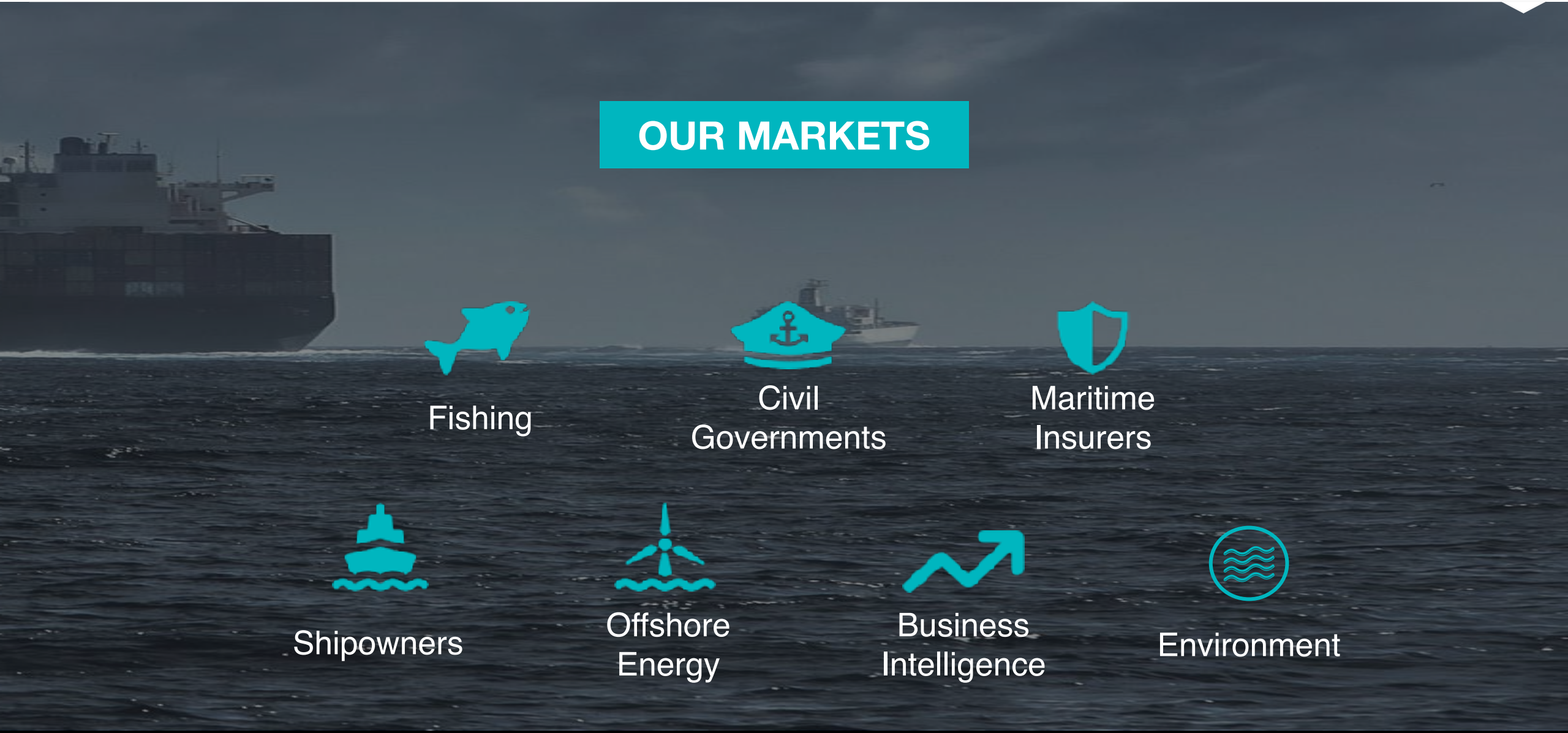
35% of vessels have an **unknown or inaccurate AIS information**

$36B annual economic loss from illegal, unreported and unregulated fishing

that's where we come in

- **Get an exhaustive view of the actual maritime traffic**
- **Monitor and track illegal activities at sea**
- **Better identify dark vessel clusters and patterns**

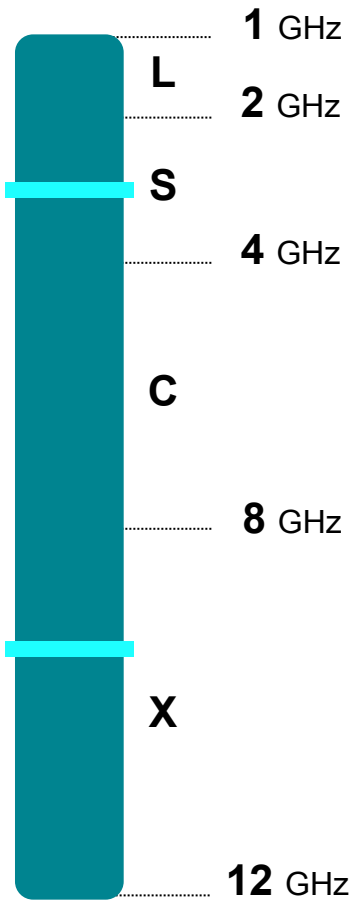
> A new layer of detection to better protect, alert and secure



> What we detect today in a single pass

> What we detect today: navigation radars

Our frequency bands today in a single pass



Exclusive multi-band RF collection in a single pass

- Cargos
- Tankers
- Bulk carriers
- Tugs and barges
- Container ships

- Fishing vessels
- Oil rigs
- Passenger vessels
- Dredgers

- Law enforcement ships
- Research ships
- Helipads
- Yachts

- Sailing boats
- Pleasure crafts
- …

> We can see what other systems cannot

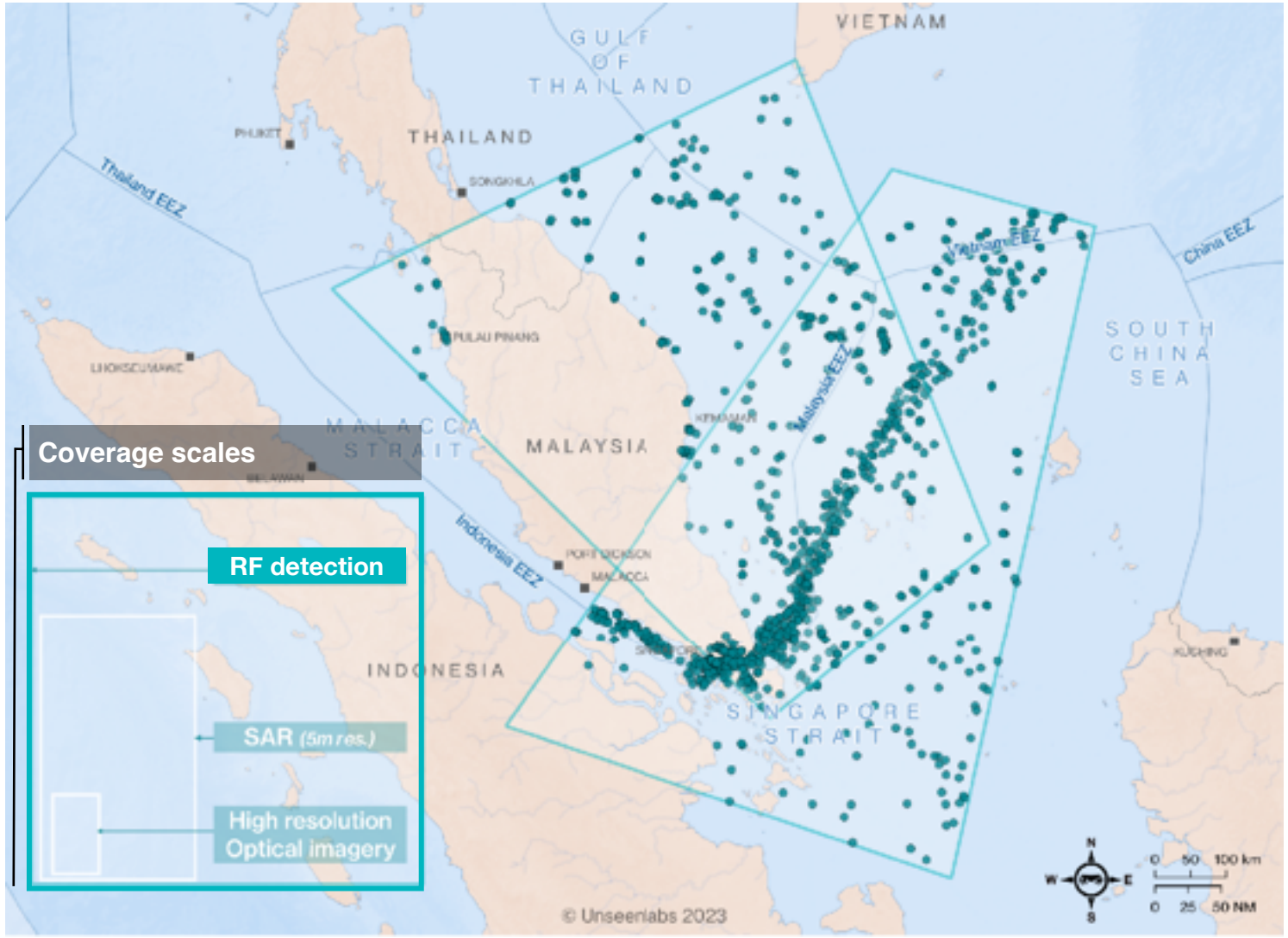
	Terrestrial		Space-based		
	Ground Radars	AIS/ VMS/ LRIT*	SAR(1)	Optical imagery	RF
All weather conditions	●	●	◑	○	●
Covered area of interest	◑	●	◑	○	●
Uncooperative asset detection	●	○	●	●	●
Unique and unfalsifiable fingerprint	●	○	○	◑	●
Easily implementable data	○	●	○	◑	●

Source: Company information & estimates. 1. Synthetic Aperture Radar; Automatic Identification System; Vessel Monitoring System; Long-Range Identification and Tracking

> RF complementarity with other sensors (space, air, sea)

- Every **mono-satellite of Unseenlabs** constellation **can detect** the electromagnetic signals of vessels located **in large areas at sea**

- A cost-effective way for the customer to **task other surveillance spatial sensors** (as SAR or Optical imagery) **to investigate further specific areas, vessels or assets of interest**

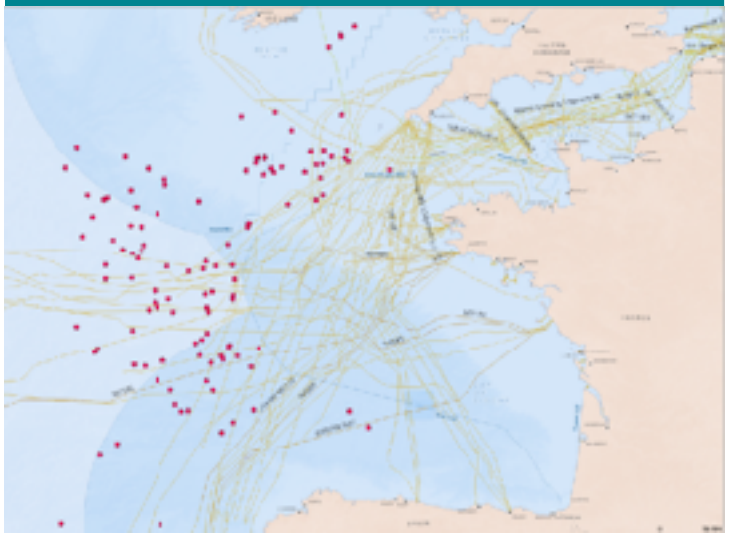


> Our solution offer

> Our solution in action and the levels of service

BASE SERVICE

AREA MONITORING



Monitoring of areas of interest through vessels detection and geolocation

ADVANCED SERVICES

TRACKING

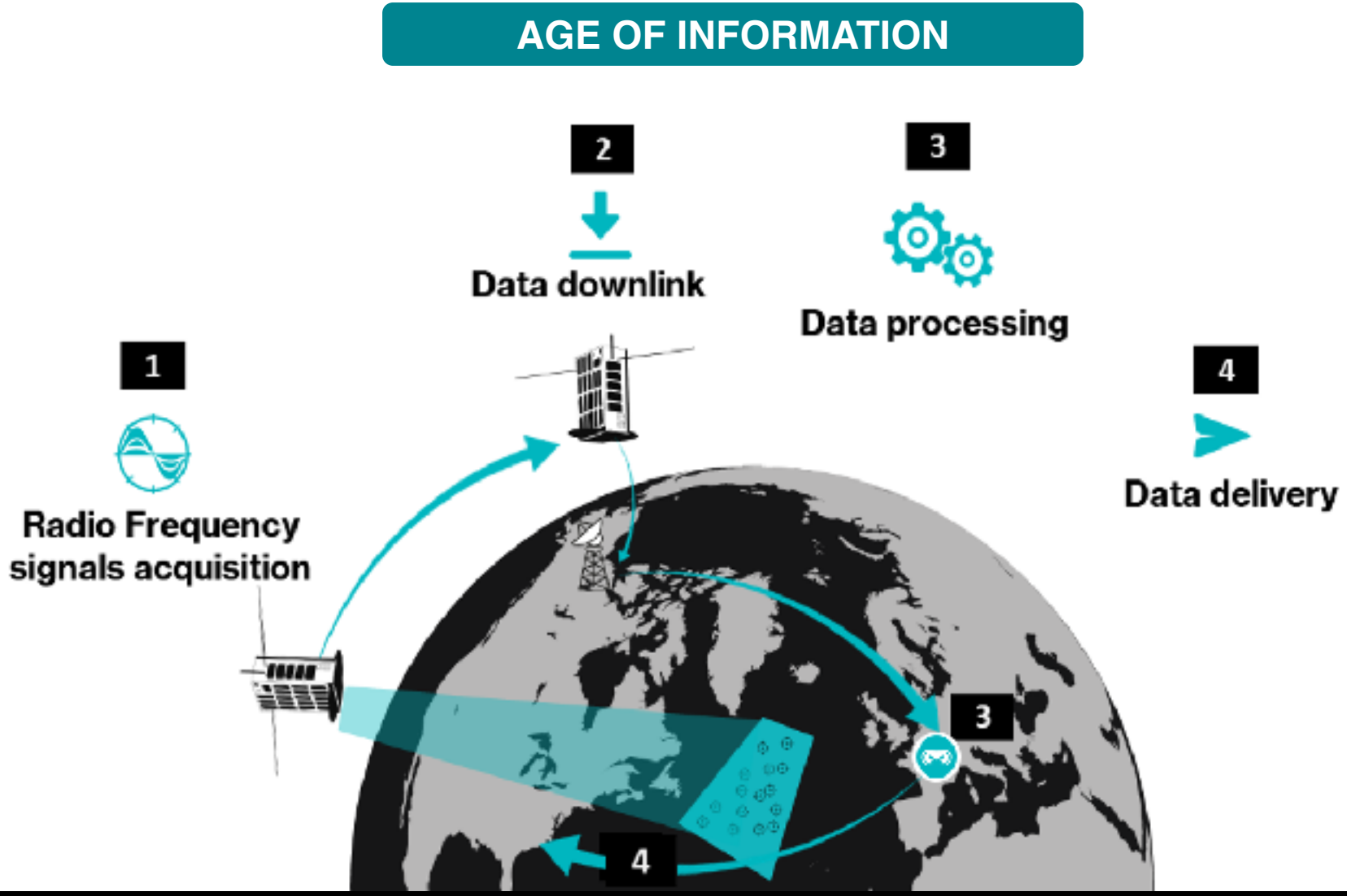
Detection and tracking of vessels via unique RF fingerprinting

IDENTIFYING

Vessel Identification

We are the only RF provider to uniquely fingerprint emitters, allowing tracking and enhancing trustful identification.

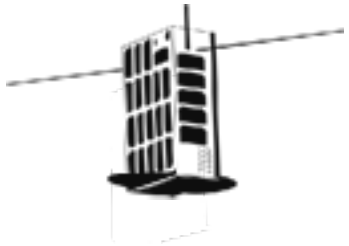
> Our space-based RF detection process



> Our space-based RF detection process

	TASKING TIME		AGE OF INFORMATION			
	CLIENT REQUEST	PLANNING	SATELLITE COLLECTION	DATA DOWNLINK	DATA PROCESSING	DATA DELIVERY
	Area(s) of interest	Feasibility assessment	RF signals detection **Simultaneous multi-band RF collection in a single swath**	Downlink to the closest ground station	Automated algorithms	Secured FTP
	Period / Duration	Tasking of available satellites	Onboard signal pre-processing	Secured transfer to Unseenlabs servers	Analytical expertise (automated and human)	Connection through API
	Revisits / day	Sending of control commands to satellites				Web Portal

> Current revisit rates



MONOSATELLITE CONSTELLATION

+

LATITUDE TOWARDS THE POLES

12 data collections / day

10 data collections / day

8 data collections / day

10 data collections / day

12 data collections / day

> Our solution offer

WHAT YOU CHOOSE

Area(s) of interest

Number of data collections / day

Level of service
‘Base’ to ‘Advanced’

WHAT YOU GET

(FOR EACH DETECTED VESSEL)

BASE SERVICE

- **Geolocated position**
  - Latitude & Longitude of the emitter
- **Technical parameters**
  - Frequency of the signal
  - Level of accuracy (based on radius) of its location
  - Other characterization data about the emitters

ADVANCED SERVICES

- **RF positions correlation (with AIS)**
- **Interpolated AIS**
- **Unique RF fingerprinting (incl. exclusive “Waveform”)**
- **Intelligence** (analysis, reports,…)

> Our unique RF fingerprinting solution

Field-proven since fall 2022, now available

1. **Each vessel has a unique RF environment**, composed of emitters with their own frequency and parameter settings

2. Based on the signal frequency and other technical parameters, processed with our **exclusive processing tag ("Waveform")**, we can assign a **unique RF fingerprint, specific to each vessel**

3. It is **incredibly stable** and do not change over time

> Use Cases : Southern Red sea

> Context in Southern Red Sea

RF COLLECTION CAMPAIGN

DATE:	**2023/12/20 – 29**
PERIOD:	**10 DAYS**
FOOTPRINT:	**300,000 km²**
# COLLECTIONS:	**10**
# REVISITS/DAY:	**1**

The **Red Sea** is a seawater inlet of the Indian Ocean, lying between Africa and Asia. Bab el Mandeb strait and the Gulf of Aden in the south the Sinai Peninsula and the Gulf of Suez in the north.

This area is characterized by :

- a high concentration of commercial maritime traffic (important role in the global economy)
- the Bab el-Mandeb strait is a strategic transit corridor (more than 6 million barrels per day of crude oil)

The context has recently evolved :
- Yemen's Houthis have been disrupting Red Sea maritime trade for the past two months, attacking ships in the southern Red Sea
- **In response, a new maritime military force has been setup**

Objectives

- **Detection, identification and tracking of dark vessels in the area.**

Key insights

- **9% of dark vessels locations (not emitting AIS) have been detected** during the whole campaign.

RF value-addition

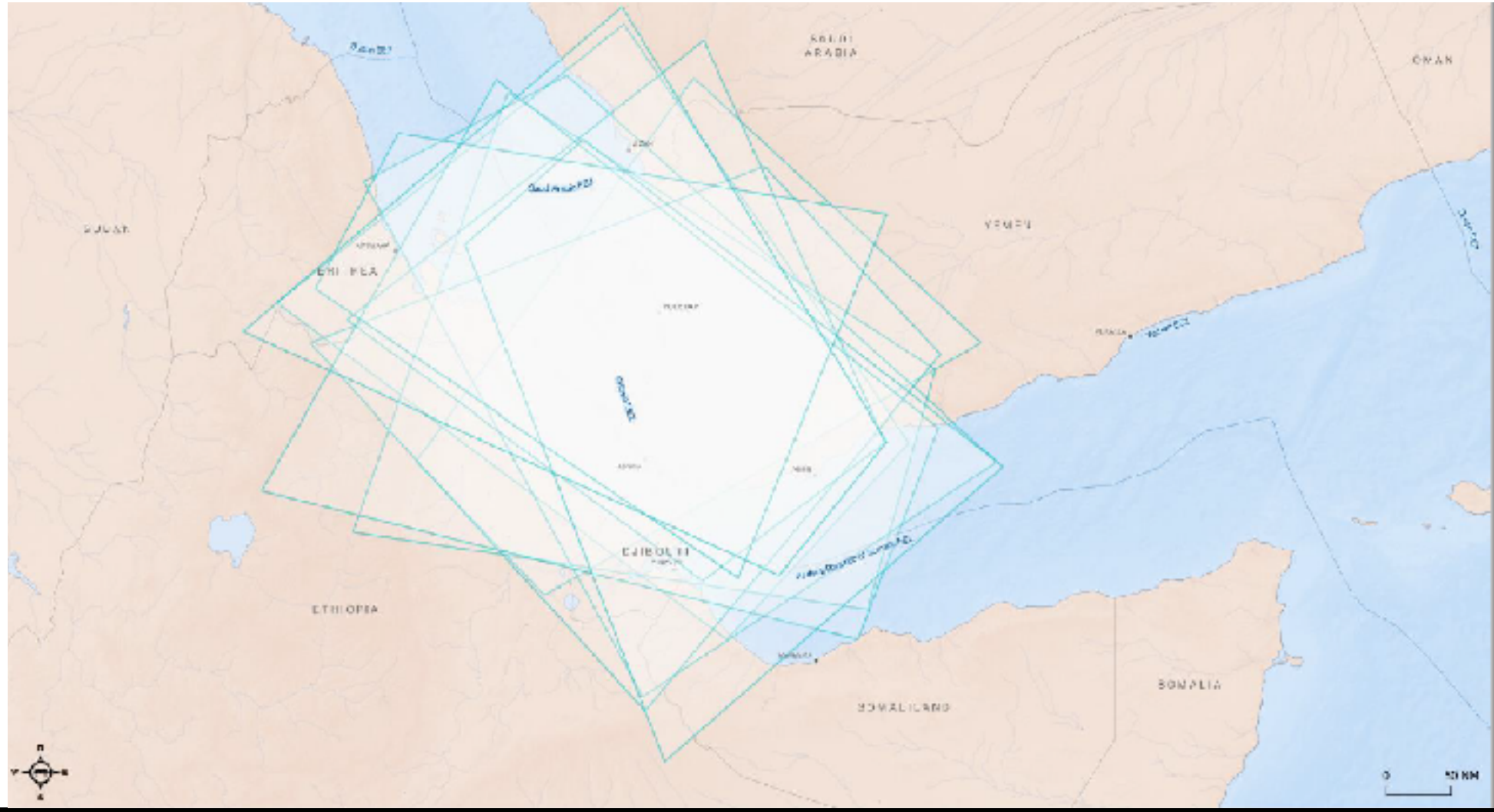
- The detection and geolocation of vessels using their radiofrequency **(RF) emissions fill the AIS gaps and contribute to a better understanding of the maritime situation.**
- In addition, our exclusive unique RF signature enables the tracking of a vessel anywhere/anytime.

> Southern Red Sea - 10 data collection

Area of interest monitored by Unseenlabs satellites

During 9 days, Unseenlabs carried out 10 RF data collections, each covering a **large area of interest**:

300 000 km²
(average)



> Southern Red Sea

Overview of vessel activity (cooperative and non cooperative)

Unseenlabs satellites detected and geolocated **1 650 RF emitter positions**

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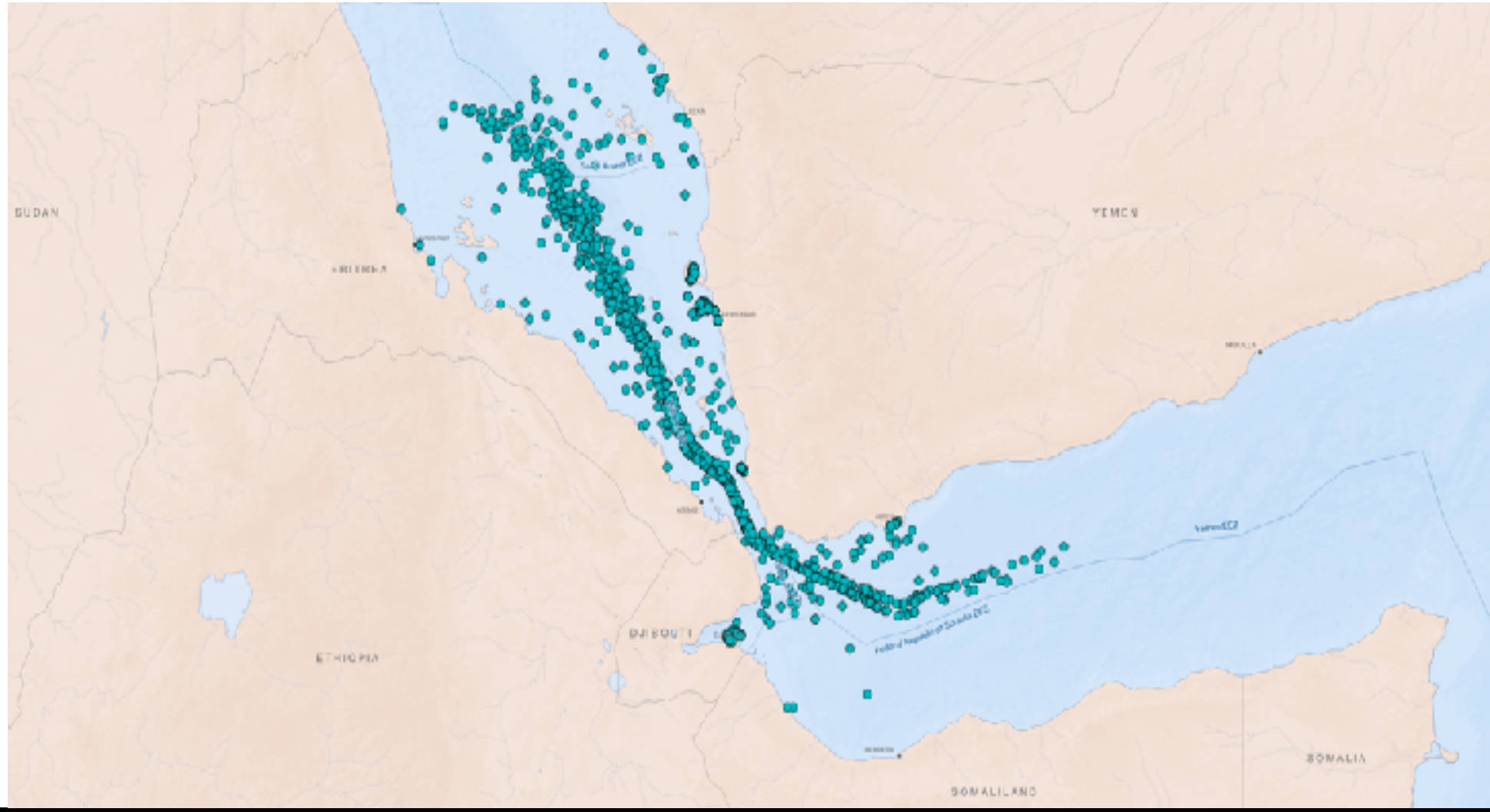
COLLECTION CAMPAIGN

AREA : **SOUTHERN RED SEA**
DATE : DECEMBER 23
PERIOD : 10 DAYS

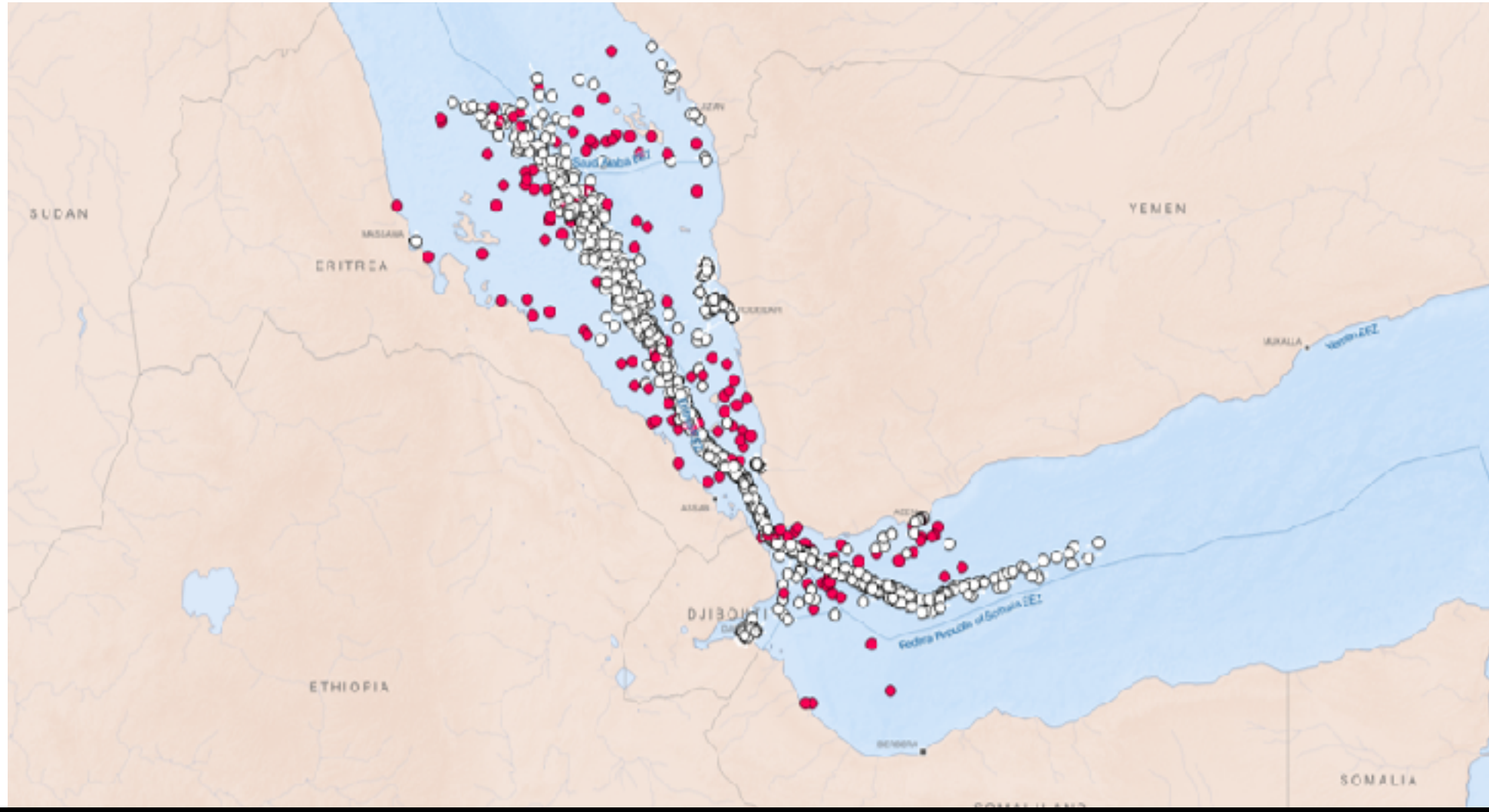
DATA **ALL RF EMITTERS**



> Southern Red Sea

Among those 1 650 positions detected by RF, **145 positions are not matching AIS**.

Those RF signals without any AIS correlation, **might be engaged in undeclared or illegal activities at sea.**



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COLLECTION CAMPAIGN

AREA : SOUTH RED SEA
DATE : DECEMBER 23
PERIOD : 10 DAYS
DATA RF ONLY
RF CORRELATED AIS

> Southern Red Sea

✦on November 29th,
a significant presence of ships was noted in Southern Red Sea, with our satellites detecting 212 RF emitters, leaving only 4 as RF-only emitters, or dark vessels.

29 November 23

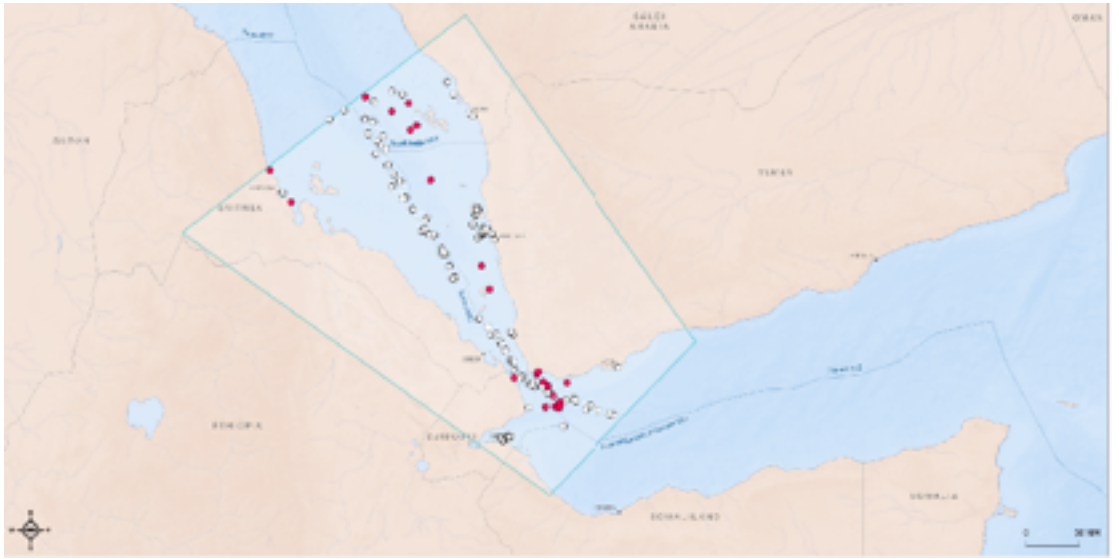
212 RF
4 RF Only

✦on December 26th,
We observed a 12% drop in maritime traffic.

In the meantime, 28 RF-only emitters were detected – possibly vessels switching off their cooperative beacons for safety concerns.

26 December 23

187 RF



> Southern Red Sea - Example of vessel tracking

VESSELS	# RF positions	RF Frequency	Other RF parameters	Waveform
RF-1	2	Similar	Identical	1909648.3
RF-2	3	Similar	Identical	2329079.1
RF-3	2	Similar	Identical	1699934.4
RF-4	4	Similar	Identical	2433938.2
RF-5	4	Similar	Identical	3167941.3

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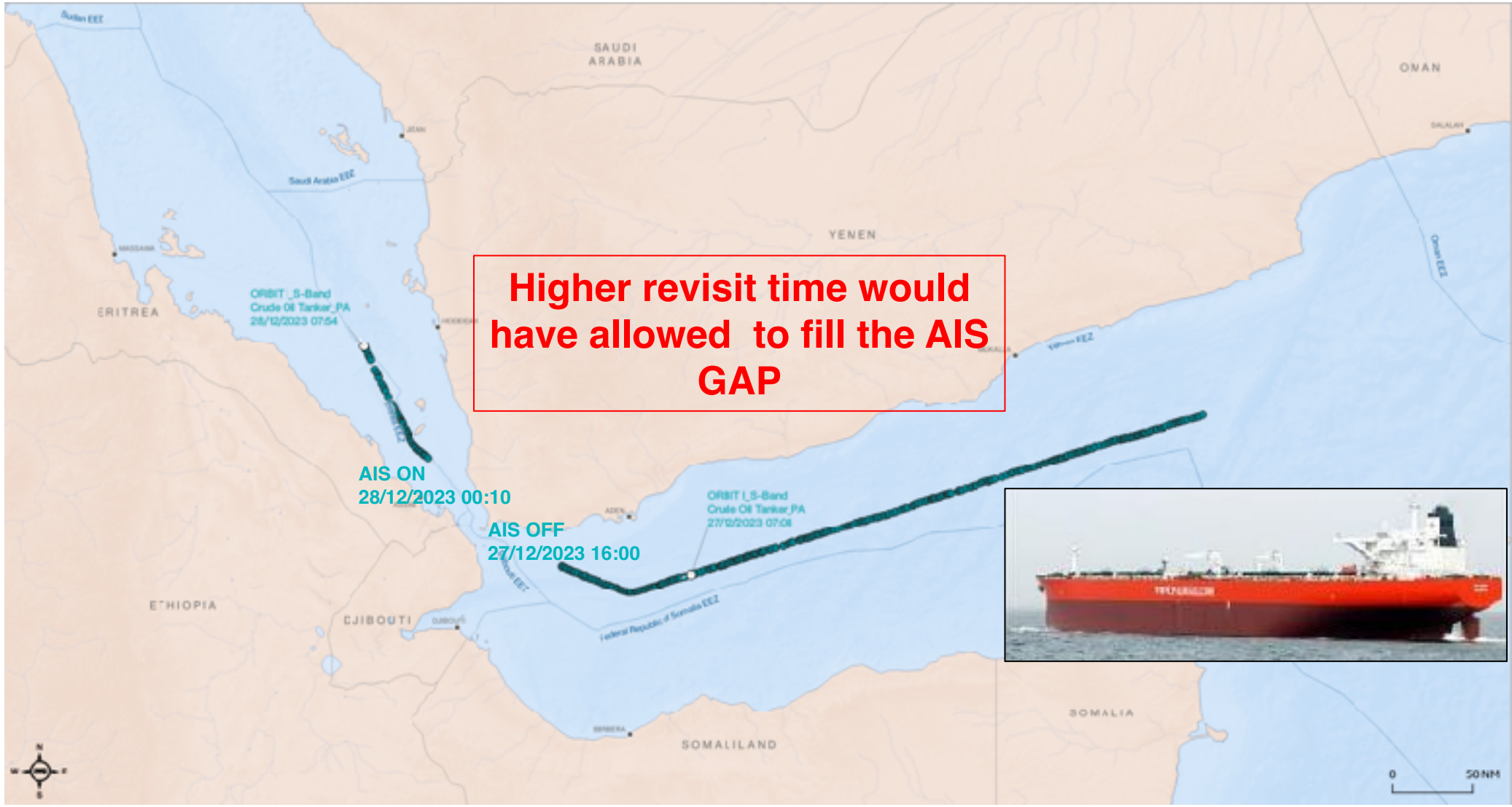
COLLECTION CAMPAIGN

AREA : SOUTHERN RED SEA
DATE : DECEMBER 23
PERIOD : 10 DAYS
DATA **RF ONLY**

> Specific ship Behaviour

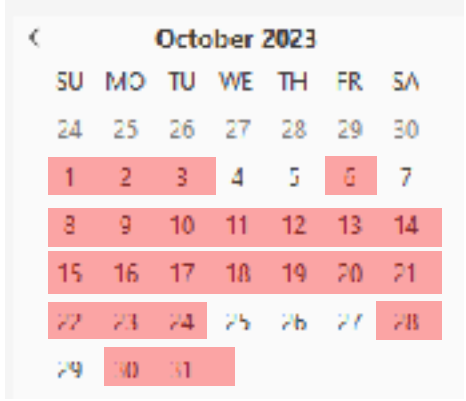
ORBIT I
Crude Oil Tanker
Flag : Panama
MMSI : 354441000
IMO : 9234642



> Celtic sea

> Celtic sea - a focus on subsea cables

24 collections
from October 01 to 31, 2023



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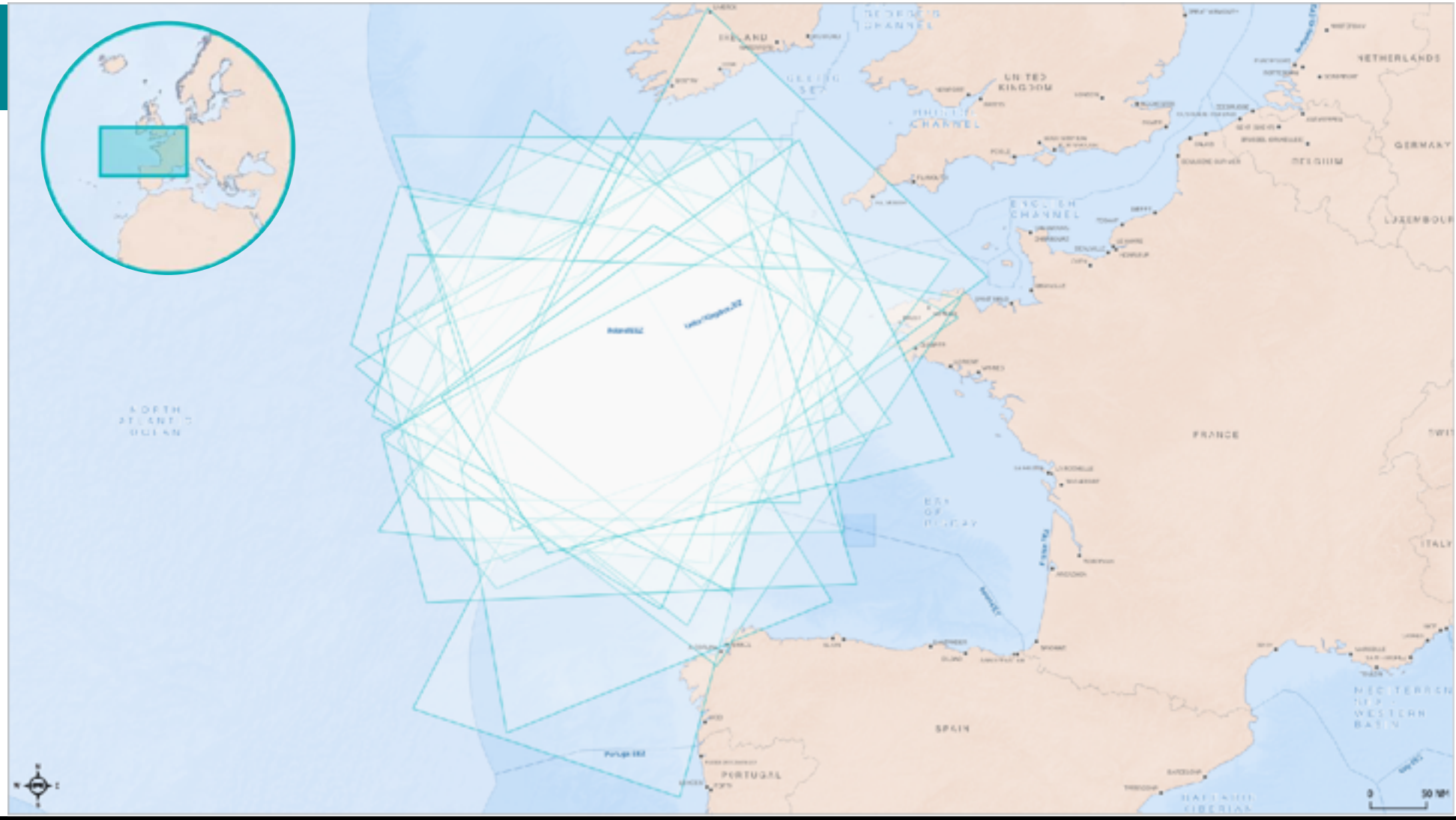
COLLECTION CAMPAIGN

AREA: **CELTIC SEA**
DATE: OCTOBER 2023
PERIOD: 31 DAYS

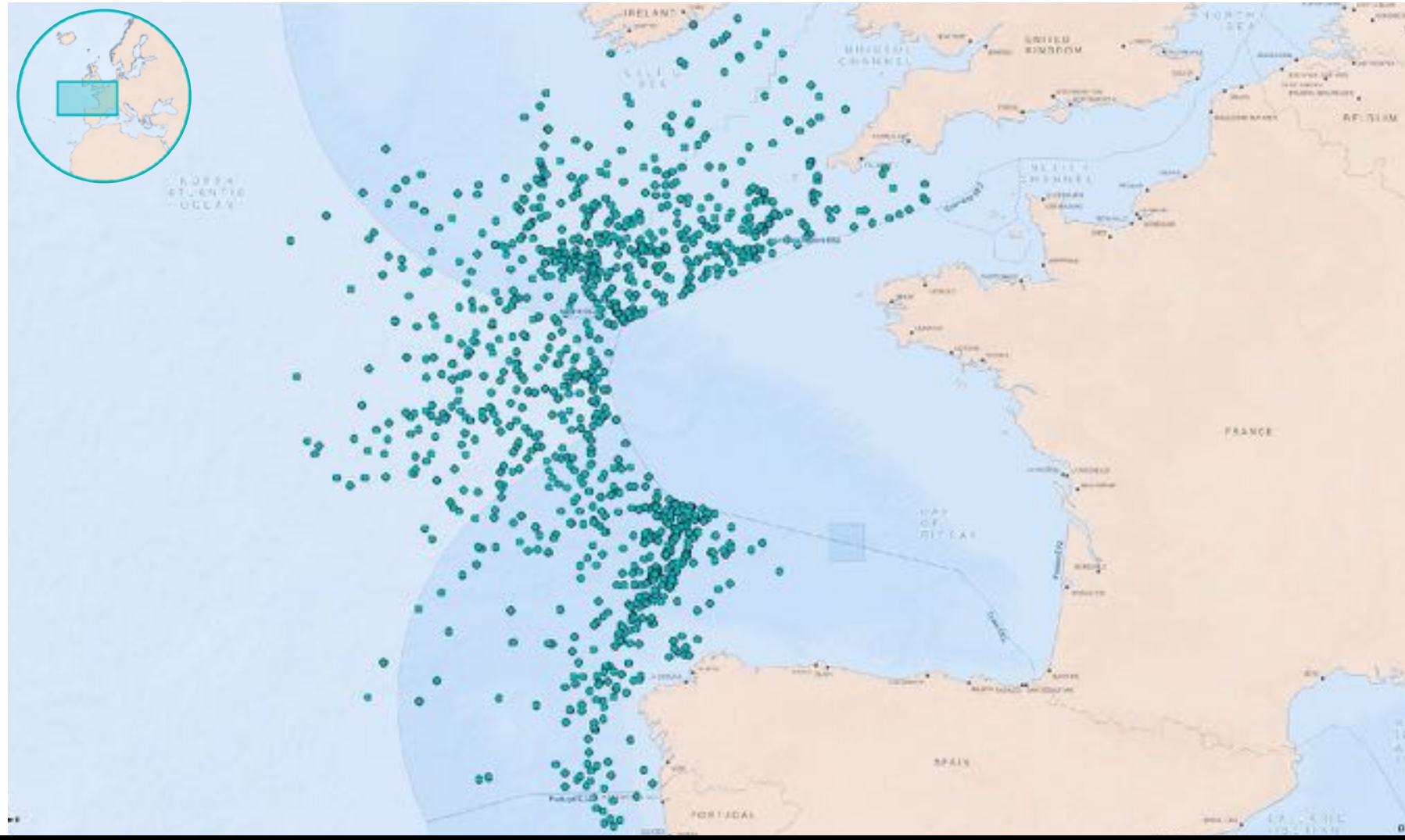
DATA RF COVERAGES



> Celtic sea - a focus on subsea cables

Global Maritime activity

2748 RF emitters detected outside EEZs



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COLLECTION CAMPAIGN

AREA: **CELTIC SEA**
DATE: OCTOBER 2023
PERIOD: 31 DAYS

DATA **ALL RF EMITTERS**

> Celtic sea - a focus on subsea cables

Global Maritime activity

2748 RF emitters detected outside EEZs

151 ‘RF only’ emitters with AIS OFF

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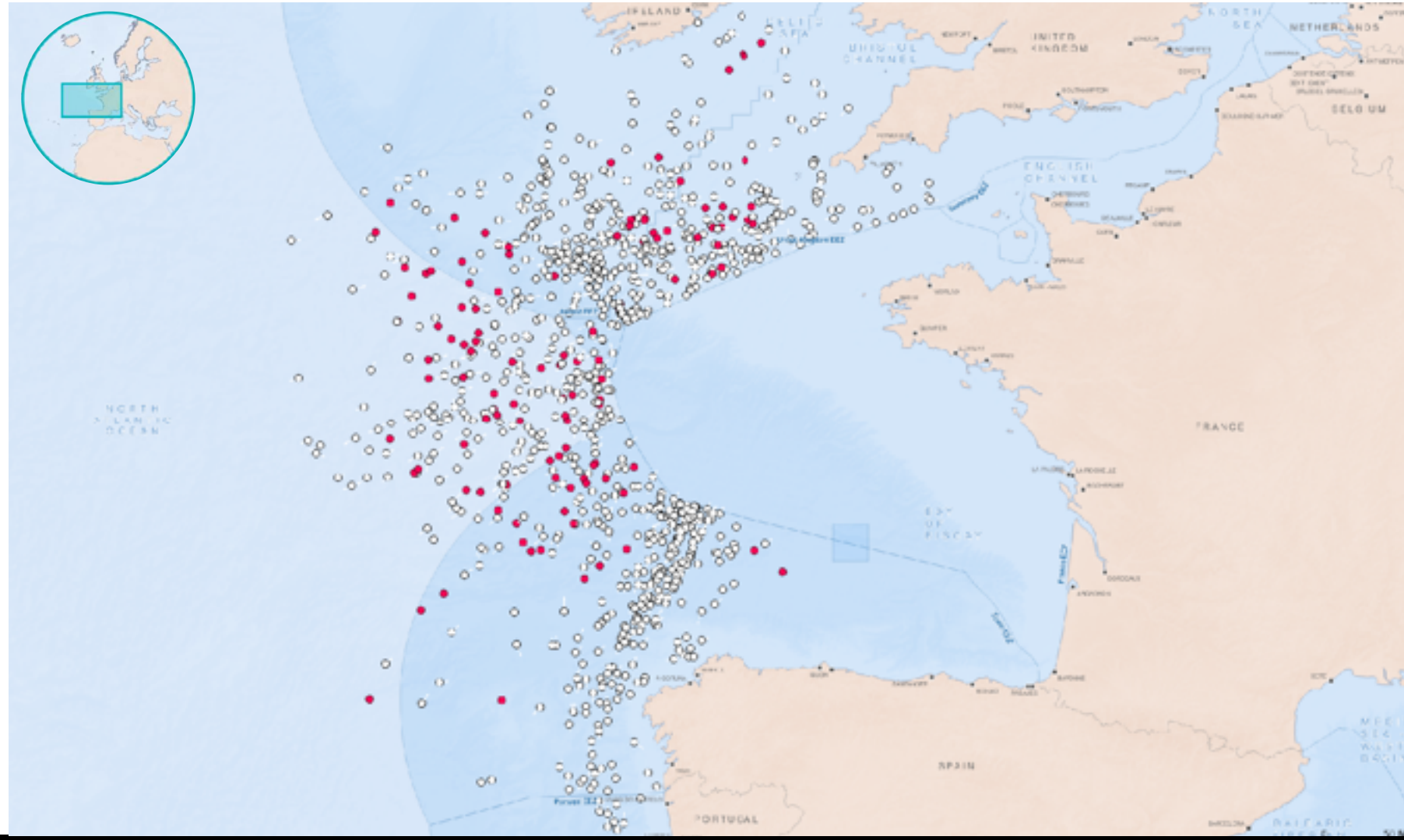
COLLECTION CAMPAIGN

AREA: **CELTIC SEA**
DATE: OCTOBER 2023
PERIOD: 31 DAYS
DATA
- **RF ONLY**
- **RF CORRELATED AIS**



> Celtic sea - a focus on subsea cables

Focus on
dark vessels activity

2748 RF emitters detected outside EEZs

151 ‘RF only’ emitters with AIS OFF

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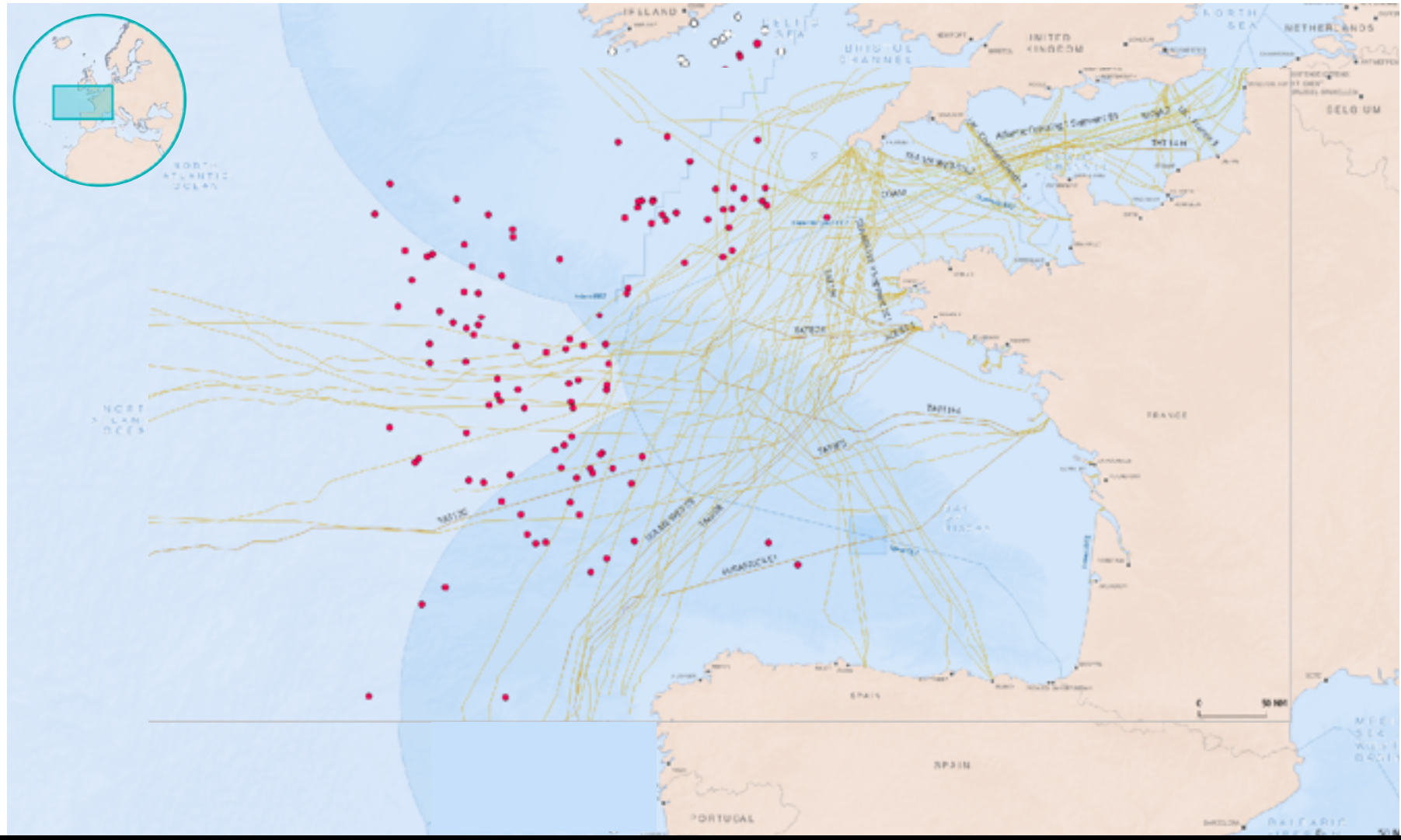
COLLECTION CAMPAIGN

AREA: **CELTIC SEA**
DATE: OCTOBER 2023
PERIOD: 31 DAYS
DATA **RF ONLY**
SUBSEA CABLES



> Celtic sea - a focus on subsea cables

RF matching Example with AIS correlation

Each color is associated to the same ship

VESSELS	# RF positions	RF Frequency	Other RF parameters	Waveform
RF-1	2	Similar	Identical	3063082.1
RF-2	3	Similar	Identical	3167940.0

unseenlabs
COLLECTION CAMPAIGN

AREA: **CELTIC SEA**
DATE: OCTOBER 2023
PERIOD: 31 DAYS
DATA **RF ONLY**
COURSE

> Our unique value proposition

> Our unique value proposition

1. **We can see where other systems cannot**
2. We are **the only RF monosatellite** space-proven actor
3. Our technology is **fully operational** and **future-proof**
4. We deliver **unique, reliable and high value-added** intelligence fast

Global, persistent coverage of RF signals

Sub-kilometer **accuracy**

Lightweight data and intelligence

Interoperability with other Earth observation solutions

Unique RF fingerprinting assignment

Fast time delivery
for mission-critical decision making

> We see the unseen

Contact us

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