

## Where Sea and Space Meet

Updating Critical Maritime Infrastructure Protection Policies  
with Space-Based Earth-Observation (EO) Applications



**LT (ROU-N) Alexandru C. HUDIȘTEANU**

Exercise Staff Officer, MARSEC COE



# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE

## Agenda

MCI

EO Technology

How to EO?

EXER MARSEC-23

The views expressed in this presentation are the author's alone and do not necessarily reflect the official views of NATO, the Romanian Naval Forces, or MARSEC COE.

Kindly do not take photos of the presentation. A distributable version will be made available.





# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE

*The damage to the NS1 and NS2 pipelines in international waters in the Baltic Sea is of deep concern. All currently available information indicates that this is the result of deliberate, reckless, and irresponsible acts of sabotage. These leaks are causing risks to **shipping** and substantial **environmental damage**. [...]*

*We, as Allies, have committed to **prepare for, deter and defend** against the **coercive use of energy and other hybrid tactics** by state and non-state actors. Any deliberate attack against Allies' **critical infrastructure** would be met with a united and determined response.*

NAC Statement on the damage to gas pipelines, 29 September 2022  
[https://www.nato.int/cps/en/natohq/official\\_texts\\_207733.htm](https://www.nato.int/cps/en/natohq/official_texts_207733.htm)





# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE

## Maritime Critical Infrastructure (MCI)

### Major Ports and Terminals

Major shipping hubs and intermodal terminals are the joints of the global shipping system



### Offshore Platforms & Pipelines

Offshore oil and gas production make up for about 30% of the global output



### Submarine Internet Cables

An absolute majority of data is transmitted through undersea cables



### Major Sea Lines of Communications

The main sea lines of communications (SLOCs) serve as the backbone of the global shipping system



### Strategic Chokepoints

For more than 200 narrow passageways worldwide, there are only 9 global trade strategic chokepoints



### Littoral Industrial Complexes

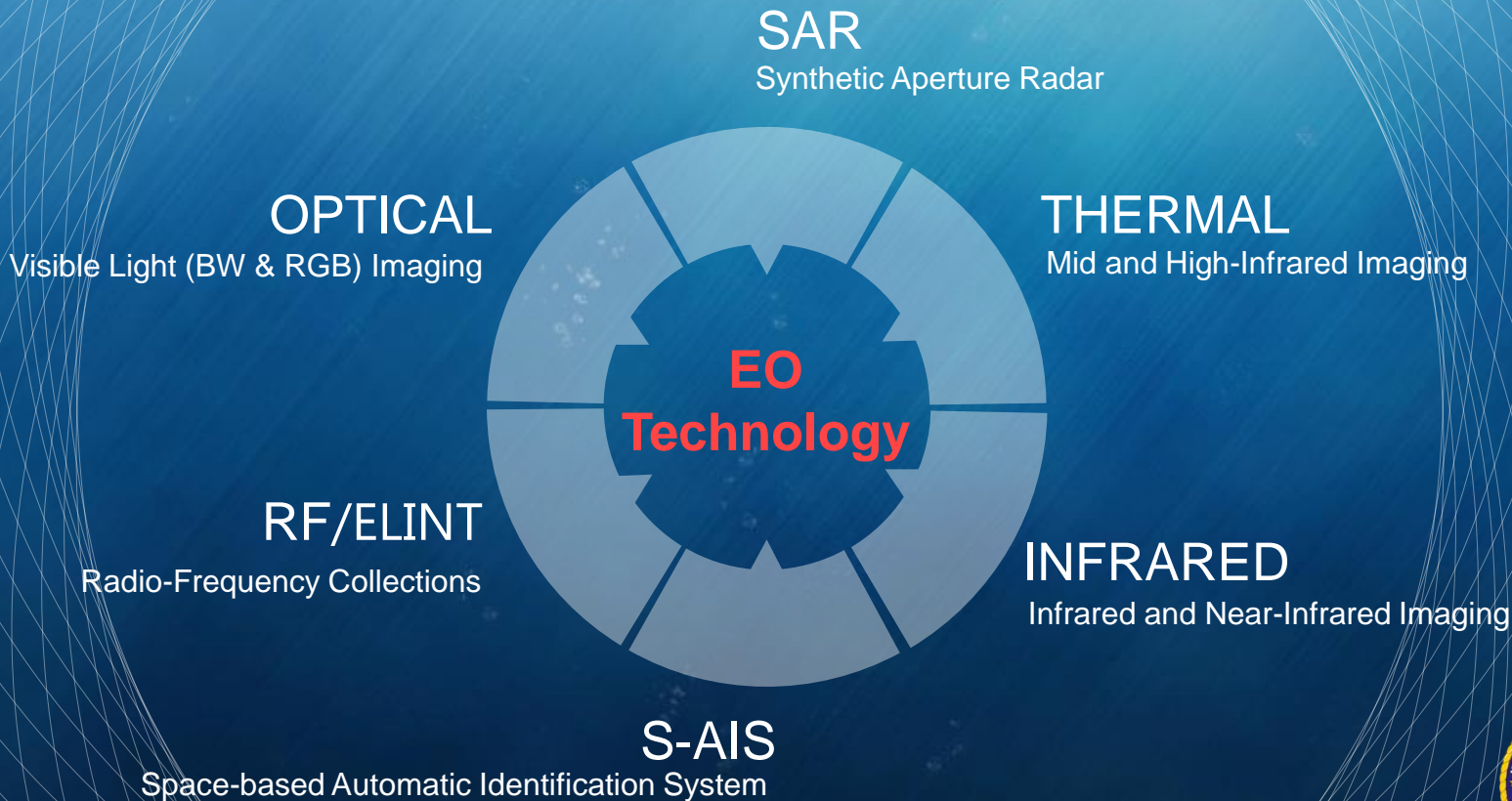
Many major industrial platforms/complexes, refineries and powerplants are located on or near the shore





# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE





# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE

To illustrate...

**SAR**



ICEYE, <https://www.iceye.com/sar-data>



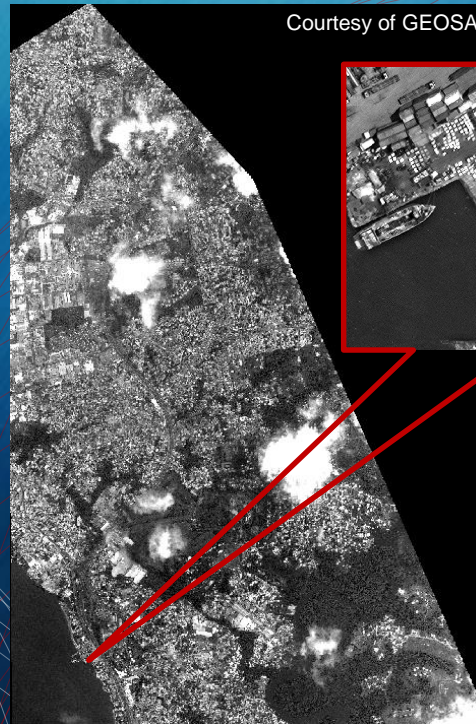


# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE

To illustrate...

Optical



Courtesy of GEOSAT



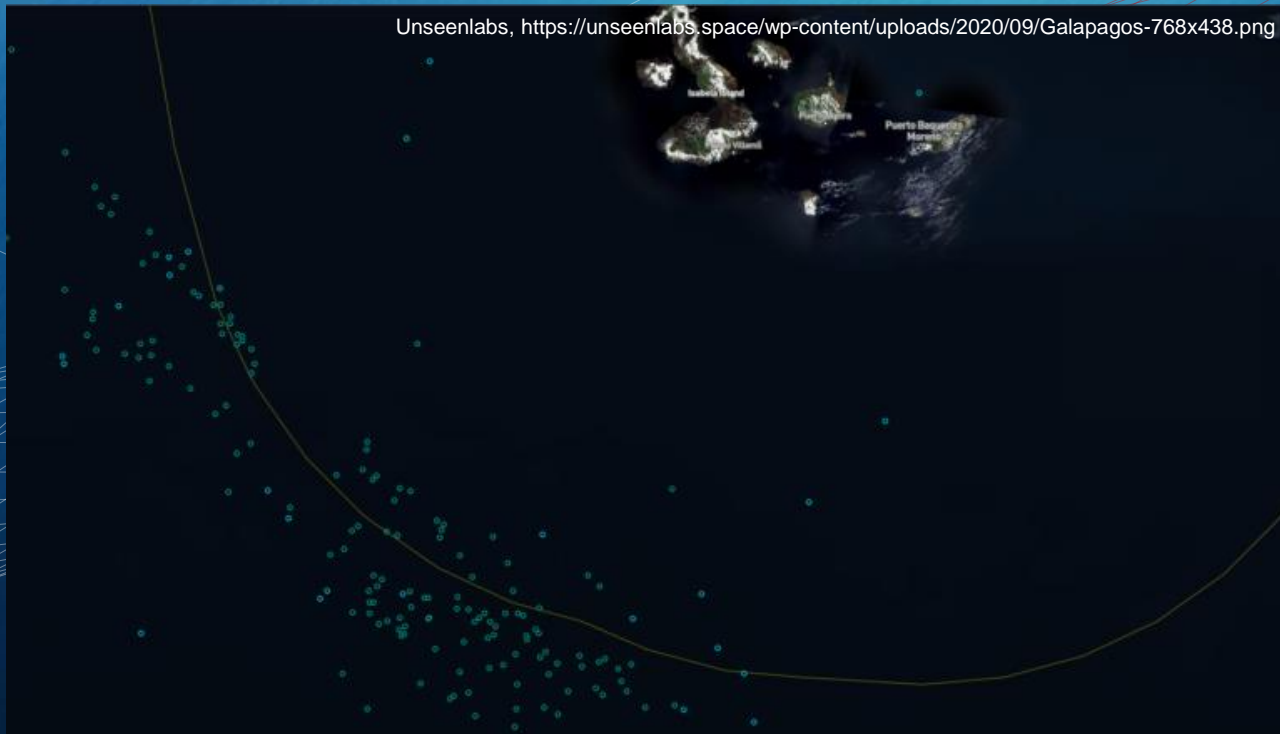


# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE

To illustrate...

RF/ELINT



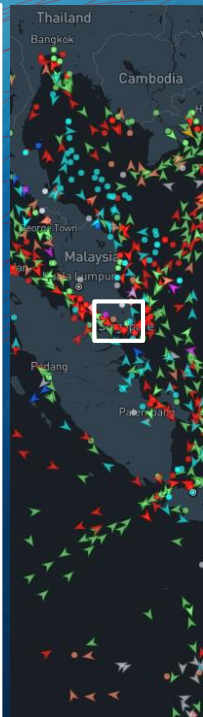
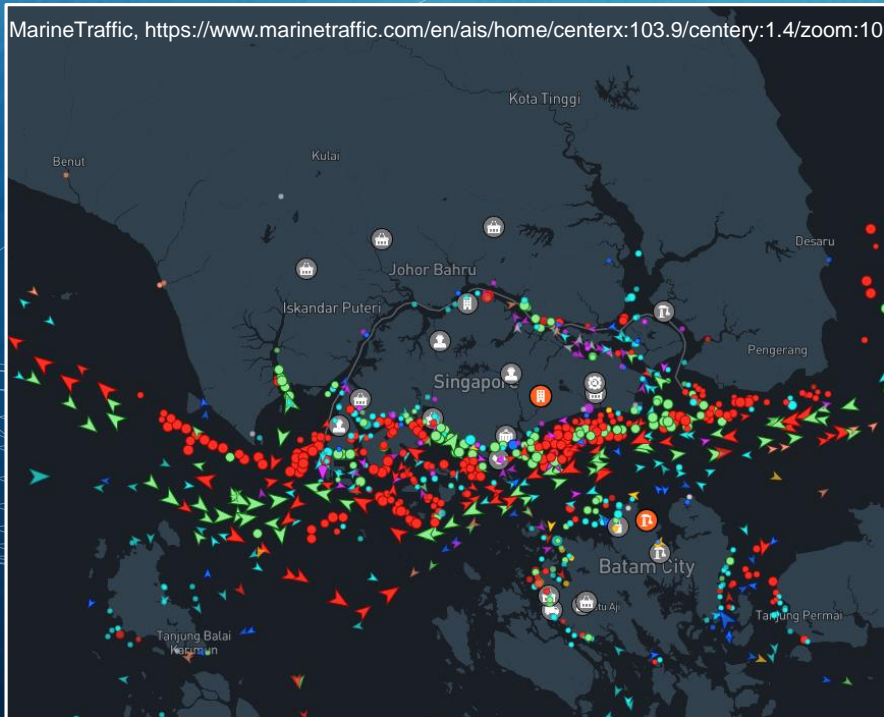


# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE

To illustrate...

S-AIS



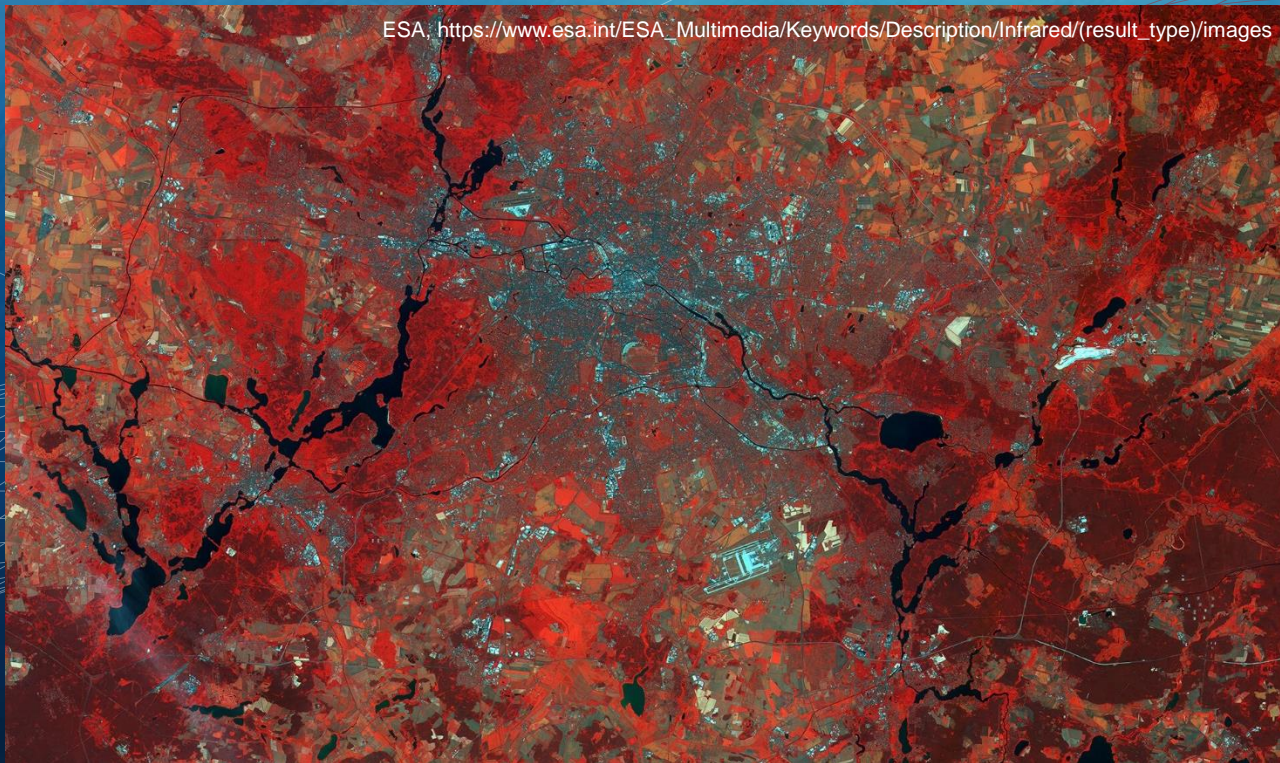


# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE

To illustrate...

ESA: [https://www.esa.int/ESA\\_Multimedia/Keywords/Description/Infrared/\(result\\_type\)/images](https://www.esa.int/ESA_Multimedia/Keywords/Description/Infrared/(result_type)/images)



Infrared

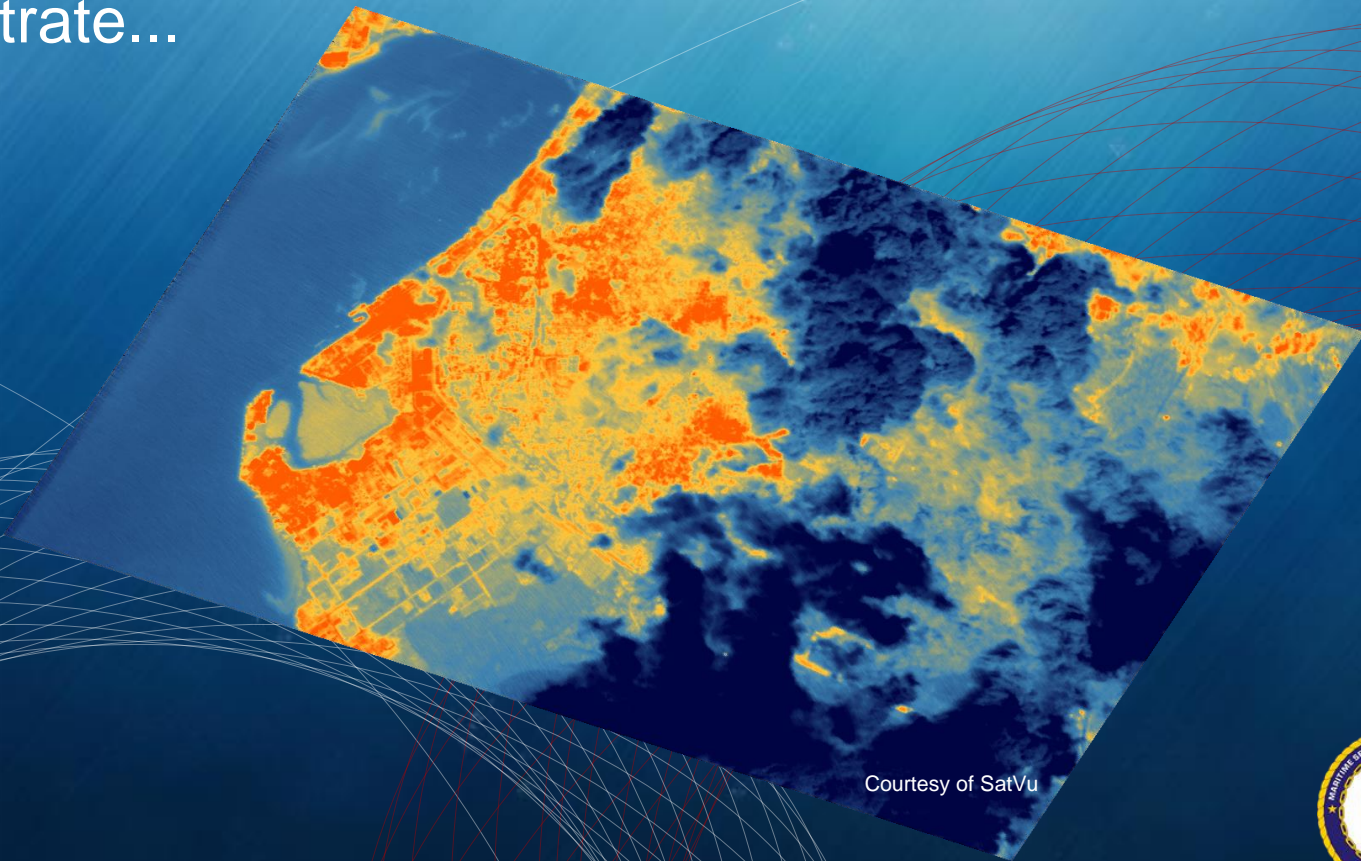




# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE

To illustrate...



Courtesy of SatVu

Thermal

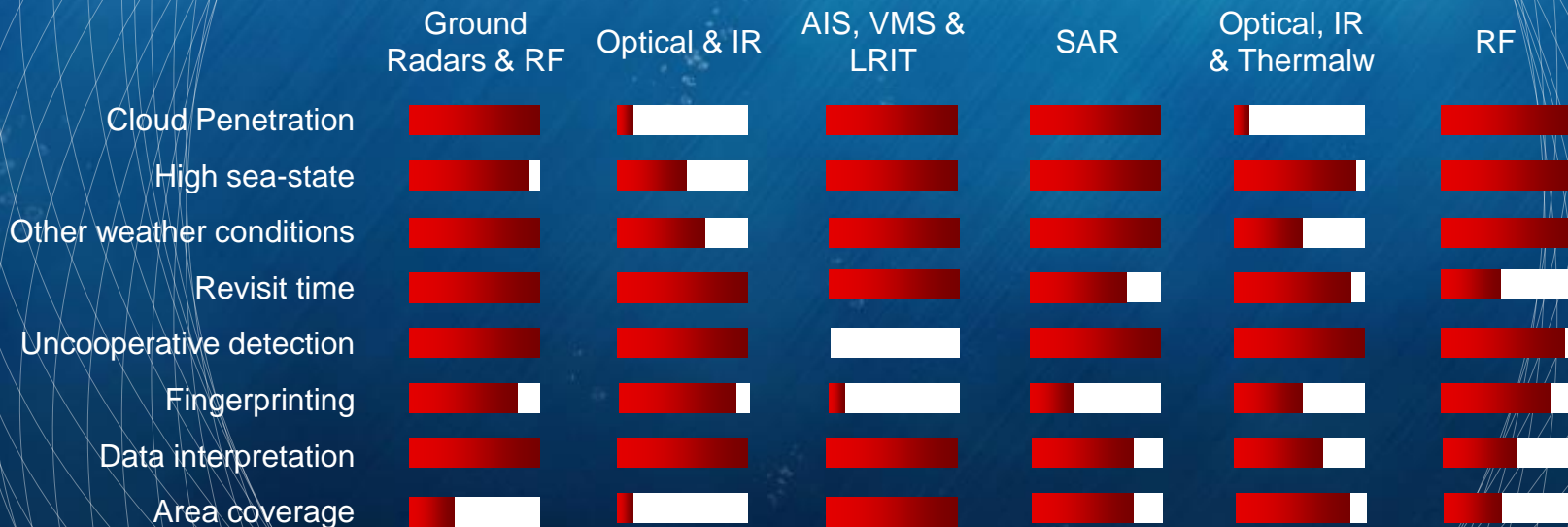




## Operational performance

### Terrestrial

### Space-based

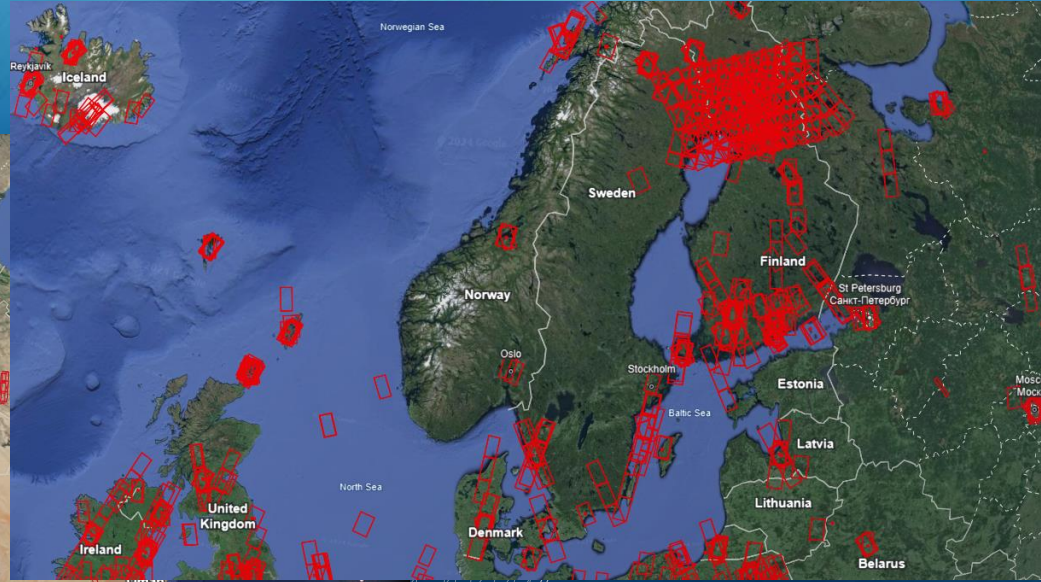




# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE

## Data availability





## How to EO? (utilisation philosophies)

### “Service”

#### Single tool, multiple modes

Intrinsic advantages & disadvantages

Connected results

Limited mitigation potential



### “Combined”

#### EO & non-EO tools, single/multiple mode(s)

Intrinsic, blended and fused advantages,

intrinsic disadvantages

Connected, blended and fused results

Reliable mitigation potential



### “Unit”

#### Single tool, single mode

Intrinsic advantages & disadvantages

Direct results

No or limited mitigation potential



### “Joint”

#### Multiple tools, single/multiple mode(s)

Intrinsic and blended advantages, intrinsic disadvantages

Connected and blended results

Mitigation potential





# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE

## Single-source channel analysis



Courtesy of GEOSAT





# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE

## Single source comparative analysis



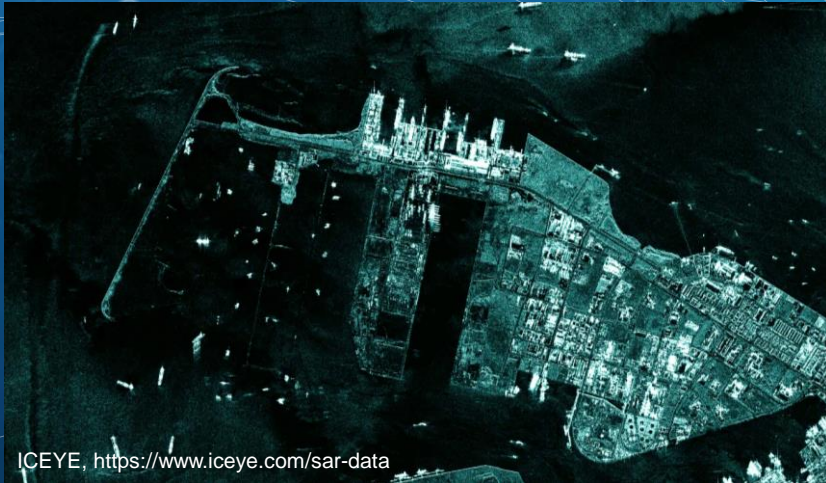
ICEYE, <https://www.iceye.com/sar-data>





# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE



ICEYE, <https://www.iceye.com/sar-data>



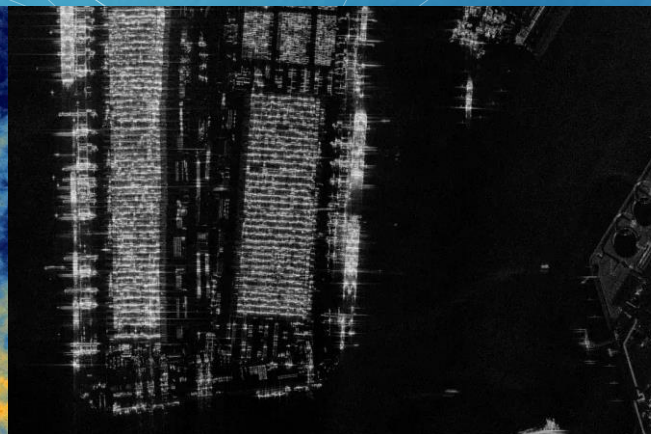
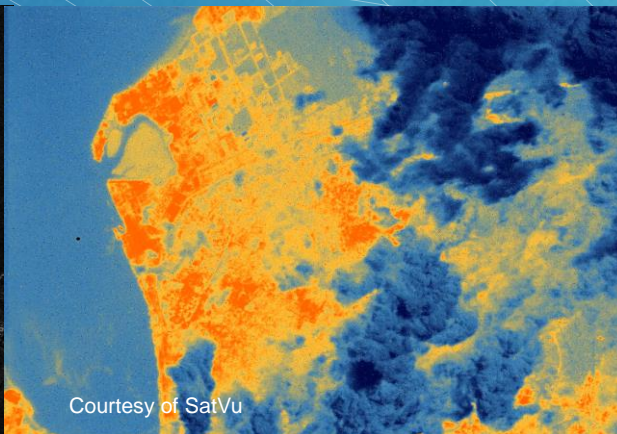
Long term site monitoring...





# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE



## Timelapse analysis

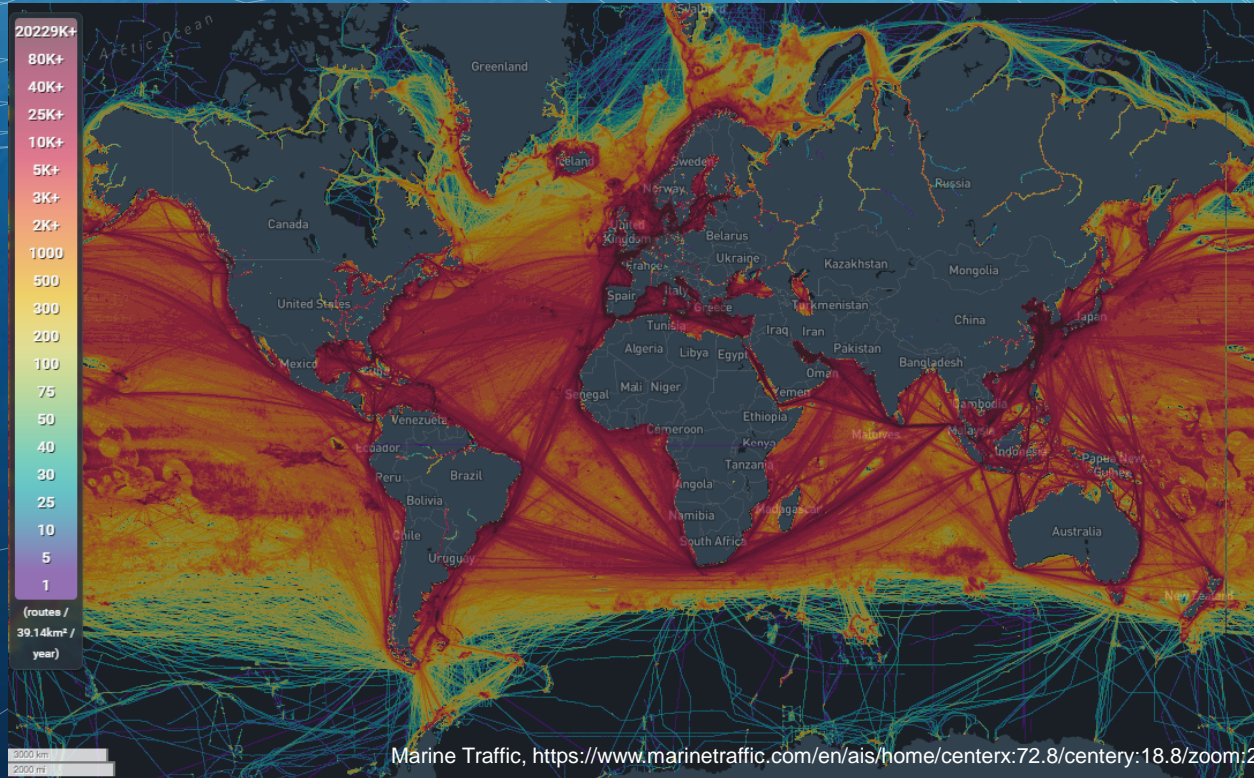




# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE

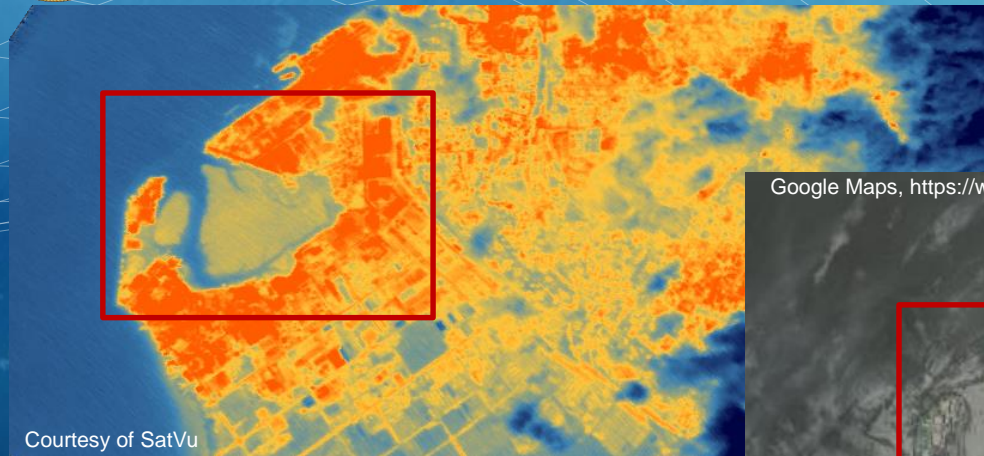
## Pattern of Life (POL) building & analysis





# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE



Google Maps, <https://www.google.de/maps/@4.0271319,9.6809583,6187m/data=!3m1!1e3?entry=ttu>



## Multi-source comparative analysis

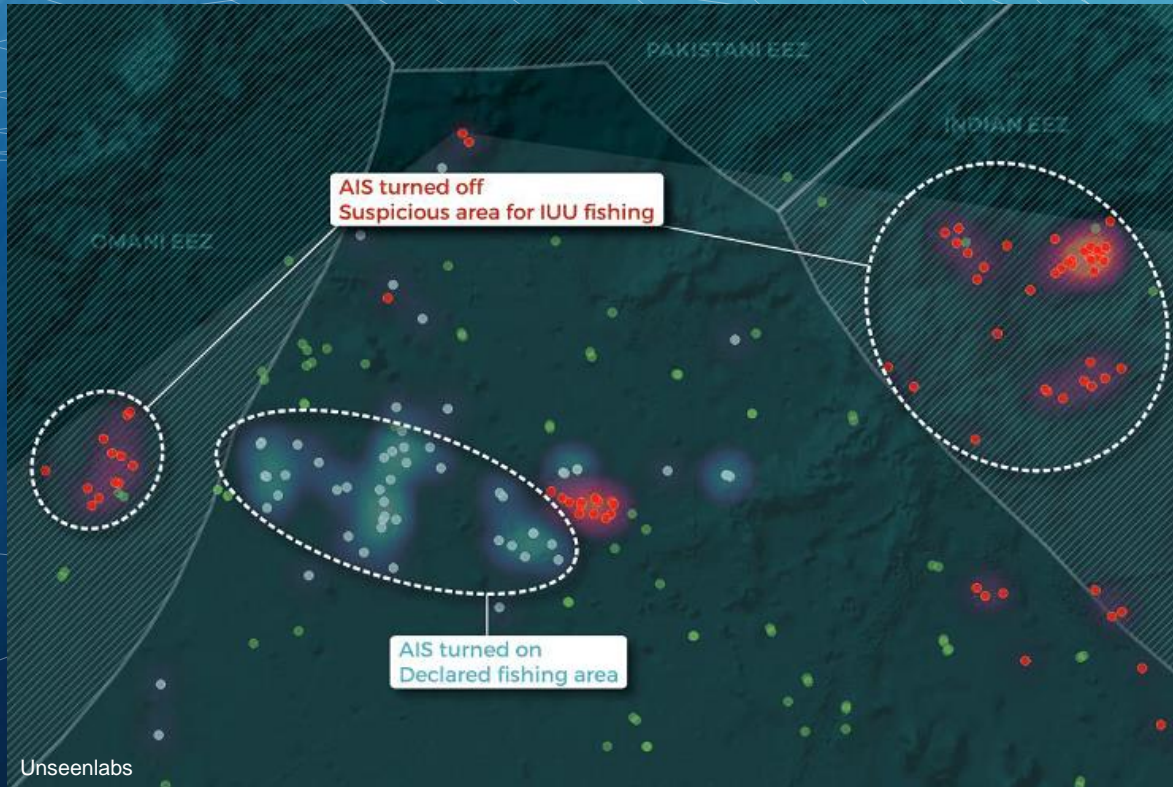




# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE

## Multi-source survey and monitoring



Unseenlabs





# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE



ICEYE, <https://www.iceye.com/sar-data>

## (AI-enhanced) Behaviour detection

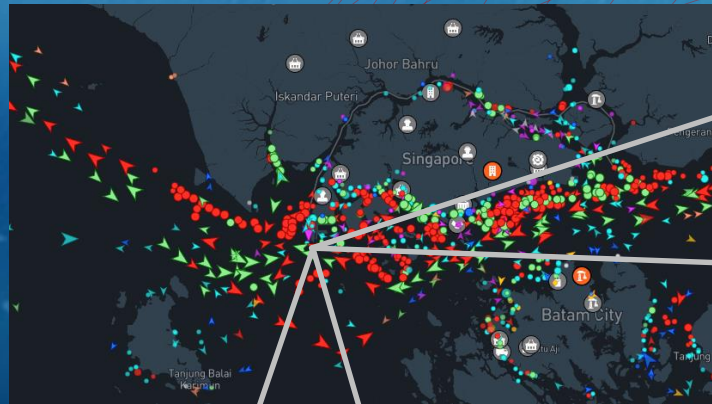




# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE

## Cue and Task



INTEL &  
Databases



An imagined case-study about not-so-imagined practices





# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE

## Crawl, Walk, Run

Experience space-based EO PED functionalities

Popularize the “space segment” in relevant fora

Explore low-cost available space “programs”

Crow-fund and focus regional instruments

Advocate and draft space-based EO policies

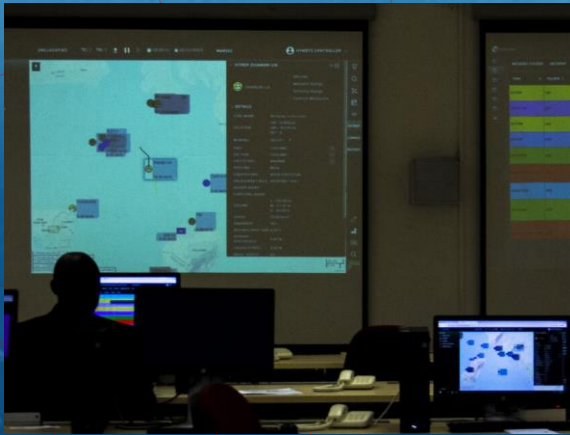
Inter-connect regions across the globe



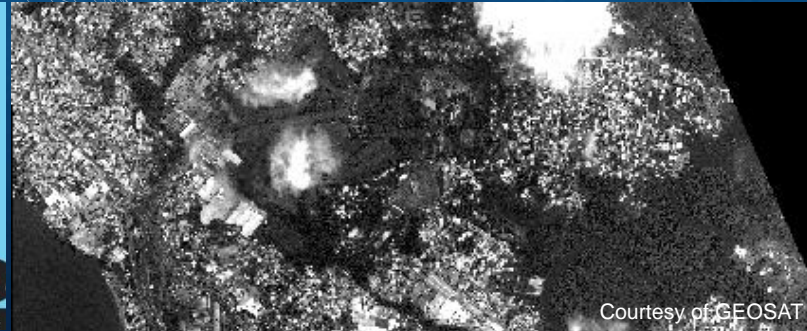
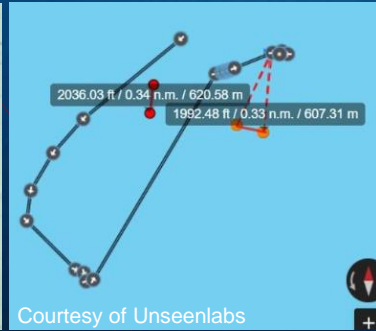
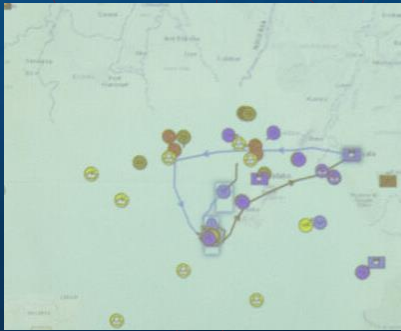
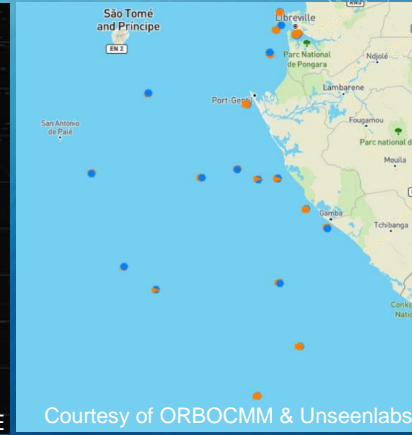
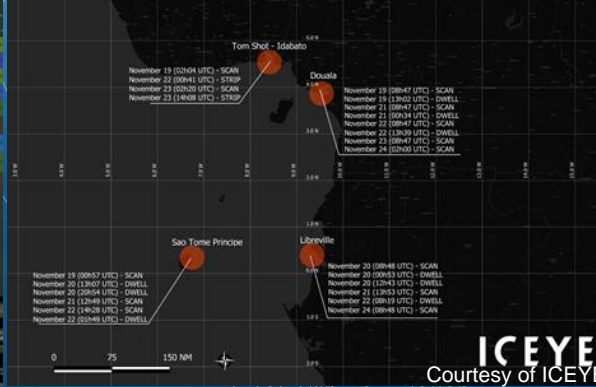


# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE



## MARSEC COE 2023: ICEYE Constellation SAR Collections



## EXER MARSEC-23





# MARSEC COE's 4th Maritime Security Conference

27-28 June 2024, İstanbul, TÜRKİYE

**Thank you  
for your attention!**

**More in the Q&A  
Session**

