Lessons learned from sensor fusion in Belgian offshore windfarms

Laurens Goossens – laurens.goossens@virya-energy.com

GEOxyz MARLINKS decreasing cable risks .Ocean

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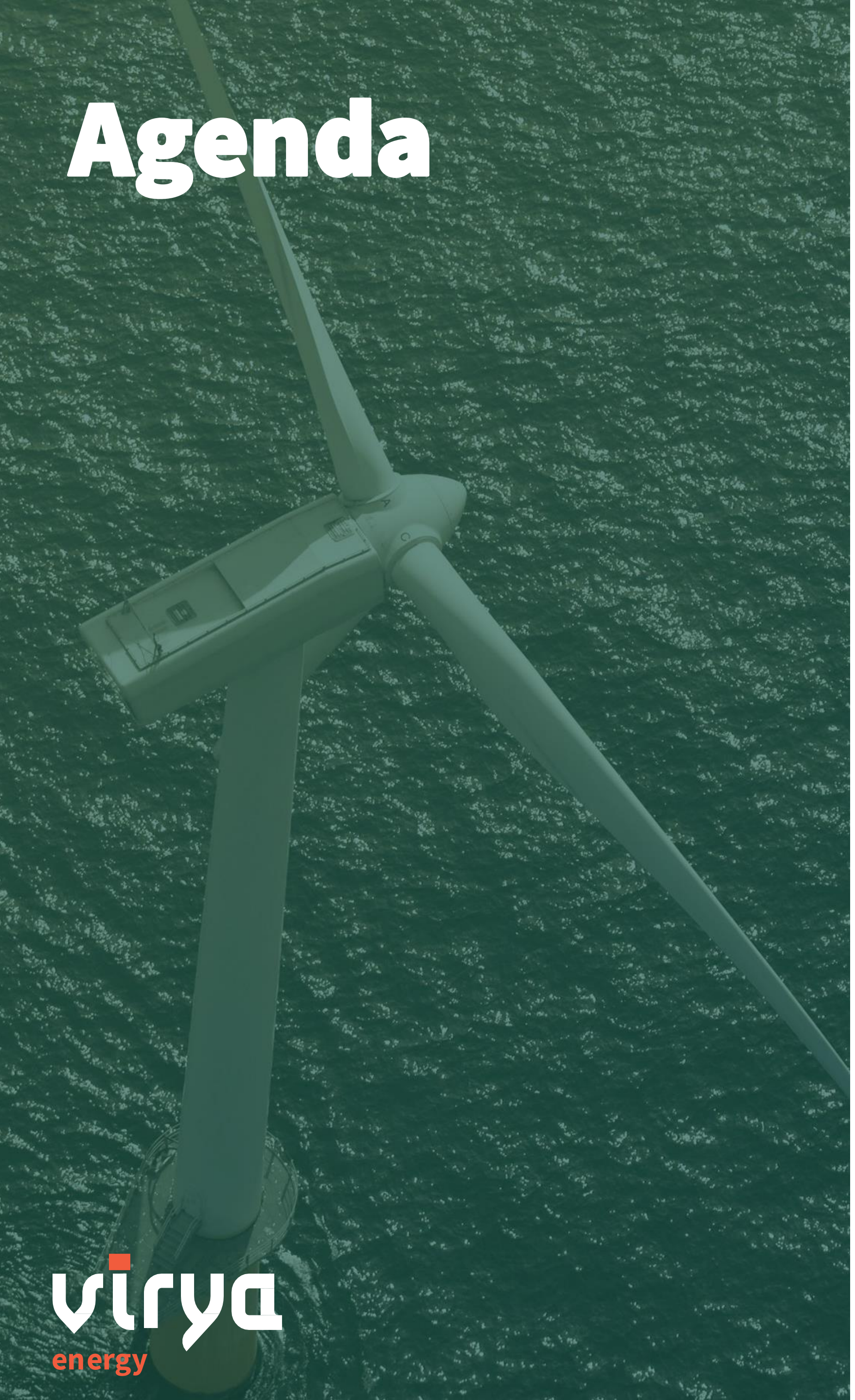
Agenda



1. **Virya Energy – daughter companies**
2. **Experiments done with different sensors**
    1. 2021: Radar/AIS
    2. 2023: DAS/AIS
    3. 2023: DAS ROV
    4. 2024: DAS divers
    5. 2025: radar/AIS/camera/USV
    6. 2025-…: radar/AIS/DAS/camera/USV
3. **EDA Cat B - Fully integrated PoC**

1. Virya Energy – daughter companies

GEOxyz

Unmanned Surface Vessel (USV)

Sensor Buoy

Camera

Unmanned Aerial Vehicle (UAV)

Remotely Operated Underwater Vehicle (ROV)

Manned Vessel

MARLINKS

decreasing cable risks

Distributed Acousting Sensing (DAS)

Data(base) management & cloud services

.Ocean

Unmanned Surface Vessel (USV)

Radar

Camera

AIS

Data(base) management & cloud services

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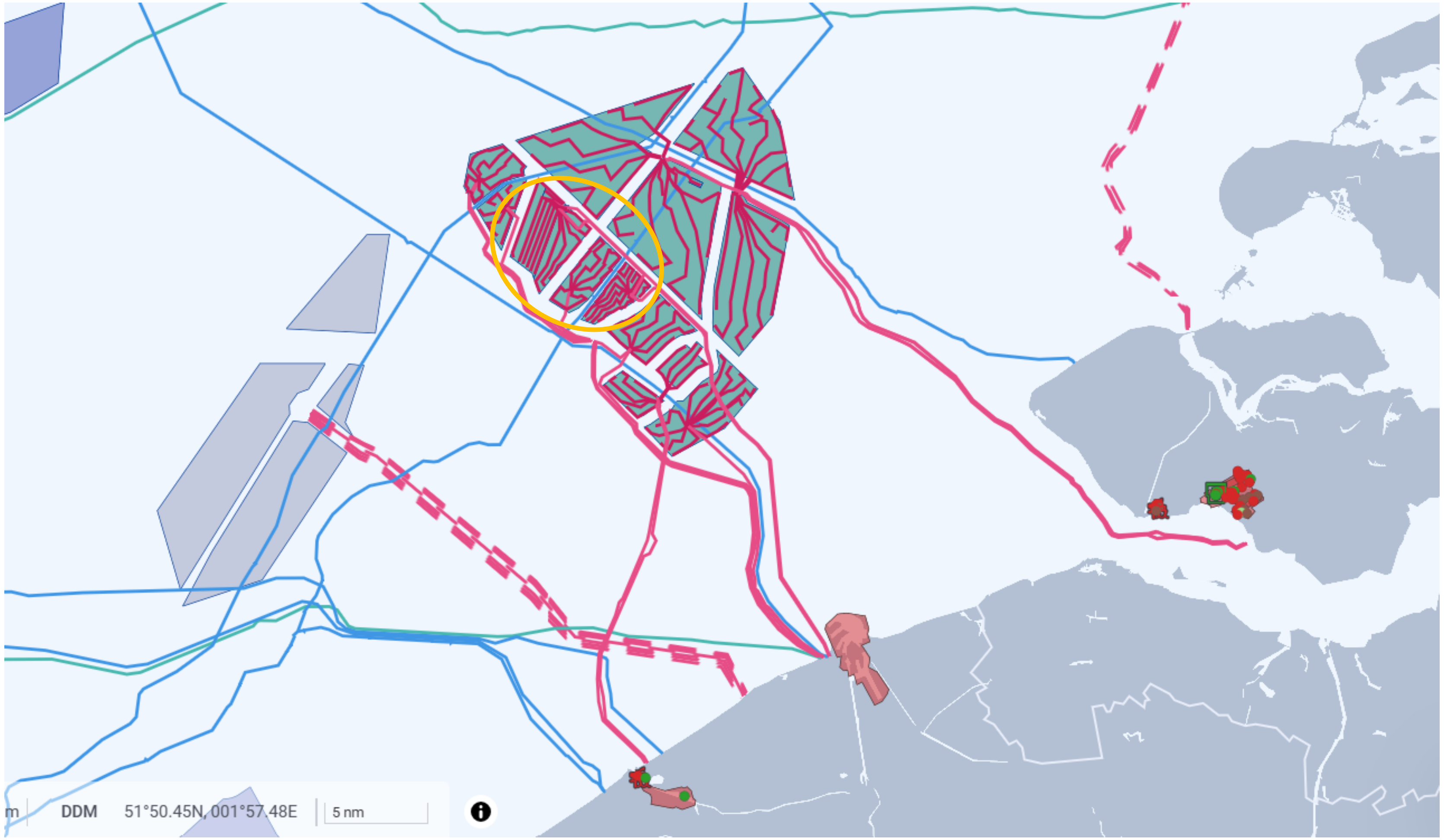
2.1 - BE Economic zone – radar/AIS - 2021



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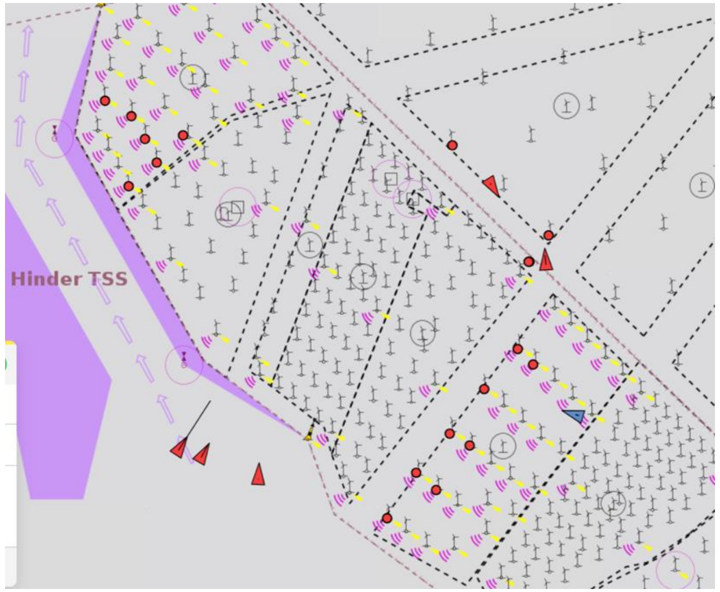
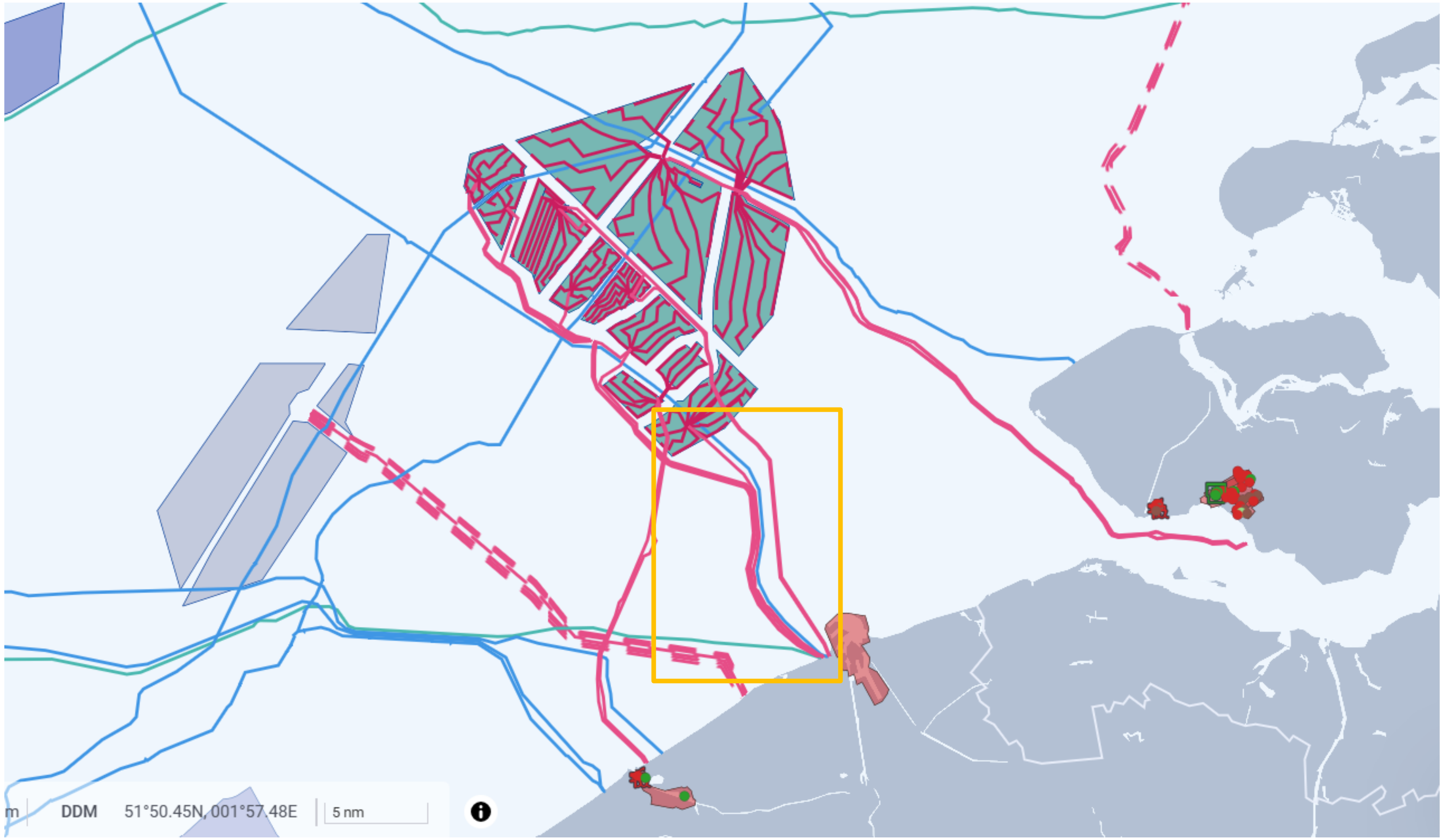
2.1 - BE Economic zone – radar/AIS - 2021



2.2 - BE Economic zone – DAS/AIS - 2023



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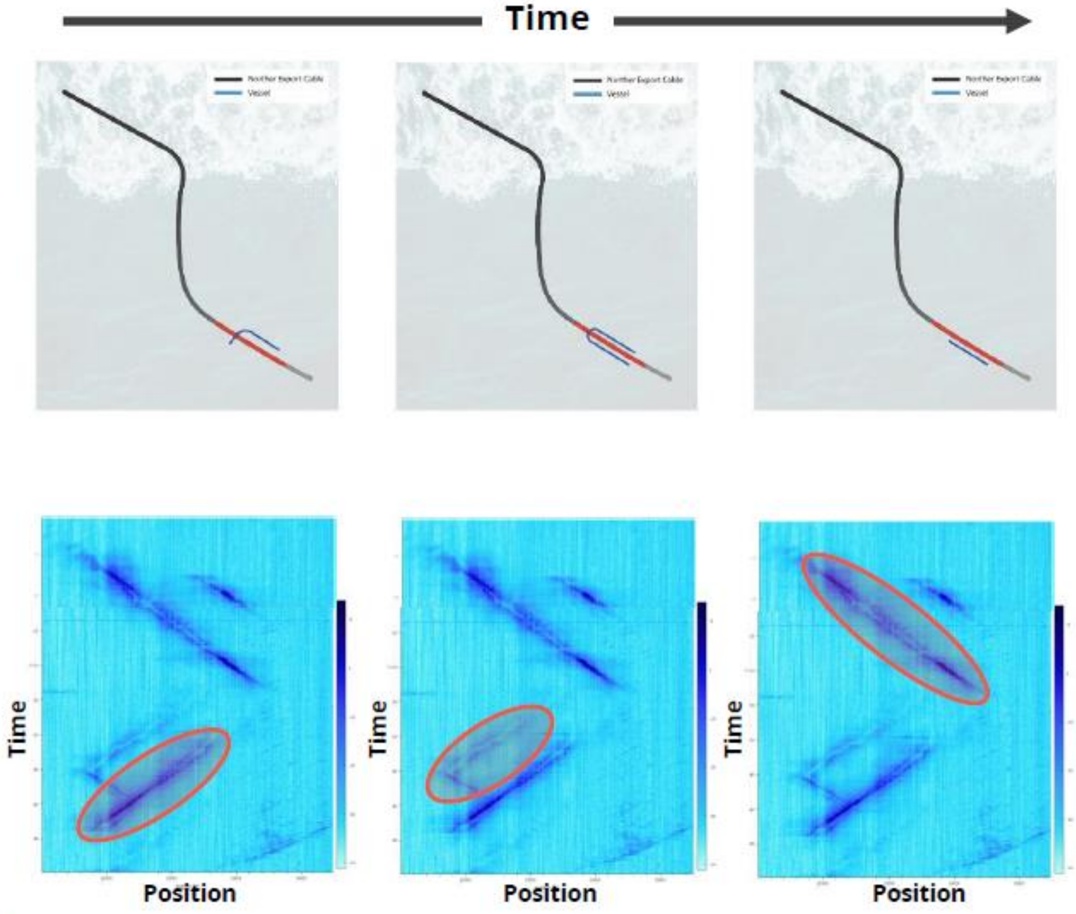
2.2

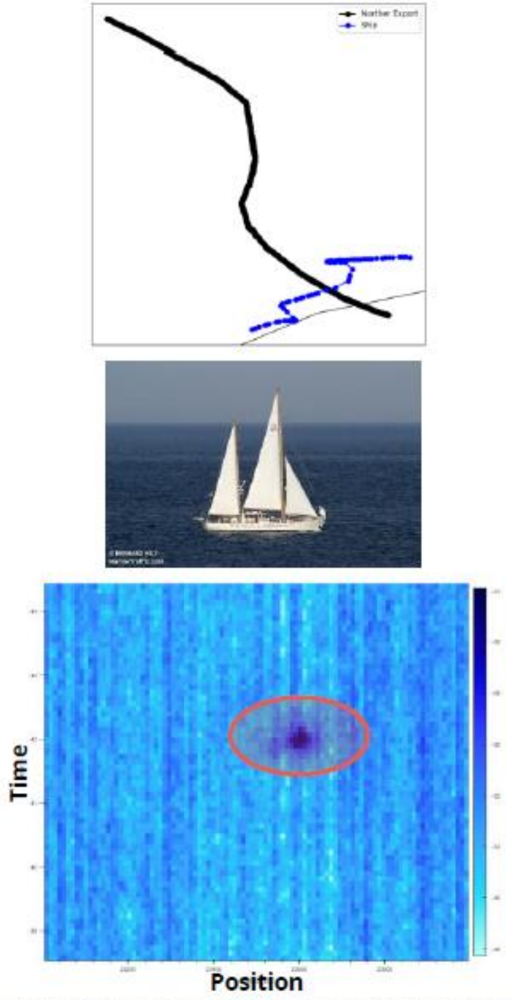
DAS DATA PROCESSING | VESSEL DETECTION

Examples of vessel detection from DAS data

Fishing vessel detection



Sailing vessel detection



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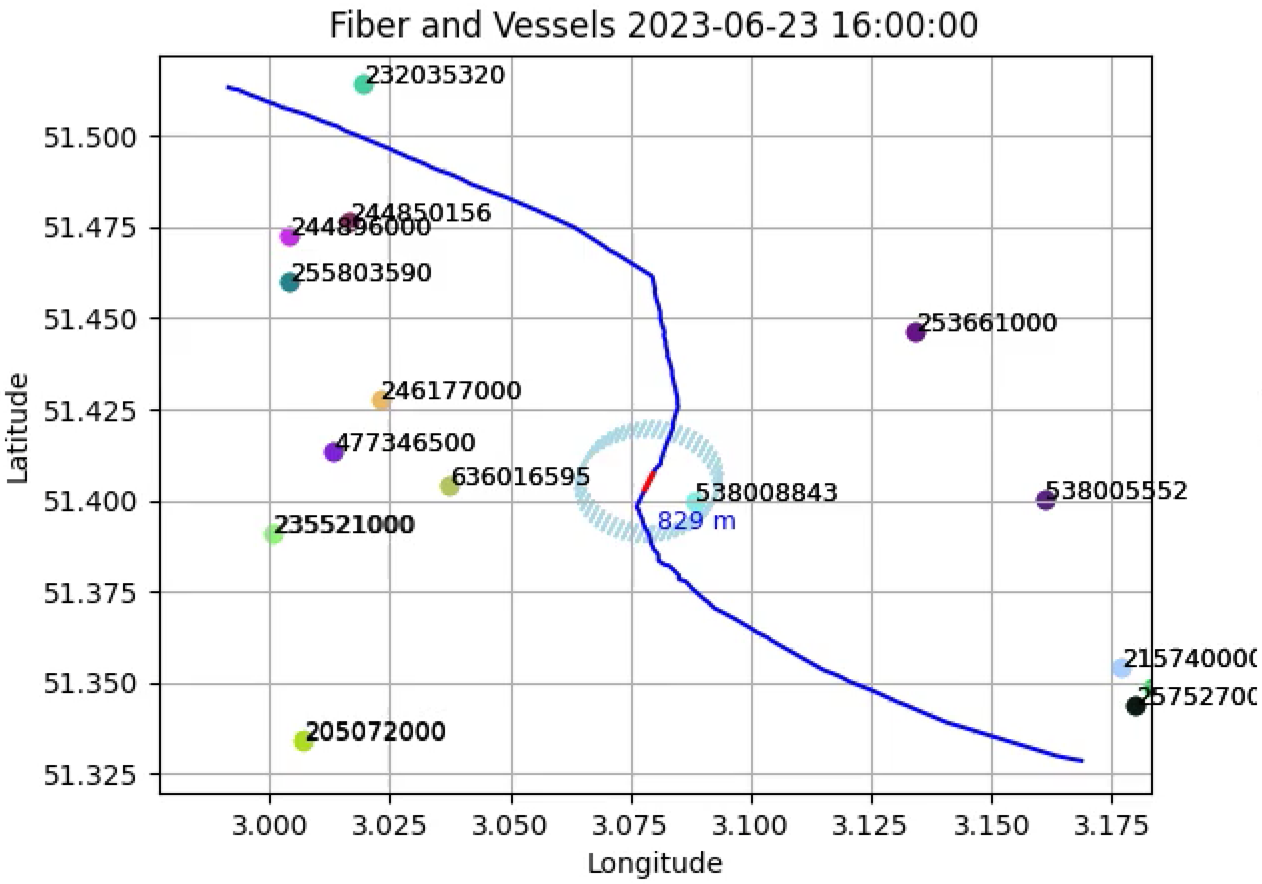
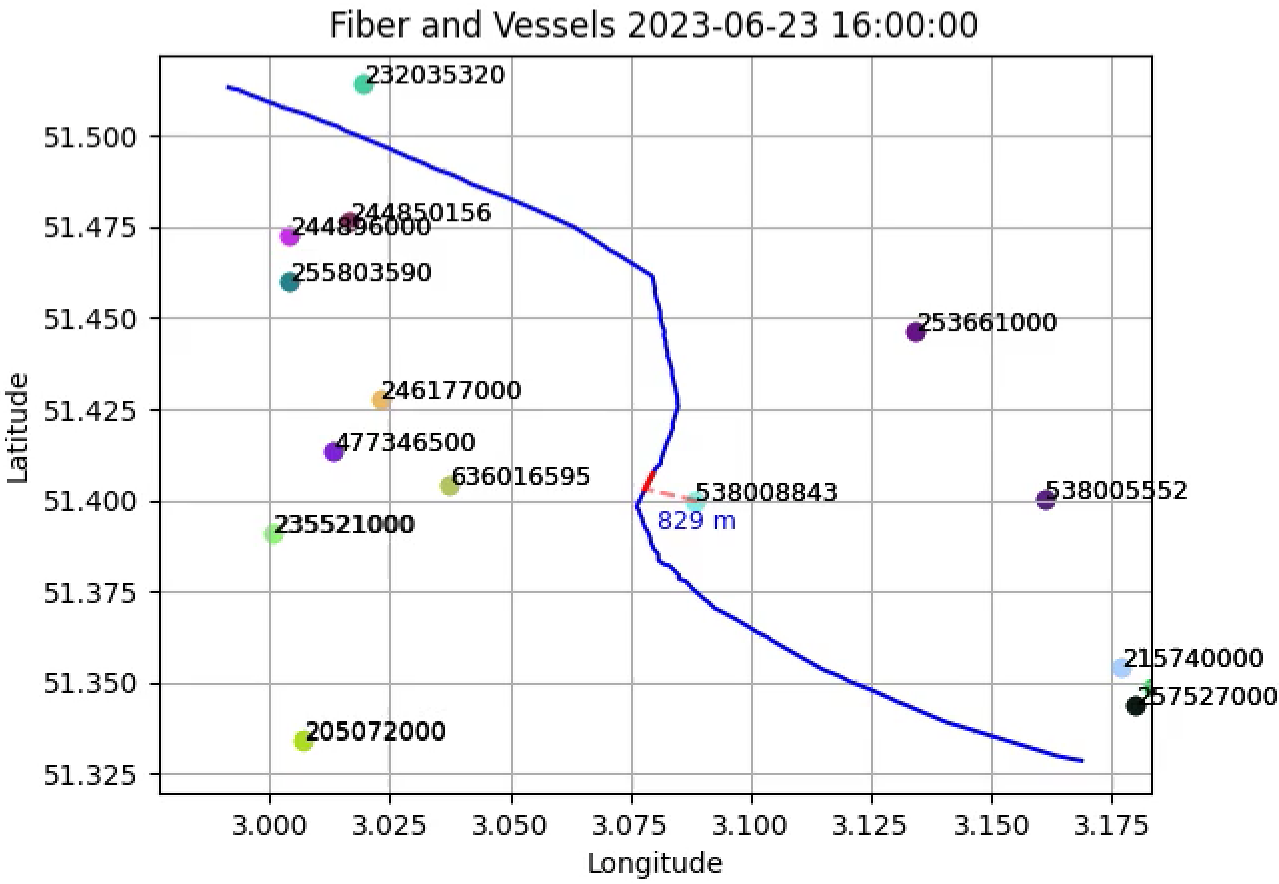
2.2 BE Economic zone – DAS/AIS – AI model

Vessel detection task (closer/further 1km)



Vessel distance estimation task



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2.3 - Extra DAS Tests performed – 26/07/23

1. Cable touching with ROV at CPS/hangoff
2. Hoovering above buried cable with ROV
3. Disturbing seabed above buried cable with ROV
4. Dropping weights on seabed from vessel

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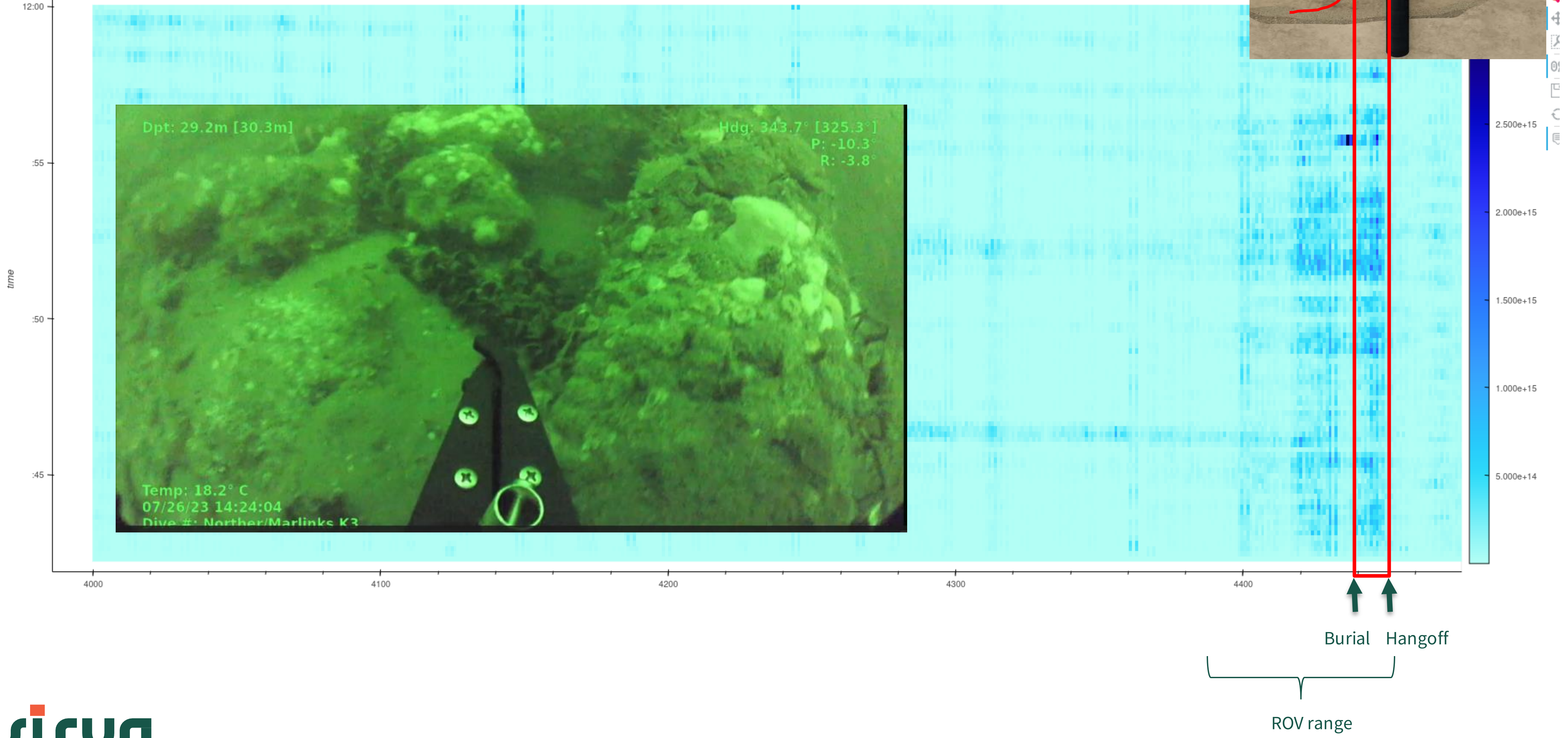
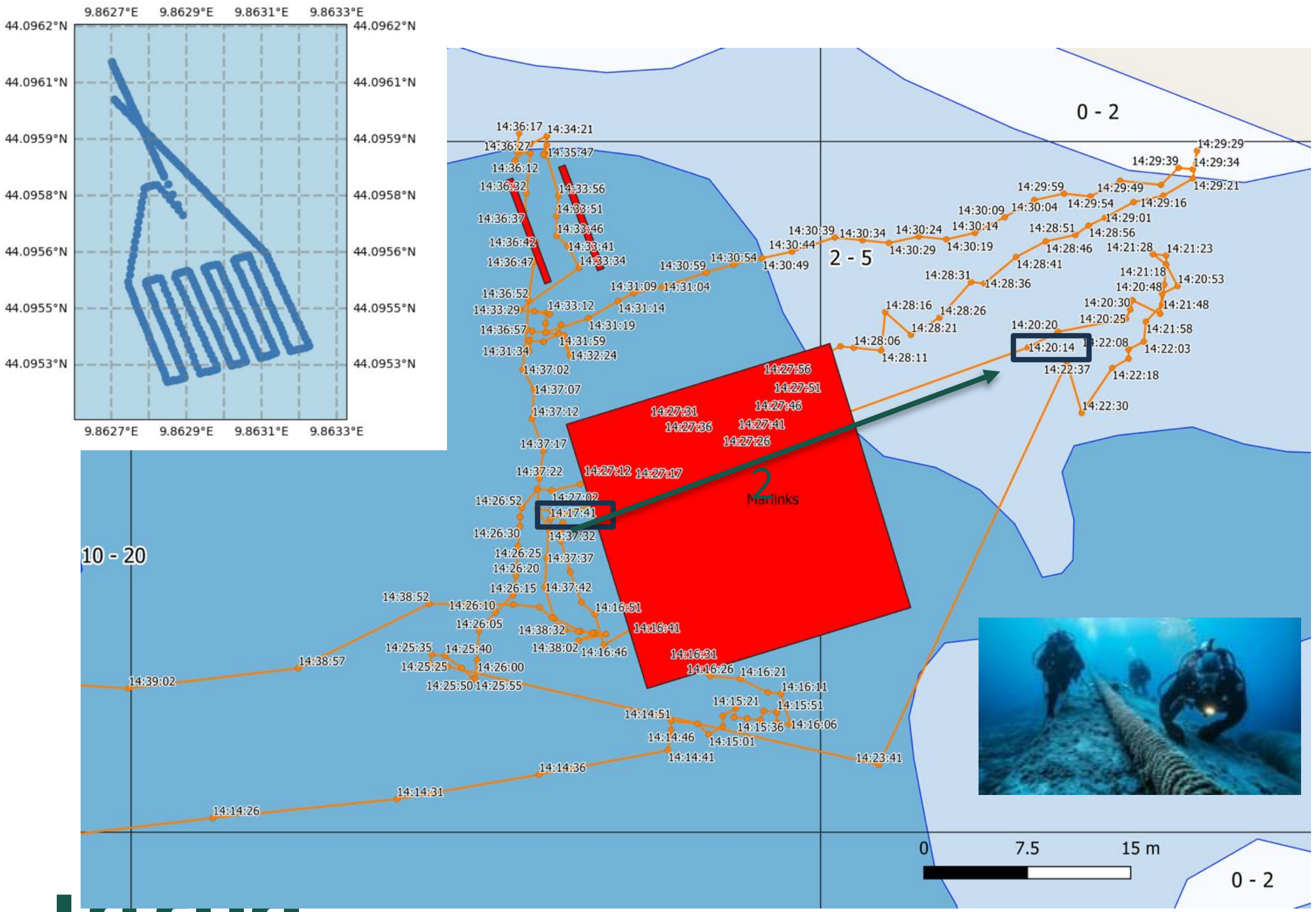
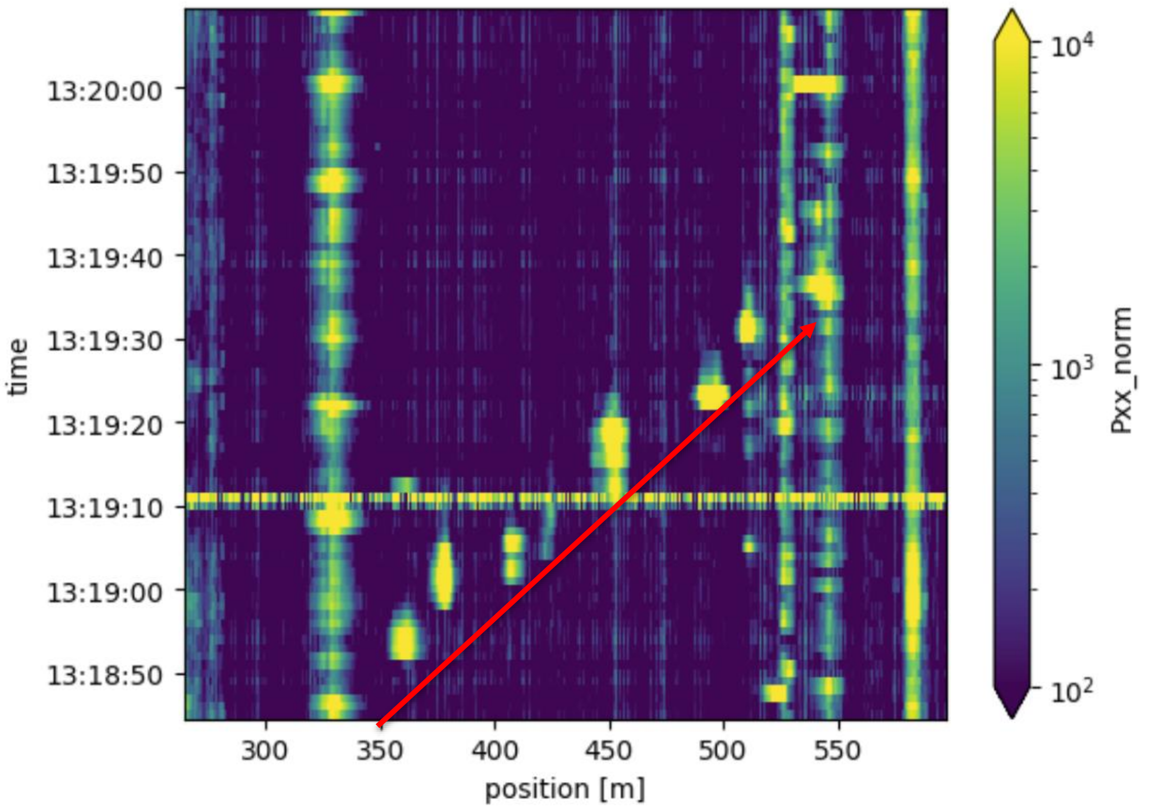
Test 2: hoovering above cable (6 – 6.5Hz spectrum) – thruster noise frequency ROV



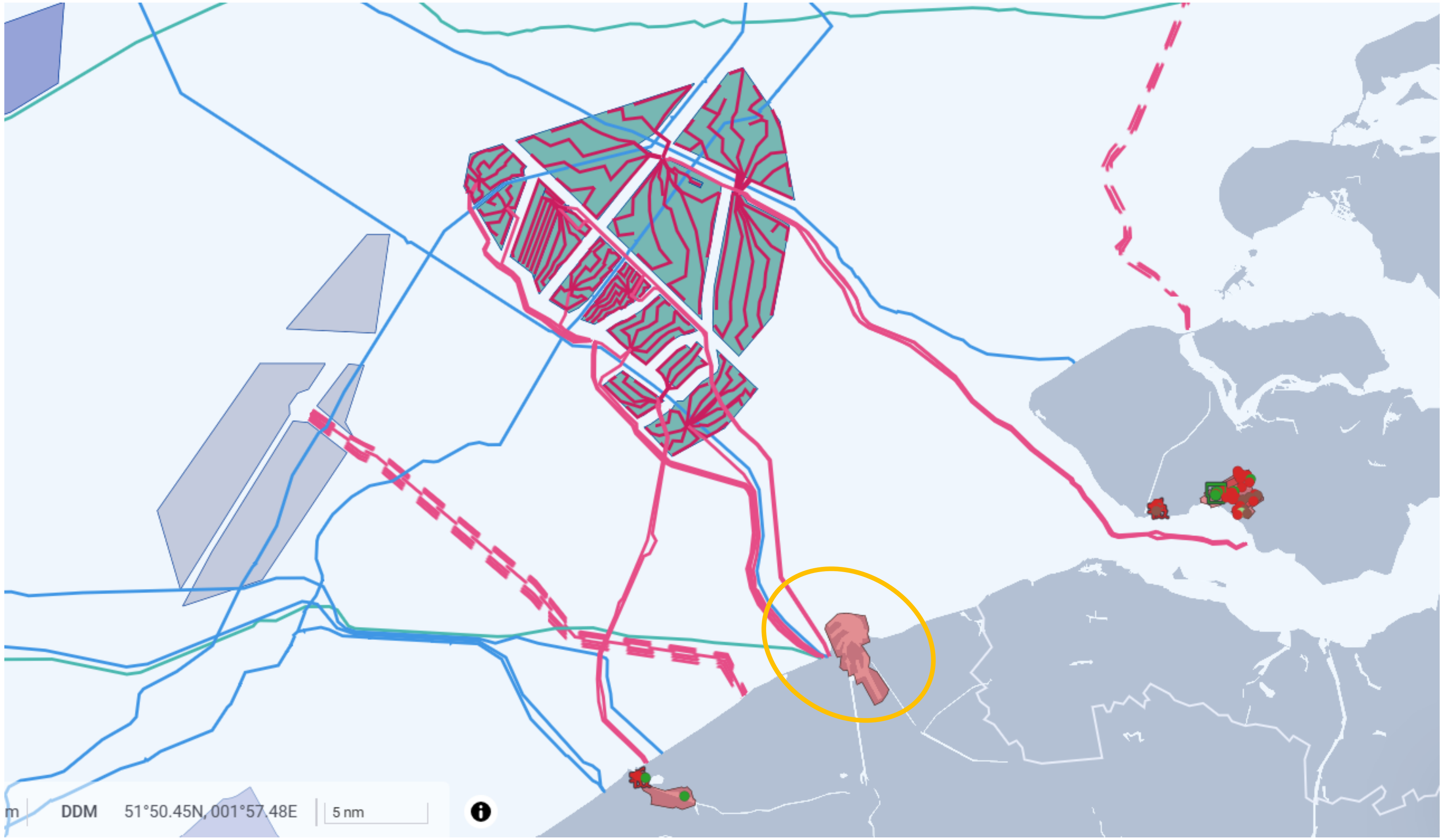
2.4 - DIANA NATO project – DAS tests with special forces divers



Conclusive



2.5 - BE Economic zone – port protection



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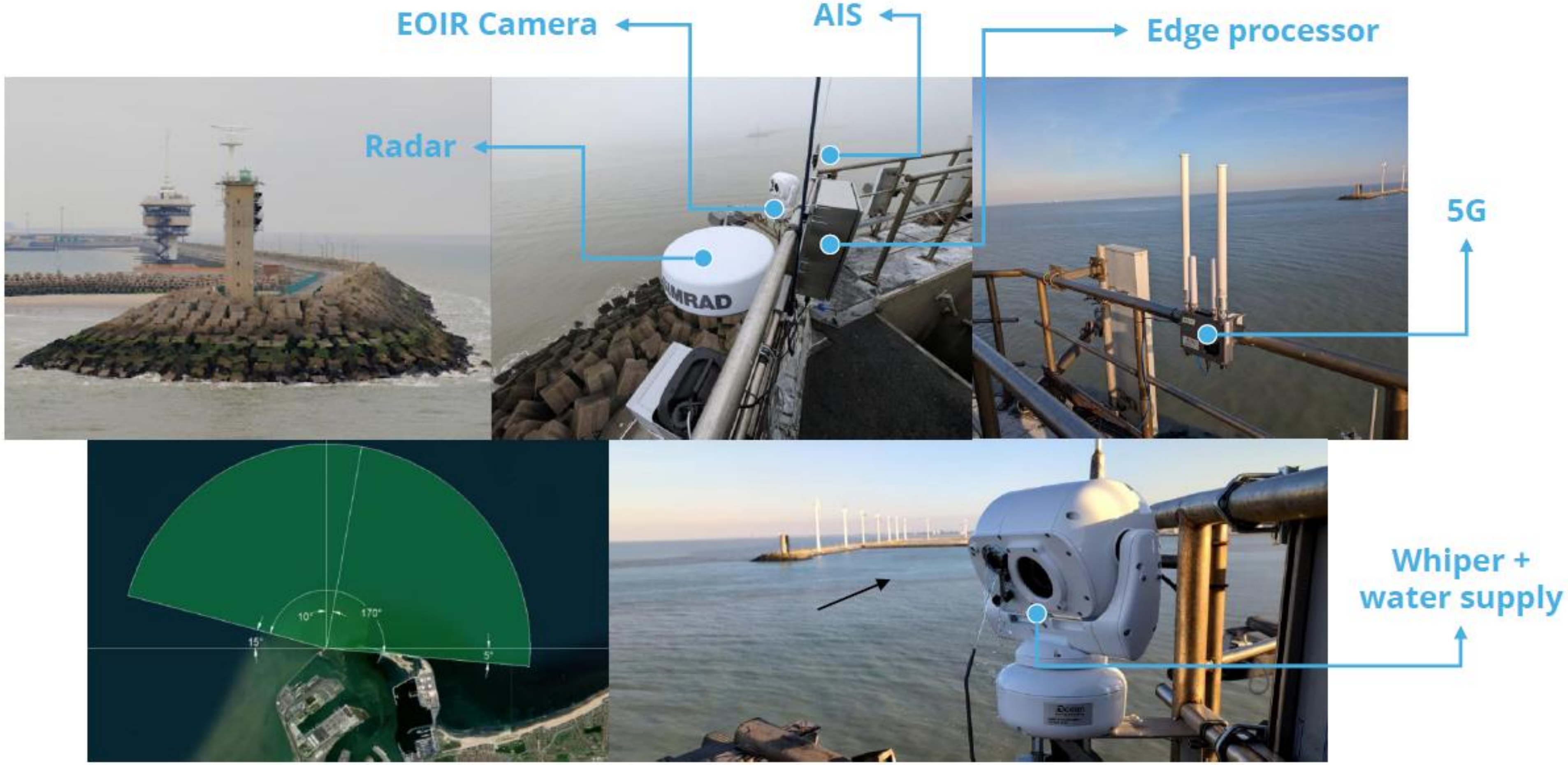
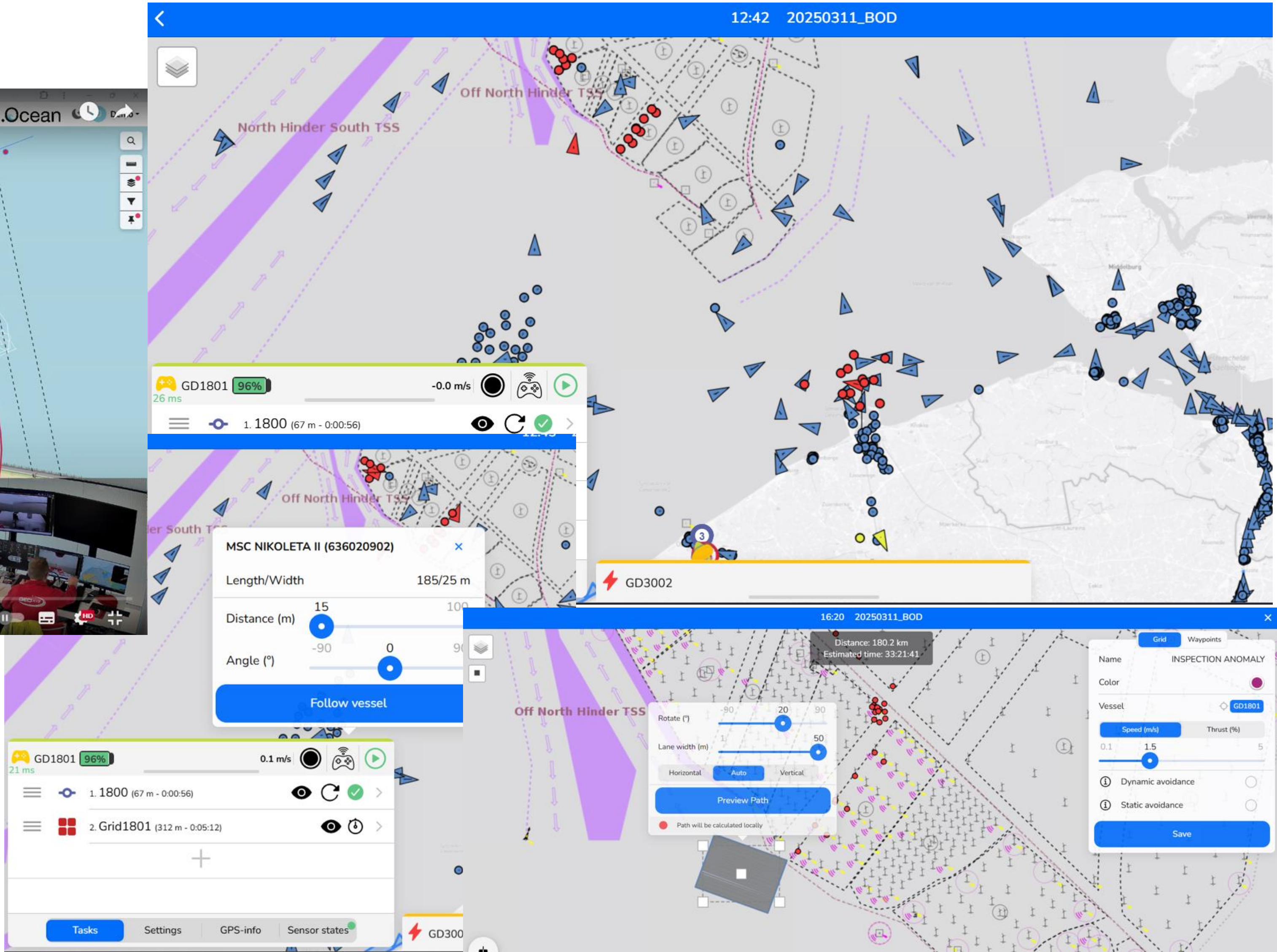
2.5 - BE Economic zone – port protection – radar/AIS/camera/USV



2.5 - Implementation of USV in security

- **Anomaly detection**

- **USV command & control:**
  - Anomaly pinpointing
  - Follow anomaly with USV
  - Inspect underwater area near anomaly



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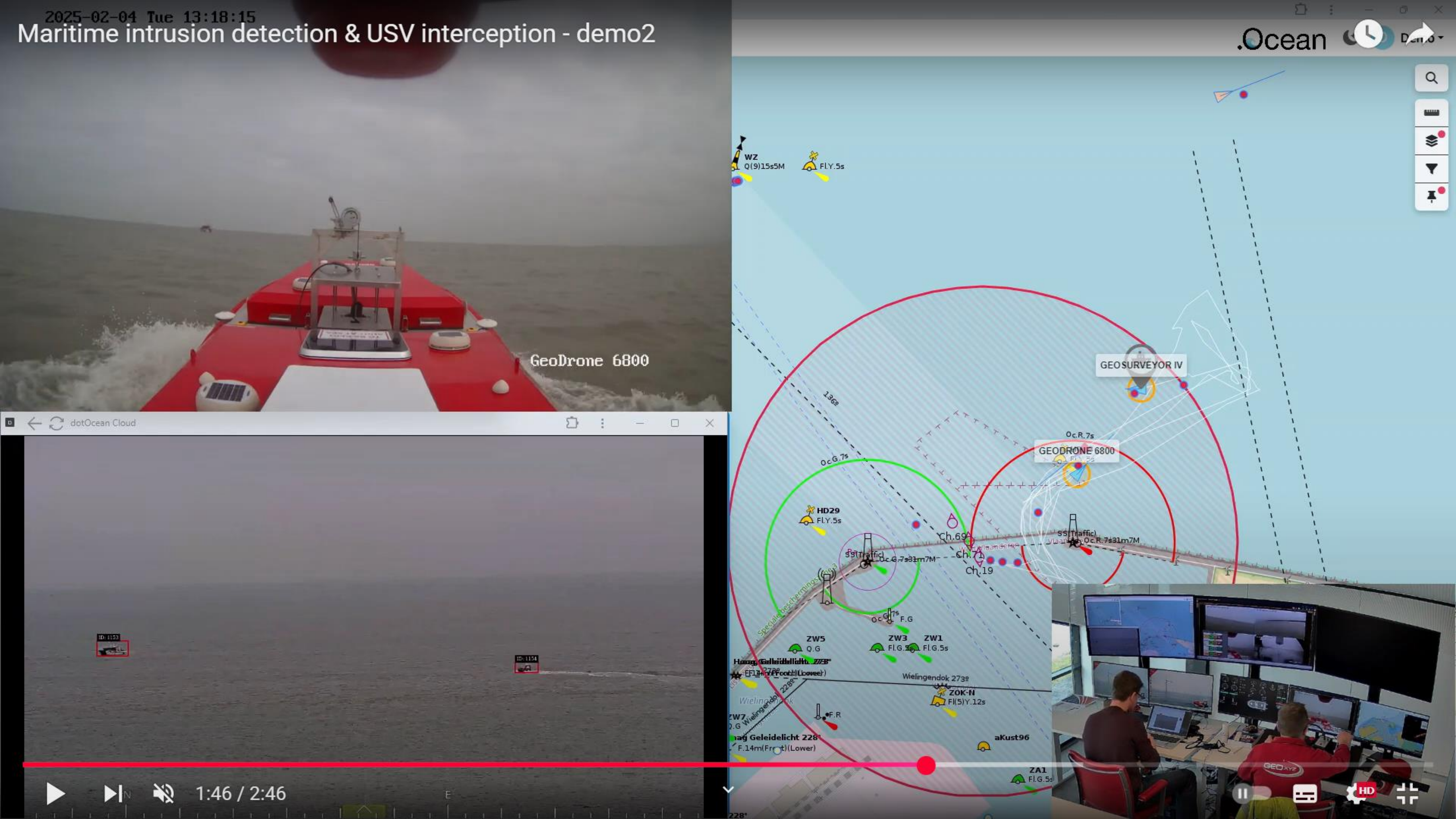
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Maritime intrusion detection & USV interception - demo2
GeoDrone 6800
dotOcean Cloud
.Ocean
GEOSURVEYOR IV
GEODRONE 6800
WZ
Q(9)15s5M
Fl.Y.5s
HD29
Fl.Y.5s
Oc.G.7s
Oc.R.7s
Ch.69
Ch.19
ZW5
Q.G
ZW3
Fl.G.5s
ZW1
Fl.G.5s
F.G
Wielingendok 273º
ZOK-N
Fl(5)Y.12s
F.R
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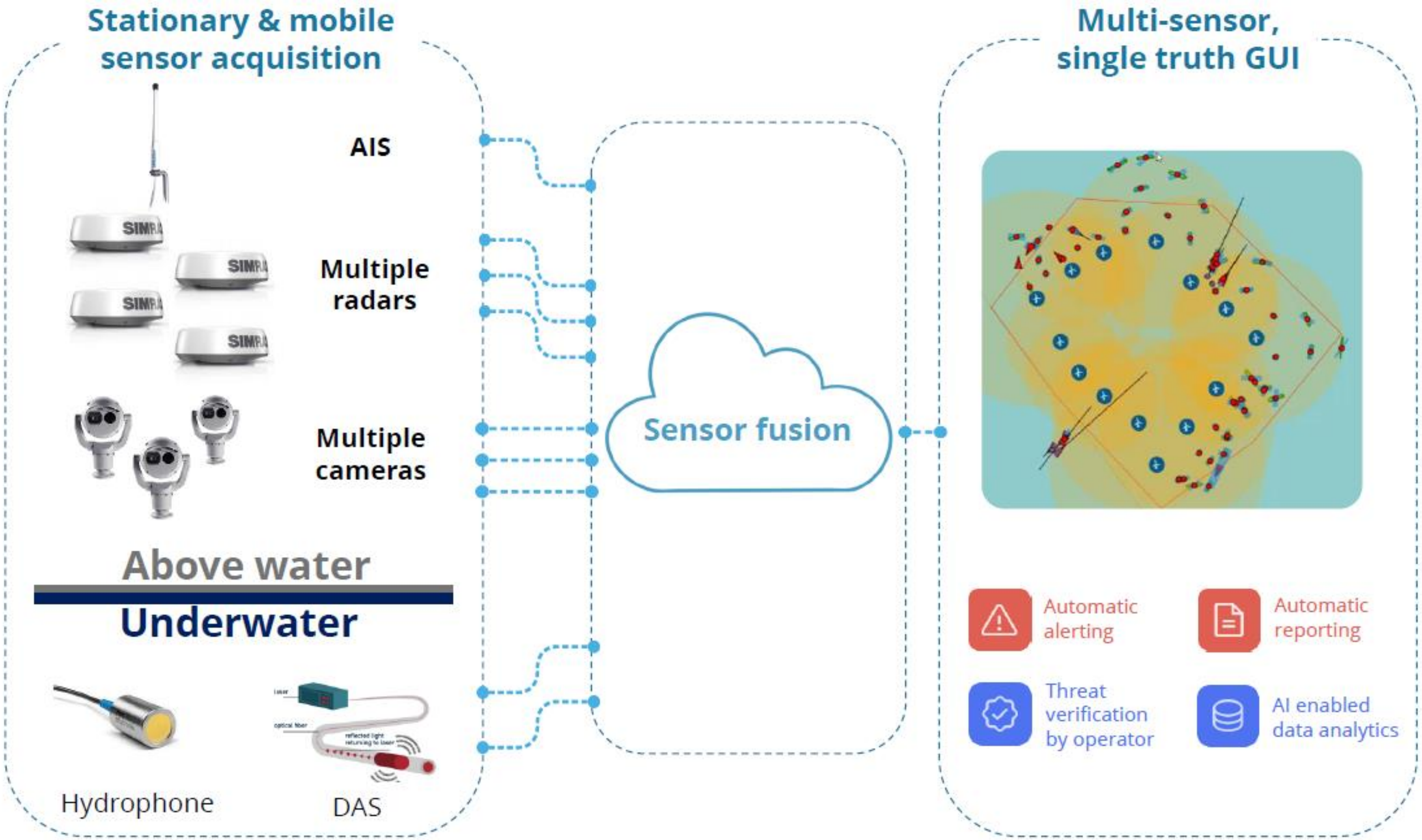
1:46 / 2:46

3. European Defense Agency – Cat B project proposal

PROVEN

TO BE INTEGRATED



3. EDA Cat B - Where?

- **BE/NL windfarms**
- **BE/NL export cables**
- **Potential for port access routes**
  - Port of **Antwerp-**Zeebrugge
  - Port of Antwerp-**Zeebrugge**

Q&A

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Videos

https://vimeo.com/whynotdigital/review/867938948/82aa975b13?#

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