BEeS

The LifeWatch ERIC Biodiversity & Ecosystem eScience Conference

Seville
22-24/05/23

Threats and challenges to biodiversity and ecosystem conservation from an eScience perspective

LifeWatch ERIC

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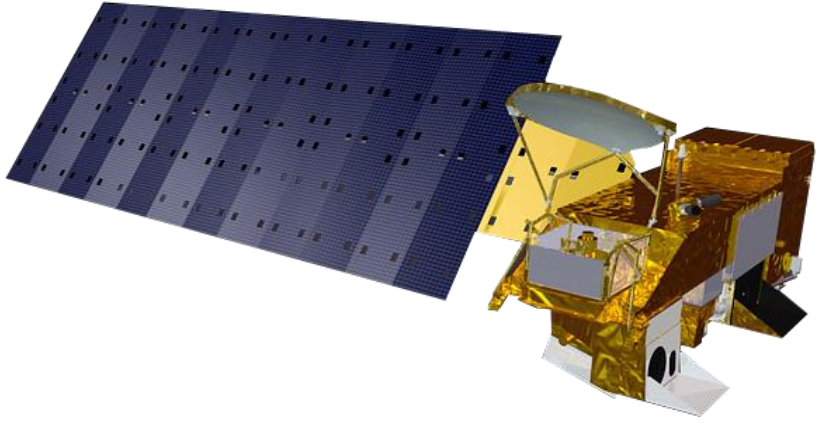
1881

Prof. Ph.D. Eng. Miroslav Tsvetkov,
Nikola Vaptsarov Naval Academy, Varna, Bulgaria
LifeWatch-Bulgaria

An approach of application of unmanned and remote-controlled multi-sensor platforms together with space-based assets in the Spanish and Bulgarian Antarctica bases for ecosystem and habitat monitoring and mapping



Remote sensing applications and modelling tool developments are key services supported by LifeWatch ERIC in ecosystem and habitat mapping thematic domain.

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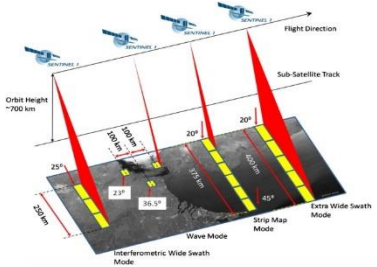
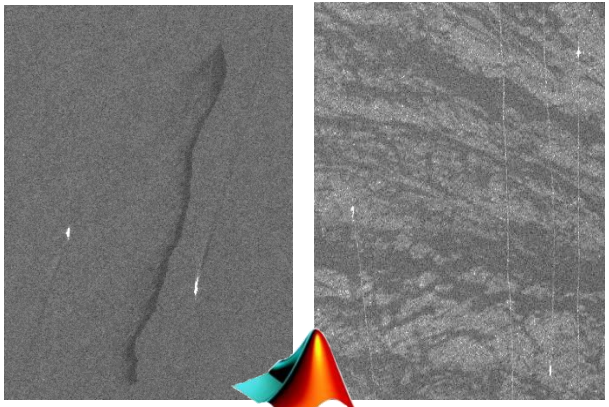
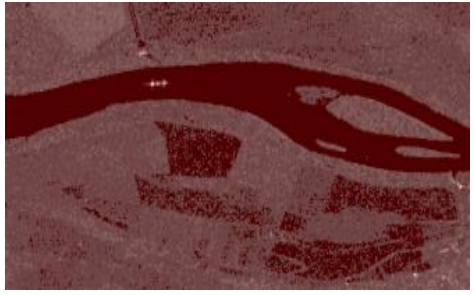
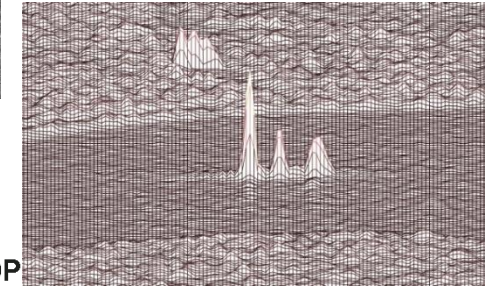
ESA Contract No. 4000122601/17/NL/SC for development of research project “Expanded traffic surveillance and deep sea oil pollution observation” for creating of algorithms and software packages for processing of radar data from the Sentinel-1 satellites, part of EU Copernicus Program.

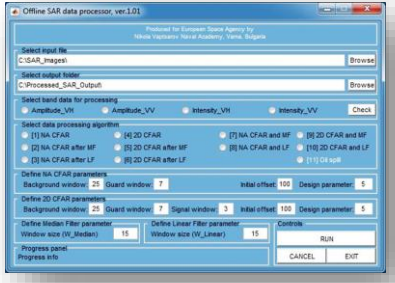




MATLAB







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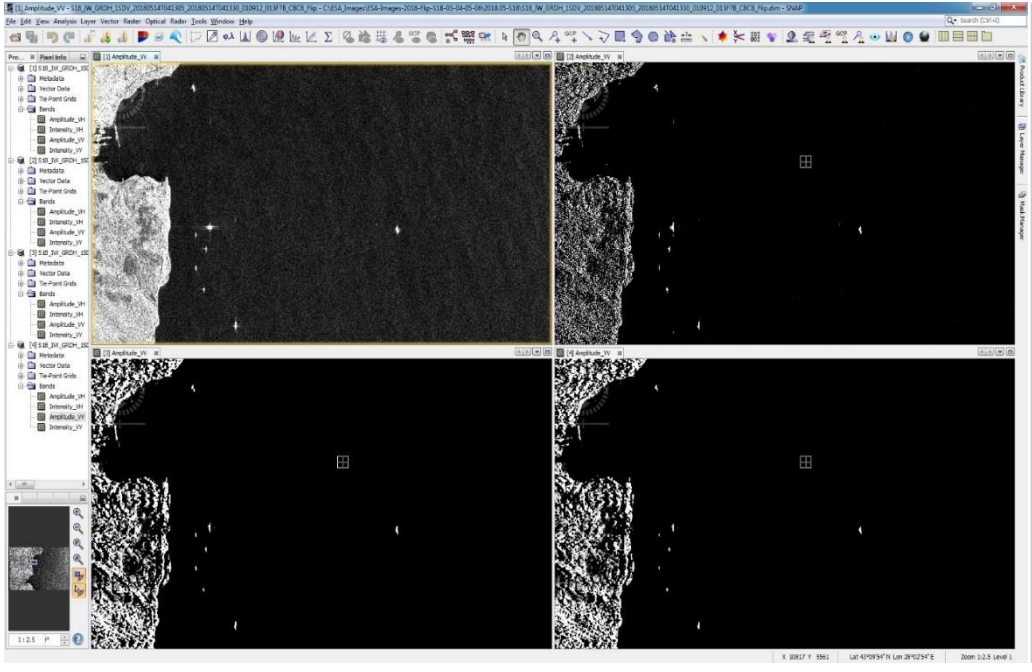
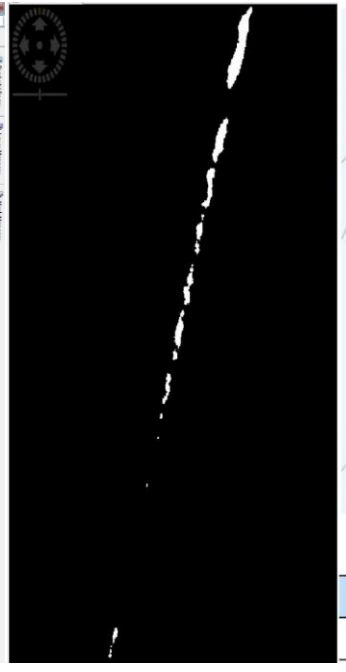
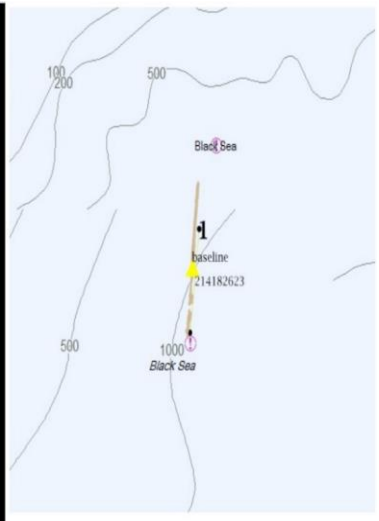
SENTINEL-1 (ESA) data processing and validation







Possible source information

IMO	Name	MMSI	C/S
N/A	N/A	214182623	N/A

EMSA SafeSeaNet

EMSA CleanSeaNet

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SENTINEL-1 (ESA) data processing and GIS integration

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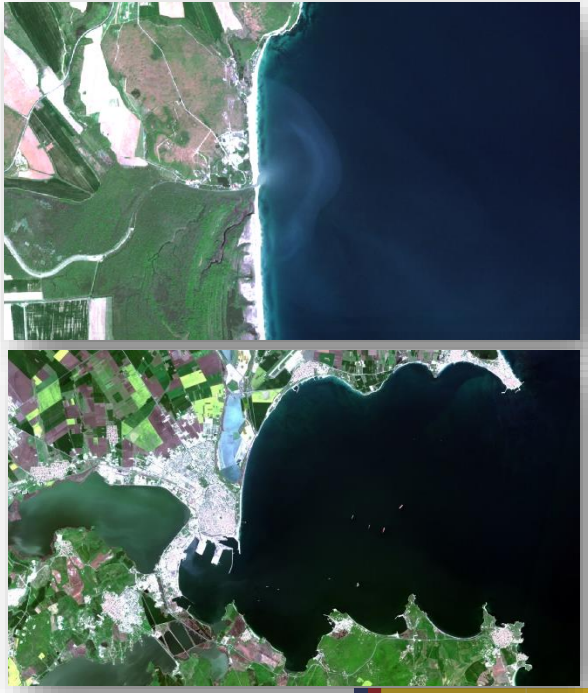
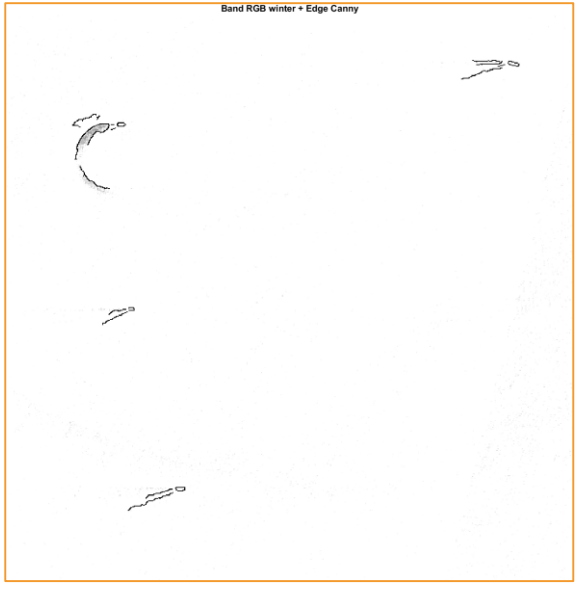
SENTINEL-2 (ESA), LANDSAT (USA), MODIS (USA), PLÉIADES (AIRBUS), PLANET + digital image processing





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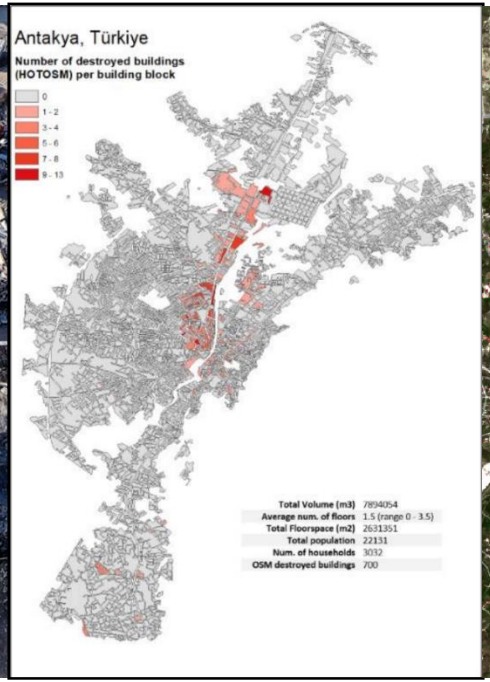
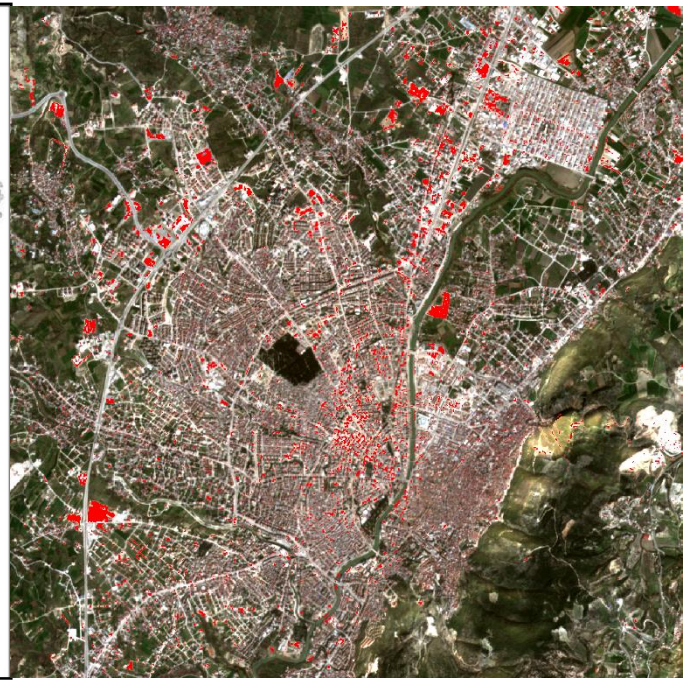
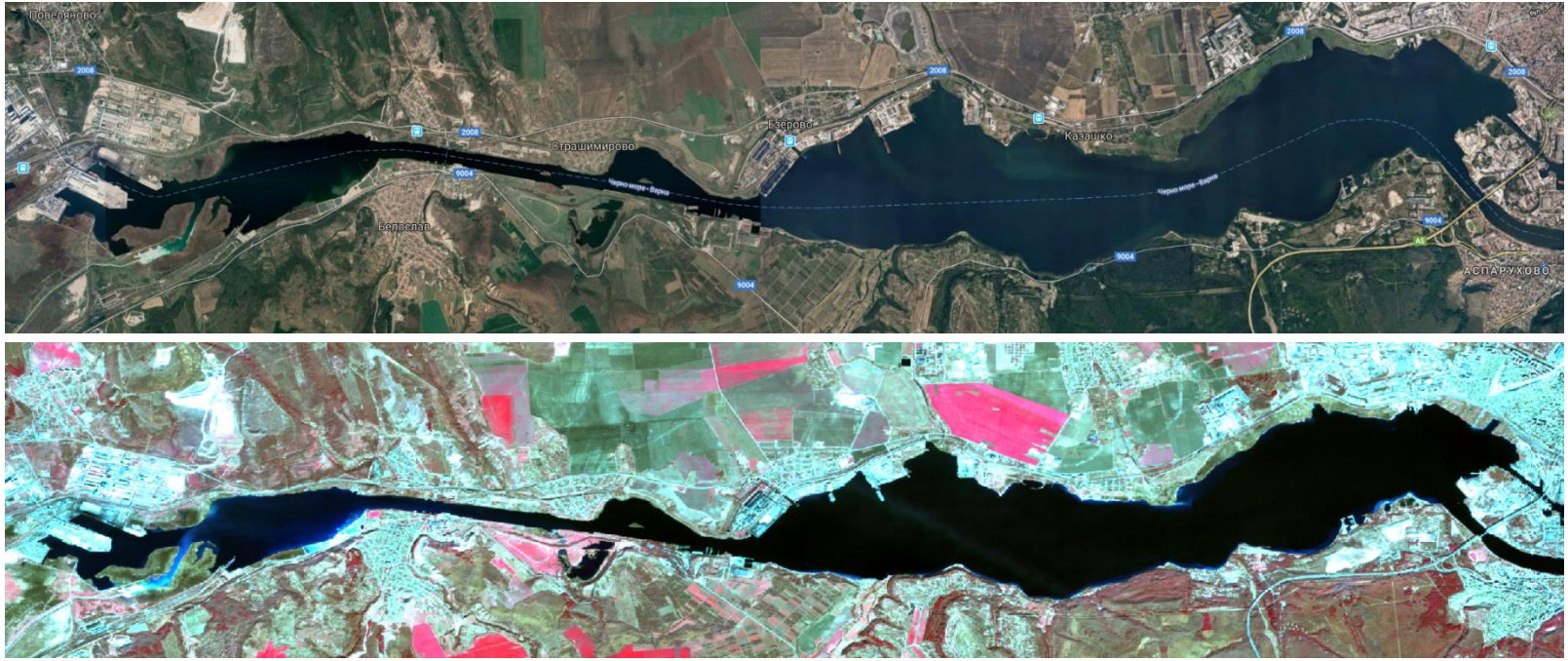
SENTINEL-2 (ESA) change detection data processing





SENTINEL-2 (ESA) water quality monitoring and eutrophication data processing



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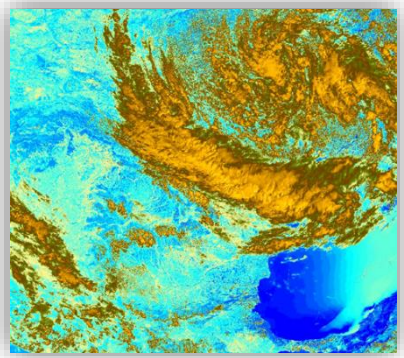
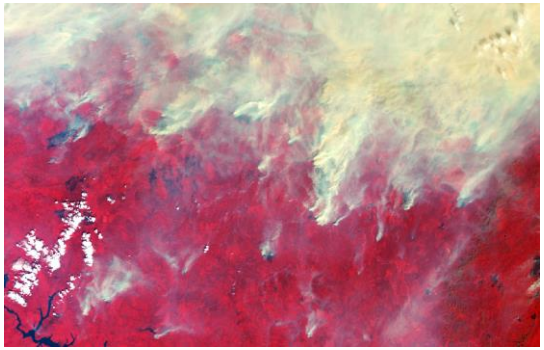
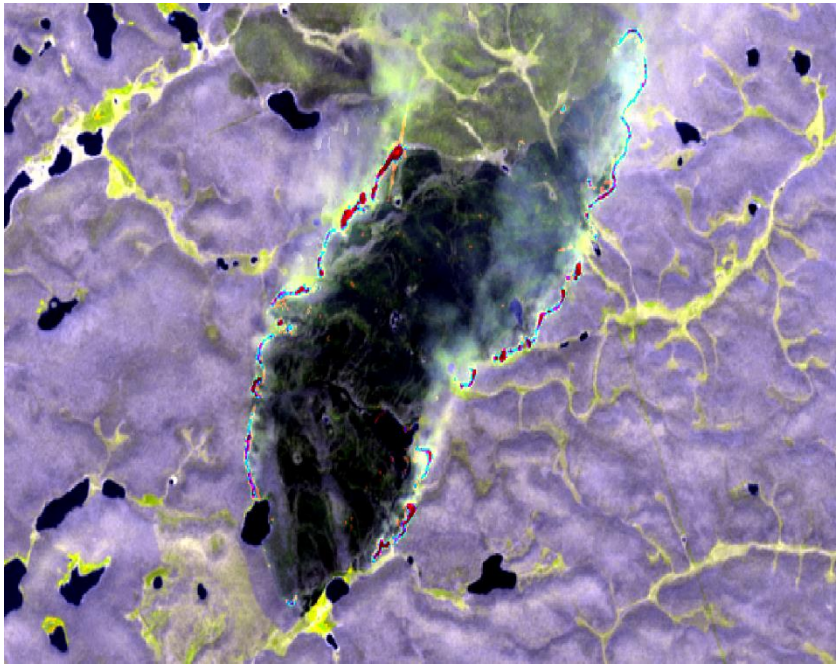
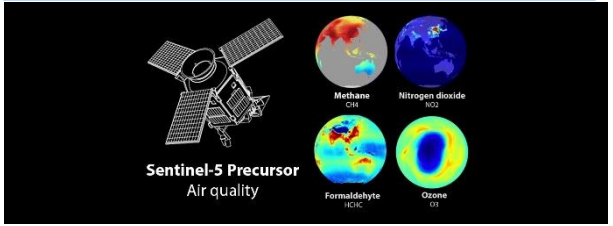
SENTINEL-3







SENTINEL 5P



Biodiversity, Remote Sensing & Space Technologies SmartFood Project

First Andalusian Earth Observation Nanosatellite

Launch October 2023

- Low Earth Orbit (Sun-synchronous polar orbit, 550 kms altitude)
- Mission: ecosystems services monitoring (forestry, agricultural, biodiversity, etc)
- Multispectral Payload (High Resolution Optical Payload) + IoT Secondary Payload
- Launch October 2023 (Falcon 9, Space-X, Florida or California, USA)

AGAPA-1 Nanosatellite Mission:

- Earth Observation nanosatellite with a High Resolution Optical Instrument (resolution 4.75 metres) + IoT secondary payload
- High Resolution Optical Instrument with spectral bands similar to Sentinel-2 (Copernicus Program)
- Part of a constellation. Revisit time 3-4 days (1-2 days if in constellation)
- Mission Control from e-BRIC (Doñana, Spain) by LifeWatch ERIC

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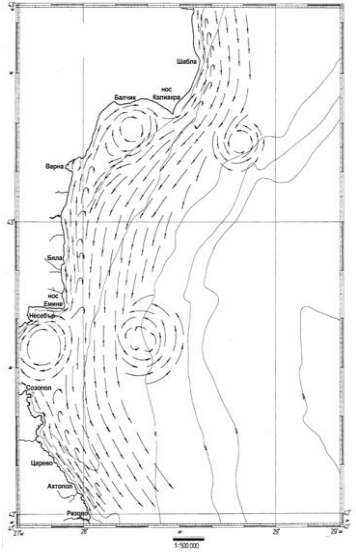
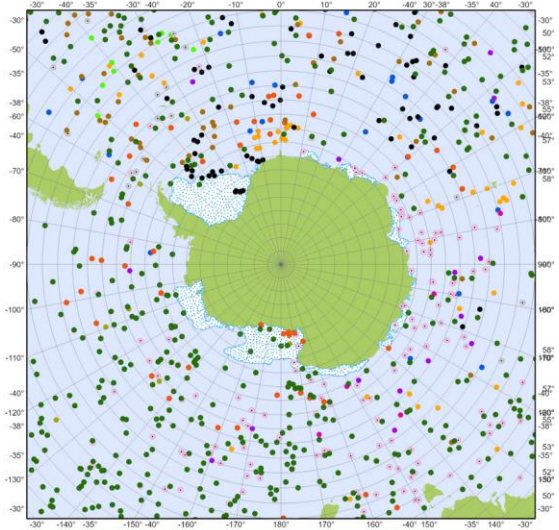
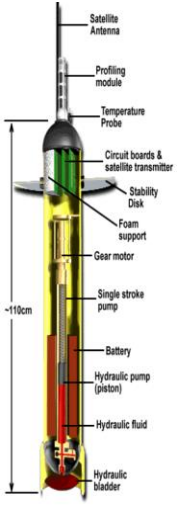
MARINE RESEARCH, DATA PROCESSING, ANALYSIS AND VISUALIZATION

SEA SURFACE CURRENTS HISTORICAL DATA
ARGO'S DATA PROCESSING (http://www.argo.ucsd.edu/) including Polar Argo
COPERNICUS Marine Service Products (http://www.copernicus.eu)







Copernicus The European Earth Observation Programme

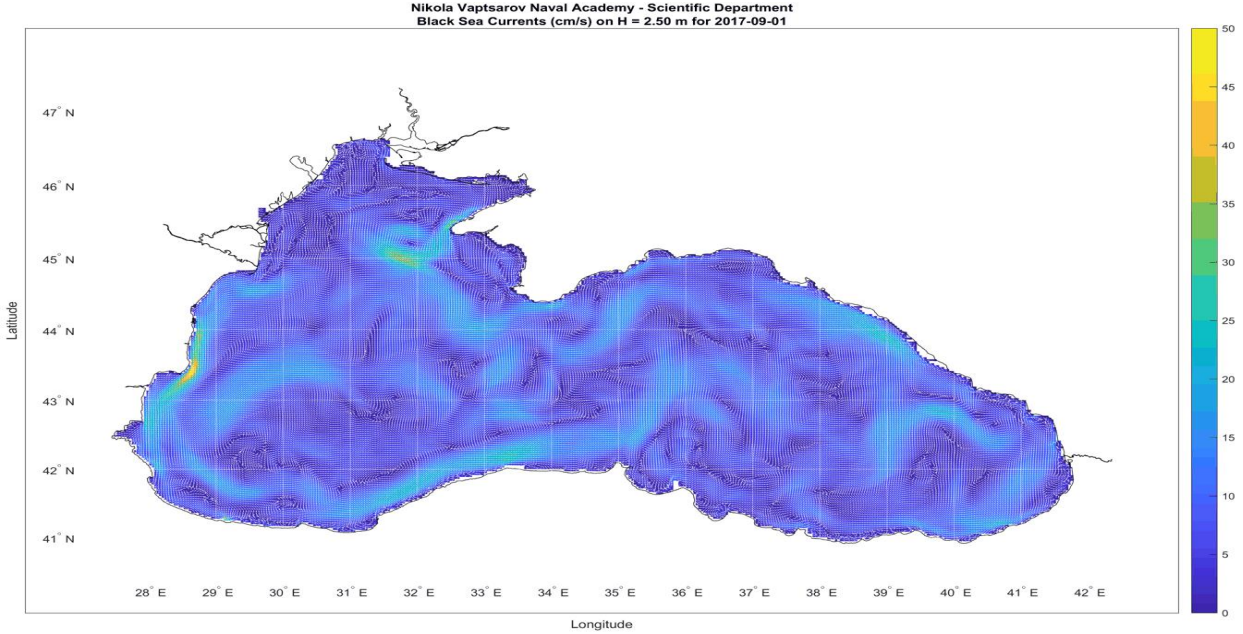
- Temperature
- Salinity
- Sea surface height
- Current Velocity
- Mixed layer thickness
- Sea Ice
- Wind
- Wave
- Plankton
- Oxygen
- Nutrients
- Primary production
- Reflectance

MARINE RESEARCH, DATA PROCESSING, ANALYSIS AND VISUALIZATION

SEA SURFACE FLOWS NUMERICAL MODELING FOR WASTE AND OIL POLLUTIONS MONITORING

Copernicus The European Earth Observation Programme

- Temperature
- Salinity
- Sea surface height
- Current Velocity
- Mixed layer thickness
- Sea Ice
- Wind
- Wave
- .....
- .....
- Oxygen



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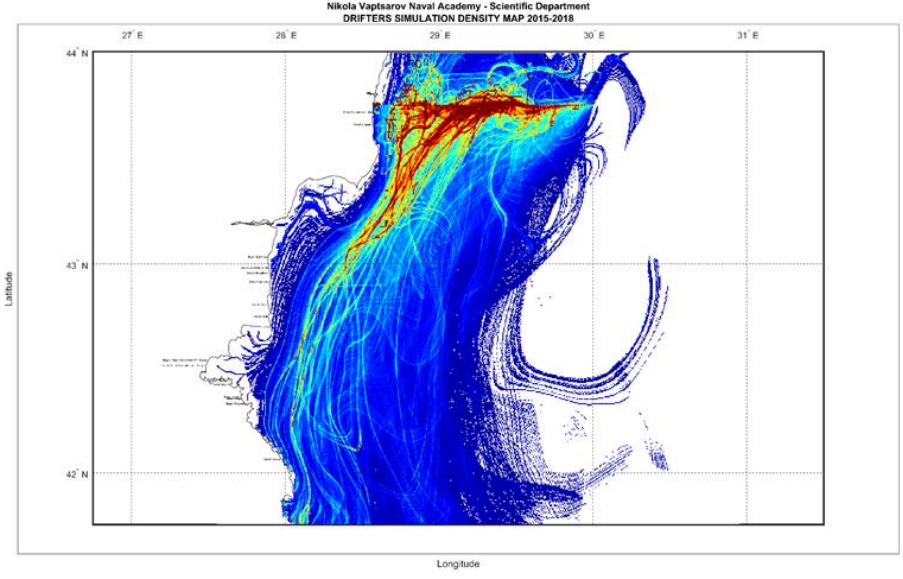
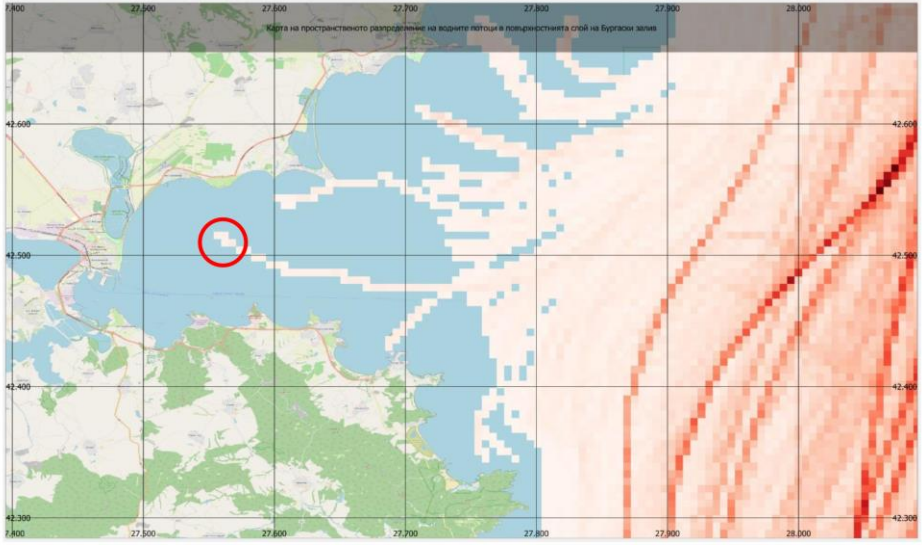
MARINE RESEARCH, DATA PROCESSING, ANALYSIS AND VISUALIZATION

SEA SURFACE FLOWS NUMERICAL MODELING FOR WASTE AND OIL POLLUTIONS MONITORING





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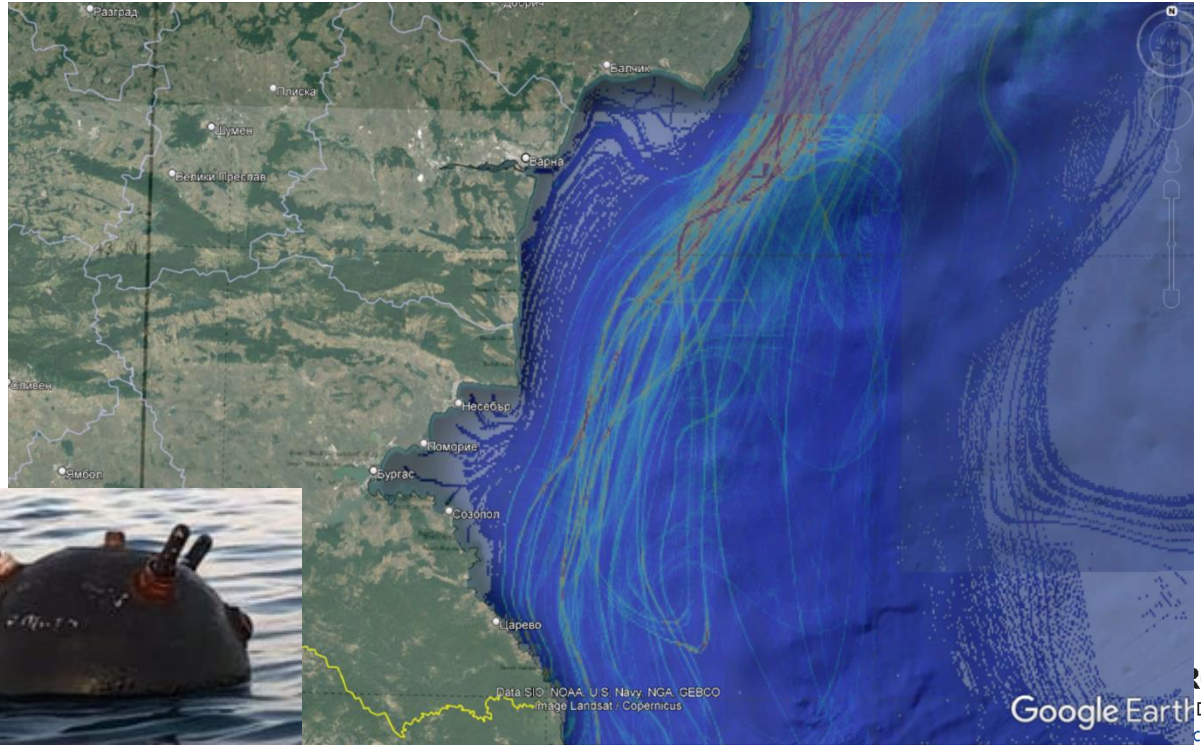
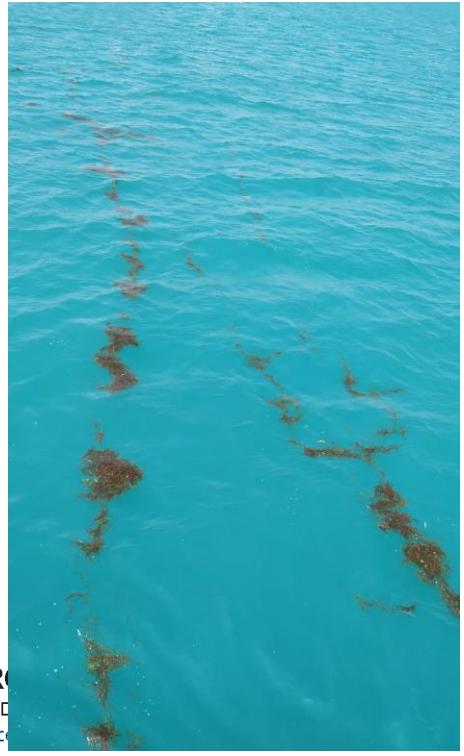
MARINE RESEARCH, DATA PROCESSING, ANALYSIS AND VISUALIZATION

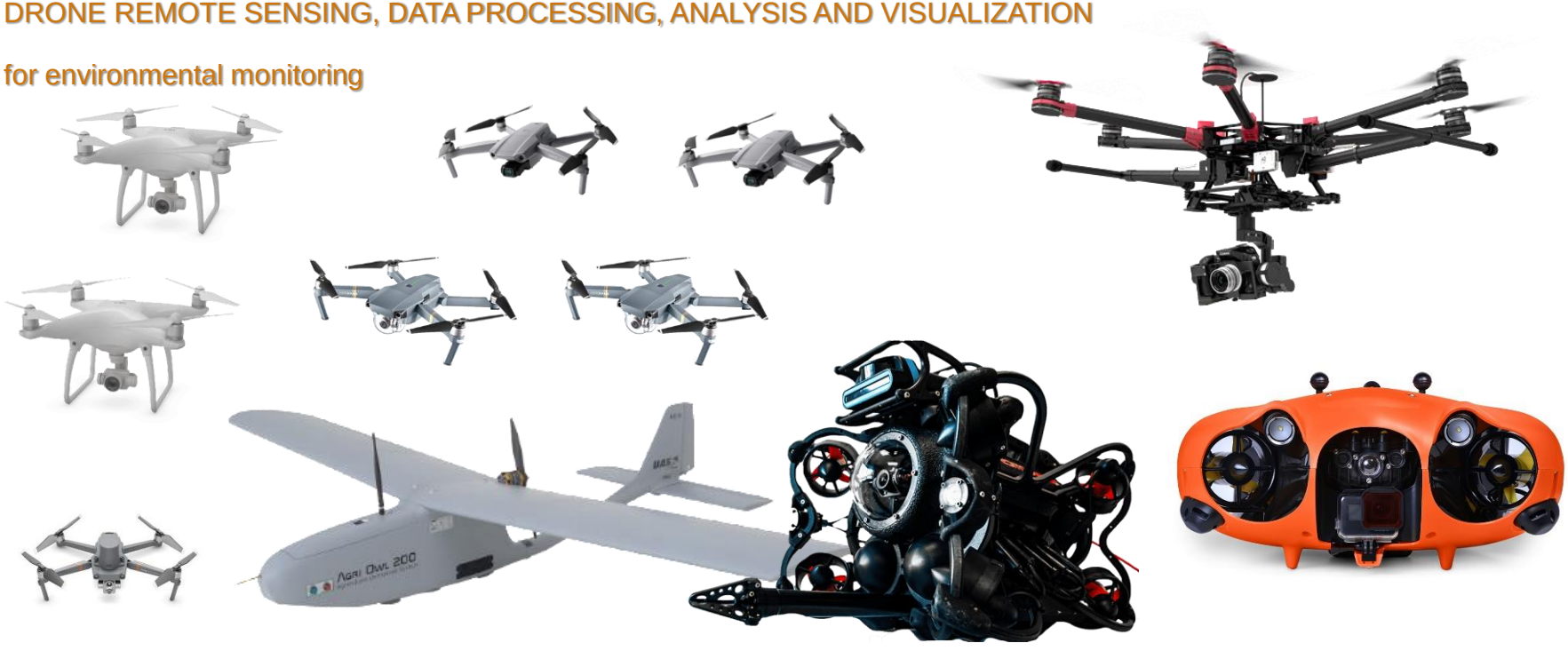
SEA SURFACE FLOWS NUMERICAL MODELING FOR WASTE AND OIL POLLUTIONS MONITORING





DRONE REMOTE SENSING, DATA PROCESSING, ANALYSIS AND VISUALIZATION

for environmental monitoring



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Drone ortho-photogrammetry (edge detection over ortho-photo images for artificial intelligence applications)

Digital ortho-photogrammetry of „Nos Foros" beach
Drone altitude - 30 meters

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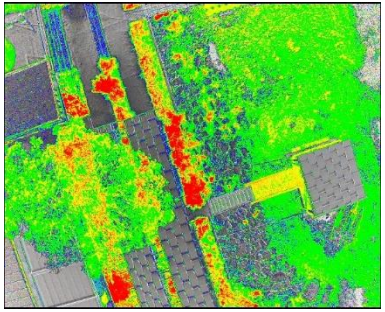
Drone ortho-photogrammetry (edge detection over ortho-photo images for artificial intelligence applications)

Drone ortho-photogrammetry (edge detection over ortho-photo images for artificial intelligence applications)

DRONE REMOTE SENSING, DATA PROCESSING, ANALYSIS AND VISUALIZATION

for environmental monitoring

Multispectral sensor drone with RTK base station



Blue (B): 450 nm ± 16 nm, green (G): 560 nm ± 16 nm, red (R): 650 nm ± 16 nm, red edge (RE): 730 nm ± 16 nm, near-infrared (NIR): 840 nm ± 26 nm

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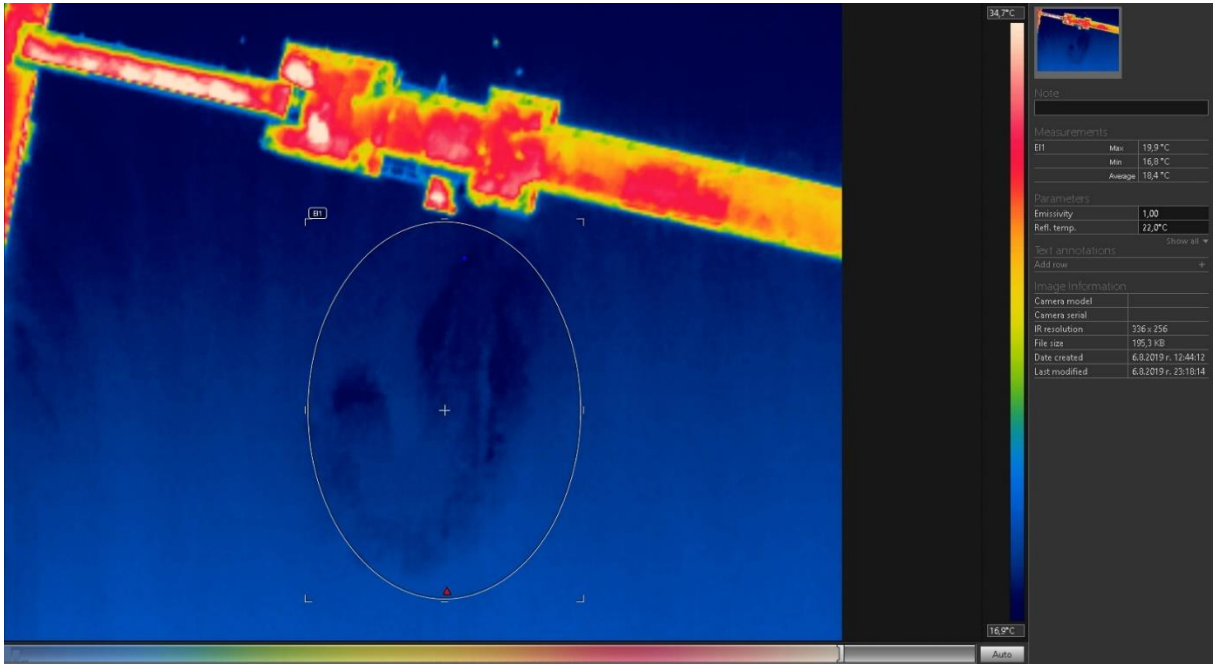
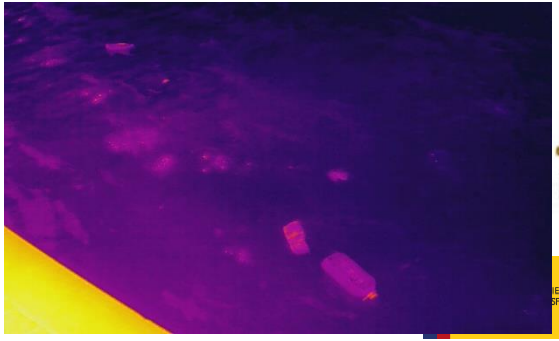
DRONE REMOTE SENSING, DATA PROCESSING, ANALYSIS AND VISUALIZATION

for environmental monitoring

Thermal sensor drone with RTK base station





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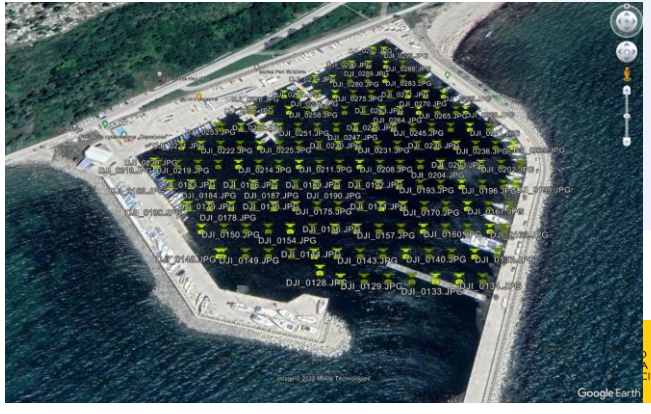
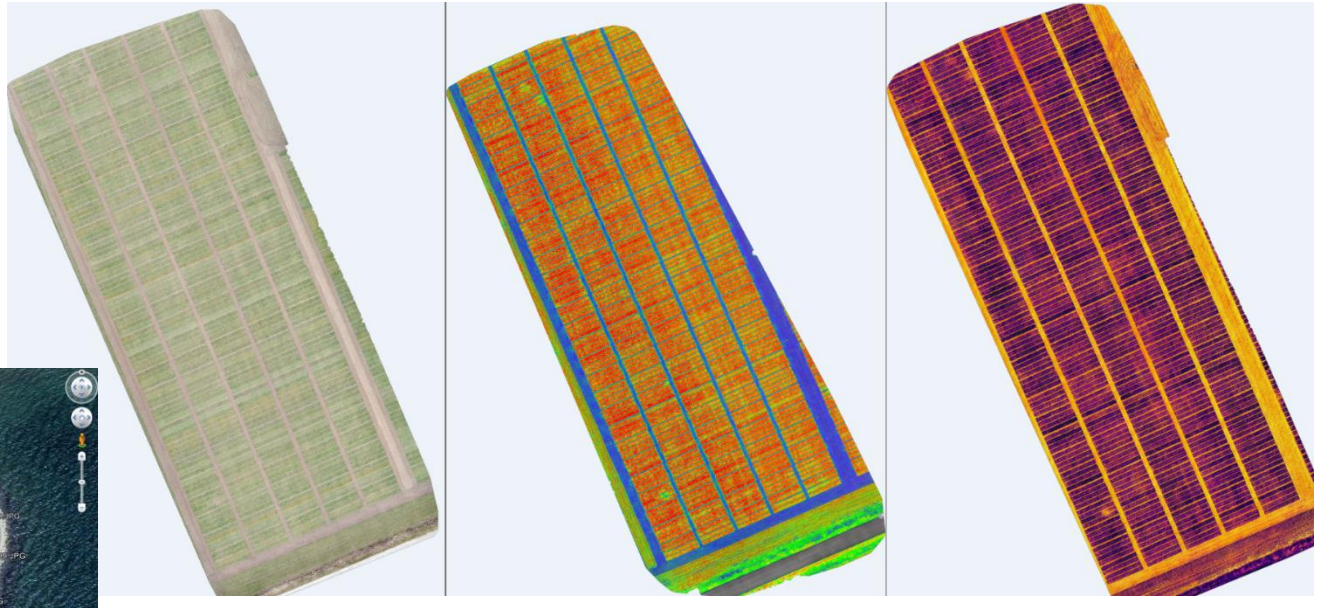
DRONE REMOTE SENSING, DATA PROCESSING, ANALYSIS AND VISUALIZATION

for environment monitoring





RGB NDVI Thermal

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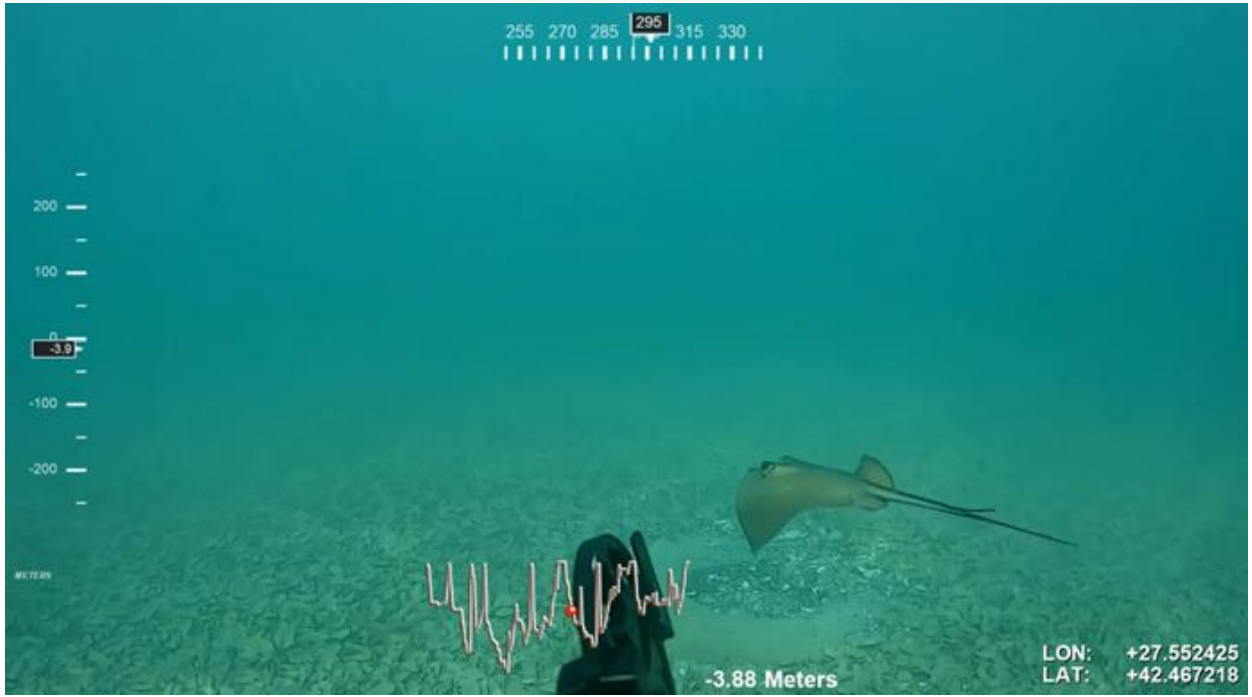
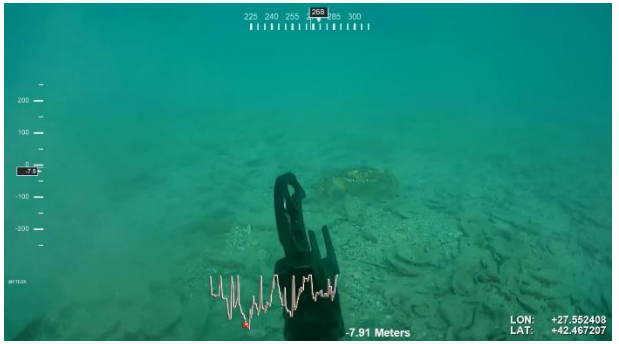
UNDERWATER DRONE REMOTE SENSING, DATA PROCESSING, ANALYSIS AND VISUALIZATION





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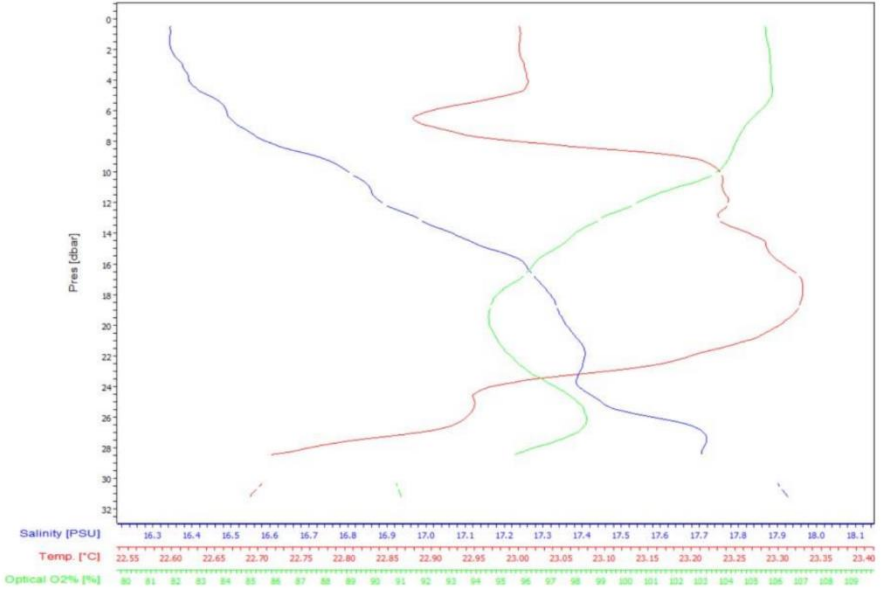
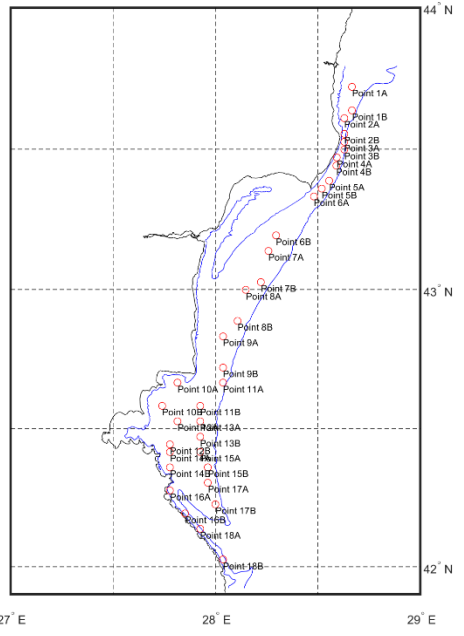
UNDERWATER IN-SITU MEASUREMENTS, DATA PROCESSING, ANALYSIS AND VISUALIZATION

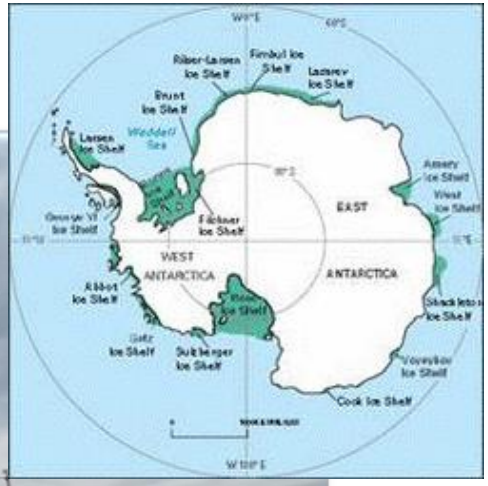
CTD, pH, O2, currents u-v-z, transparency, etc.





NIKOLA VAPTSAROV NAVAL ACADEMY RESEARCH VESSEL

R&D ACTIVITIES IN EUROPEN SEAS AND ANTARCTICA



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BEeS Seville, 22-24 May 2023

Threats and challenges to biodiversity and ecosystem conservation from an eScience perspective

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JOINT RESEARCH ACTIVITIES IN ANTARCTICA

https://bg.wikipedia.org/wiki/%D0%A5%D1%83%D0%B0%D0%BD_%D0%9A%D0%B0%D1%80%D0%BB%D0%BE%D1%81_I_%28%D0%B1%D0%B0%D0%B7%D0%B0%29
https://www.wikiwand.com/en/Juan_Carlos_I_Antarctic_Base
http://www.bai-bg.net/gallery1.html

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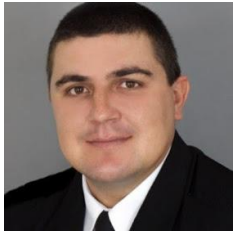
An approach of application of unmanned and remote-controlled multi-sensor platforms together with space-based assets in the Spanish and Bulgarian Antarctica bases for ecosystem and habitat monitoring and mapping



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73 'Vasil Drumev' str., Varna 9002, Bulgaria

Mobile (work): +359 889 317358
Mobile (private): +359 887 604085

E-mail (work): m.tsvetkov@nvna.eu
E-mail (private): tsvetkov.m@gmail.com

Acknowledgment: *This presentation is supported by the MASRI project (Infrastructure for sustainable development of marine research including the participation of Bulgaria in the European infrastructure EURO-ARGO).*

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