Copernicus Maritime Surveillance Service

Quasi real time SAR-based applications to serve Member States

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Earth Observation Services

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What is Copernicus?

A European Union Programme aimed at developing European information services based on satellite Earth Observation and in-situ (non-space) data analyses
Copernicus Maritime Surveillance

Copernicus Service Component

Services delivered from September 2016
CMS Objective - monitoring human activity at sea

To understand, manage and/or prevent activities carried out at sea that could impact the security, safety, economy, or environment of the European Union and its Member States
Presentation goals

1. Demonstrate to the R&D community the way forward of CMS
2. Highlight the user requirements
3. Recommend improvements/developments of new applications based on satellite data
CMS Product Catalogue

EO products

- **Standard products**
  - SAR
  - Optical

- **Value Added products**
  - Vessel detection
  - Activity detection
  - SAR wind and SAR wave
  - Oil spill detection

- **Fusion products**
  - Correlation w/ AIS, SAT-AIS, LRIT, VMS
  - Alerts and notifications

Access the products
Quasi Real Time Capabilities

**SAR**
- Quasi real time – Ground Stations coverage (value added products delivered to users within 30 min*)
- Outside Ground Stations coverage (using on-board recorders)

**Optical**
- Delivery 45 min* after satellite overpass (basic products)
- Delivery 65 min* after satellite overpass for value adding products (vessel detection & activity detection)

*Times refer to the fastest delivery times for the relevant products
Areas of activity and user communities

- Fisheries Control
- Maritime Safety and Security
- Law Enforcement
- Customs
- Pollution Monitoring
- Other (defence, anti-piracy)
Support Fisheries Control activities

- Monitoring of fishing grounds
- Monitoring of fish cages / farms
- Monitoring of fishing ports
- Monitoring of restricted fishing areas

Monitoring restricted areas

Fishing vessels in port

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Vessel towing fish cages

© European Space Imaging/DigitalGlobe 2013
Copernicus Maritime Surveillance

Maritime Safety and Security support

- Search and rescue operations
- Safety of navigation - including support to ice monitoring
- Maritime picture compilation

Find a safe navigation route

Activity detection

Ice Monitoring – RADARSAT-2 Data and Products © MacDONALD, DETTWILER AND ASSOCIATES LTD, 2016 – All Rights Reserved” and “RADARSAT is an official mark of the Canadian Space Agency
New applications and improvements using SAR

- Detection of lost shipping containers (6-14m) – to assist users in search and rescue operations
- Aircraft debris detection - capture debris and detection of oil spills
New applications and improvements using SAR

Technical feasibility on detection of lost containers

- Validation campaigns in collaboration with the MRCC MADRID – SASEMAR
- AOI’s: North of Spain
- 5 incidents reported from Sep17 – Mar18
- 21 EO-products delivered
- 69 lost containers in total
- 15 possible targets detected
- All targets checked by SASEMAR naval and aerial assets but no positive targets were validated
New applications and improvements using SAR

Technical feasibility on detection of lost containers

- EO products used:
  - RS2 Ultra Wide Fine, 3m res., HH pol.
  - TSX StripMap, 3m res., HH pol.
- Support from CLS in image analysis (march operation)
New applications and improvements using SAR

- QRT ice monitoring – provide rapid access to ice imagery and detect small icebergs – 10m-15m

Support to safety of navigation in Antarctic

Iceberg captured in SAR image
EO product: RS2 Extra Fine, 6m res., HH pol.

Iceberg photo as seen in SAR image by CMS user © COVAM, Spanish Navy, 2017
New applications and improvements using SAR

- Ship wake detection - can be used to detect the target and retrieve heading

Go fast RHIB - 12m

Sailing vessel - 14m
New applications and improvements using SAR

VDS EO product capturing 1 vessel of 92m instead of 3 vessels

- Vessel size estimations
  - EO product: TSX StripMap, 3m res., HH pol.
- Need for mitigation of uncertainties associated with the estimations of the vessel size
- Need for improvement of the target discrimination of multiple detections (transhipment or rendezvous-at-sea)
Recommendations to R&D

- Mitigate uncertainties of vessel size estimations;
- Improve discrimination of multiple detections (rendezvous-at-sea);
- Develop applications to detect small metallic features 1m to 14m (containers, aircraft debris);
- Automatically detect and track small icebergs 10m;
- Distinguish small icebergs from vessels with low false positive rate;
- Improve ship wake detection automatic algorithms.