

Satellite surveillance & monitoring service

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Pollution Response Workshop for
Bulgaria & Romania

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Pollution Response



Overview of the EMSA satellite service

- Background and approach
 - Legal basis
 - Service scope and development approach
- Summary description of the service
 - Advantages of satellite monitoring for oil spill surveillance
 - How the system works
 - Information products – examples
 - User web interface and EMSA central database
 - Verification and validation
- Next steps with Bulgaria and Romania
 - Questionnaire (for all Coastal States)
 - Image planning for 2007
 - Training for Coastal States (CS)

Legal basis

Mandated by Directive 2005/35/EC of 7 September 2005 on
Ship-source pollution and on the introduction
of penalties for infringements

Article 10

(entering into force on 1 March 2007)

...the European Maritime Safety Agency shall:

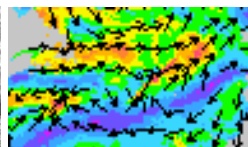
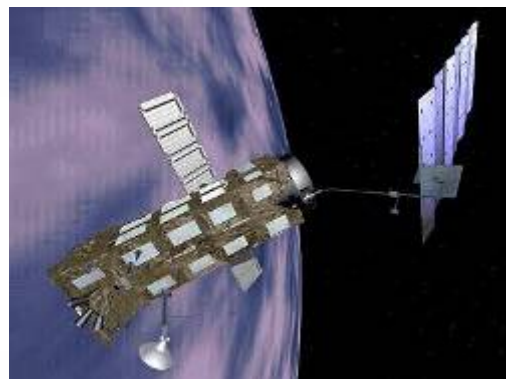
- (a) 'work with the Member States in developing technical solutions and providing technical assistance ...in actions such as tracing discharges by satellite monitoring and surveillance'
- (b) 'assist the Commission in the implementation of this Directive' including, if appropriate, by means of visits to the Member States, in accordance with Article 3 of Regulation (EC) No 1406/2002'

Satellite service scope and aims

- Pan-European system for detecting oil slicks at sea using satellite surveillance on request of the Commission and all EU and EFTA CS
- A system that integrates into the national / regional response chain and strengthens operational pollution surveillance and response for accidental spills and deliberate discharges from ships
- To assist CS to locate and identify polluters in areas under their jurisdiction

Satellite service scope and aims

- Oil spill alerts in near real time (within 30 mins) to CS and EMSA for detected slicks
- Monitoring accidental spills (under activated Charter)
- Access to the satellite images and associated information over the web
- Provide baseline service to all CS – transfer of knowledge
- The number of images EMSA will provide will be according to CS requirements as well as image availability
- Analysed images and information are provided **free of charge** to CS



Satellites

Models

Vessels

Aircraft

Real time

**Early warnings
discharges,
response and
clean-up
operations**

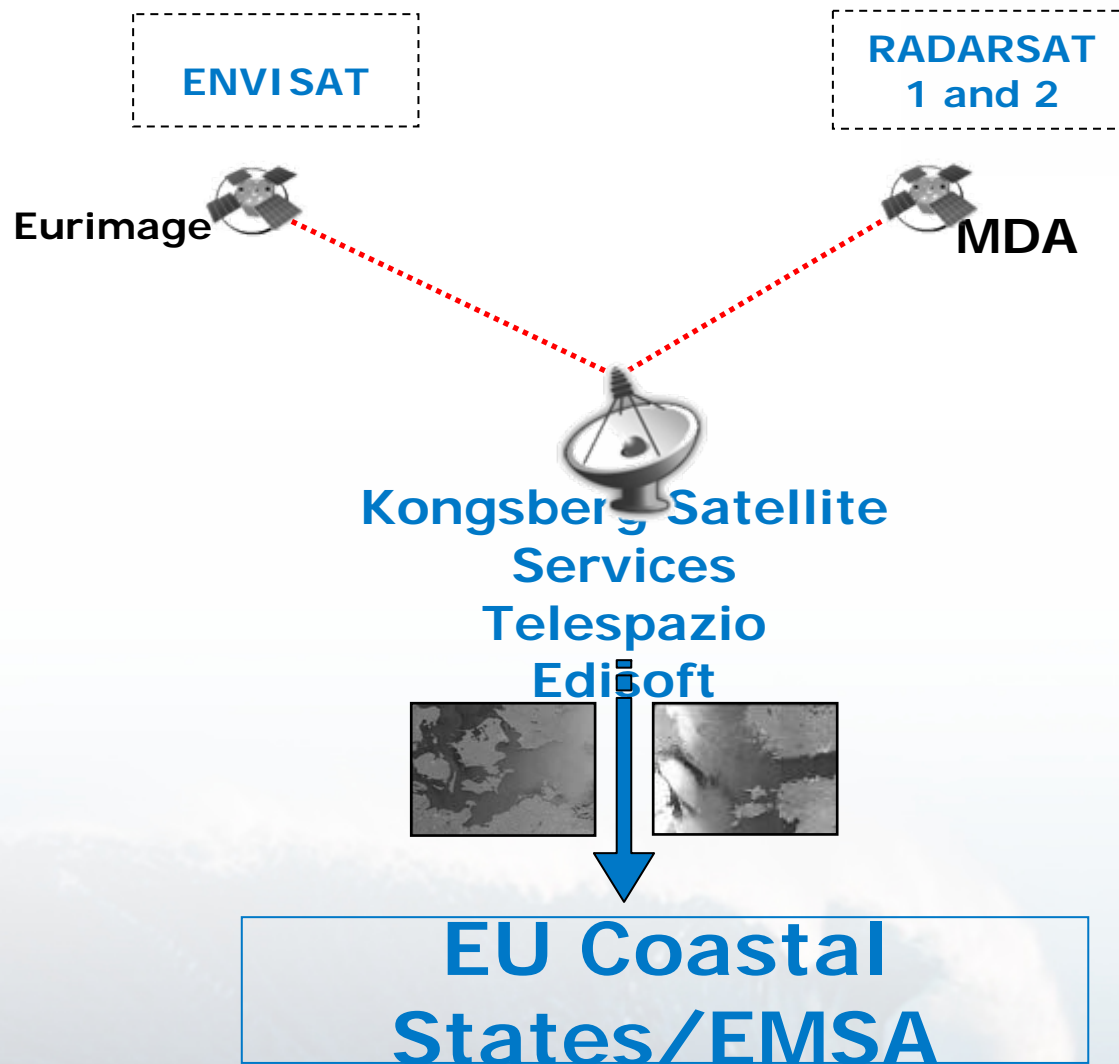
**Surveillance
Deterrent**

MS-bodies:

- Coastguards
- frontier guards
- others

Other authorities:

- Regional sea-basin bodies
- EU
- others



Development approach

- Consultation with Coastal States, Industry and European organisations
- Public procurement - commercial contracts in place with Industry
- Visits to Coastal States – questionnaire
- In-house expertise: EMSA satellite surveillance team
- ‘CleanSeaNet’ – operational by mid-April 2007:
 - Baltic Sea
 - North Sea and areas around UK, Norway and Iceland
 - West European waters from English Channel to Gibraltar, (Canary Islands and Azores from 2008)
 - Mediterranean Sea
 - Western Black Sea

- Some CS already use satellite data (since the mid-nineties in some areas of the Baltic and North Seas) others have not taken action
- Industry and European organisations have developed and are running considerable services and projects (e.g. MarCoast) which have paved the way for the EMSA service
- Work within the framework of existing national and regional arrangements e.g. HELCOM and build on existing expertise and processes
- Aim to achieve complementarities of services (e.g. ESA MarCoast project)
- Develop advanced products e.g. oil drift forecast services

Advantages of satellite monitoring for oil spills

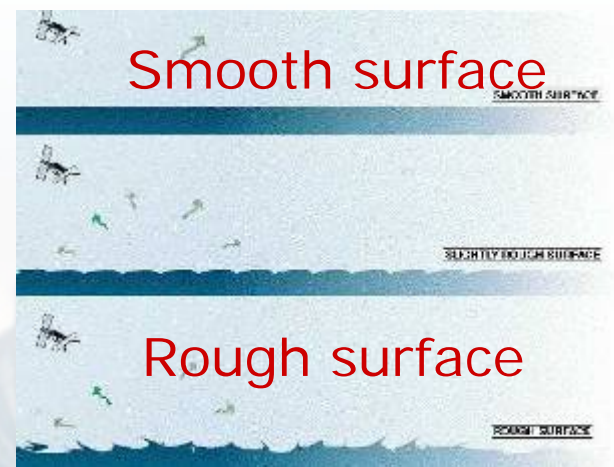
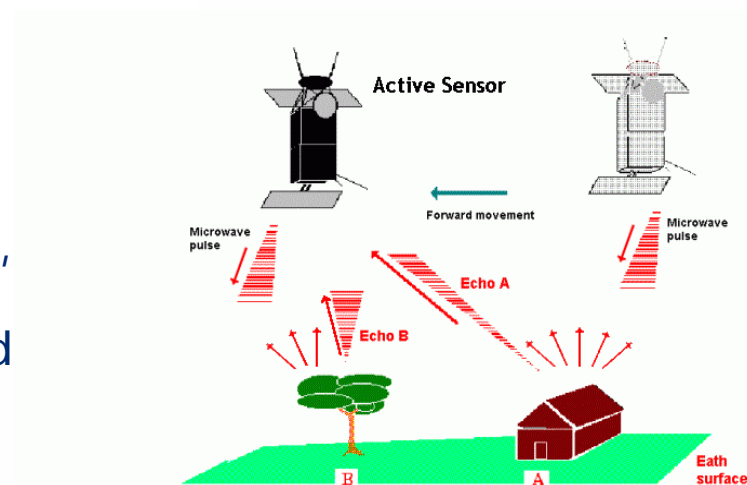
- The Satellite based Synthetic Aperture Radar (SAR) images can detect oil slicks on the sea surface discharged from ships or drilling fluids from offshore oilrigs
- The SAR can offer wide area surveillance coverage in darkness, and independent of cloud cover and weather conditions
- This technology is best used as a complement to the airborne surveillance and vessel patrols of Coastal States in order to maximise the use of assets

Advantages of satellite monitoring for oil spills

- Satellite radar images can be used to alert Coastal States and cue airborne or surface vessels to 'verify' potential slicks detected during the satellite overpass
- These images can identify 'Clean Sea' areas most likely free from pollution so that airborne or surface vessel patrols is not required
- Increasing the area surveyed in a given period leading to more effective deterrence
- In some cases improving the timeliness with which a illegal discharge is detected and thus increasing the chances of intercepting the polluter

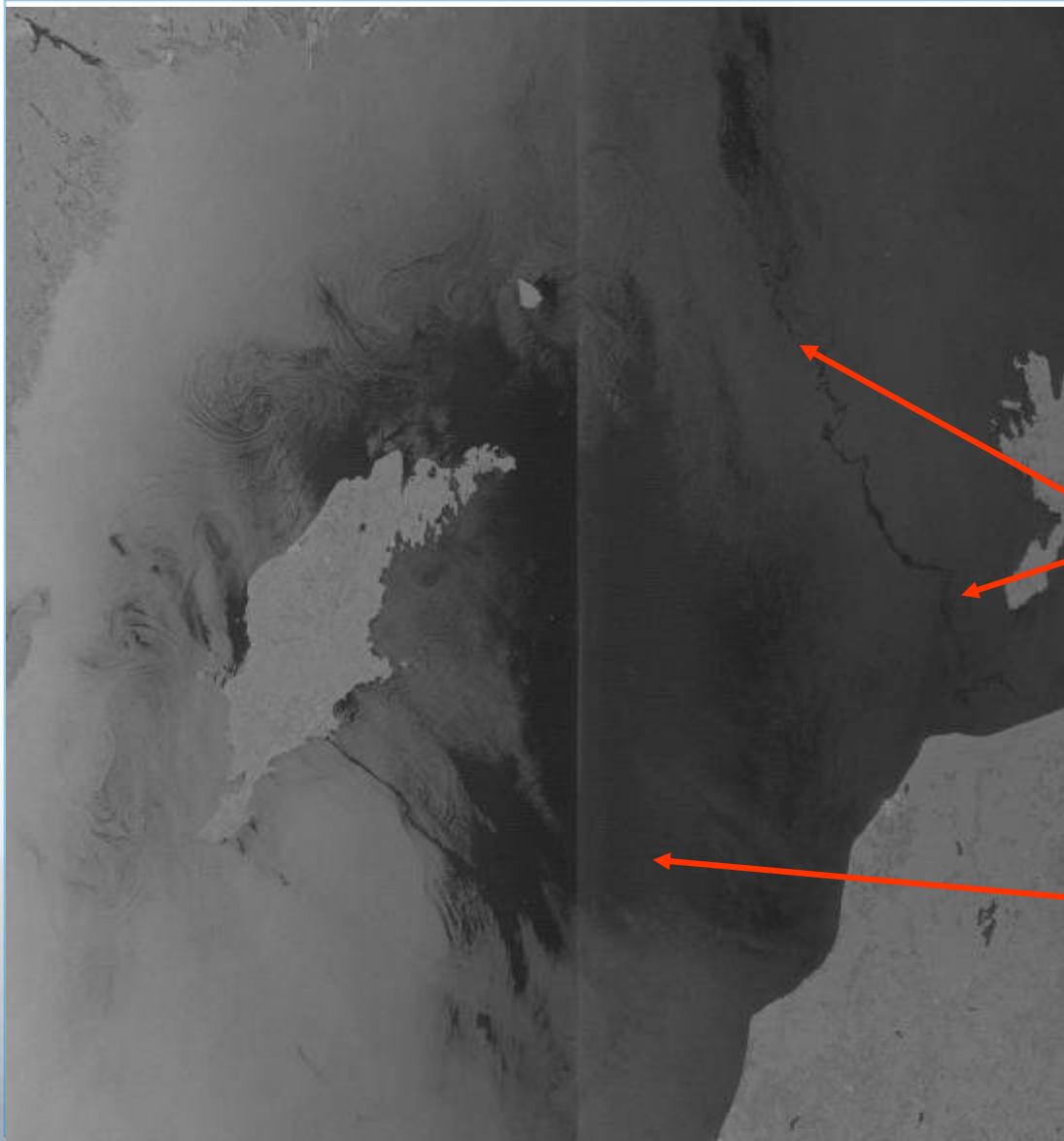
Satellite radar for detecting oil spills

- SAR uses pulses of electromagnetic energy to measure the surface roughness of the ocean - wind, waves, surface currents, internal waves, shallow water bathymetry, sea ice and surface films
- The presence of a film on the sea surface damps out small waves due to the increased viscosity of the top layer
- The slick reduces the measured backscattered energy and results in darker areas in the SAR image thus allowing the detection of a slick



Satellite radar for detecting oil spills

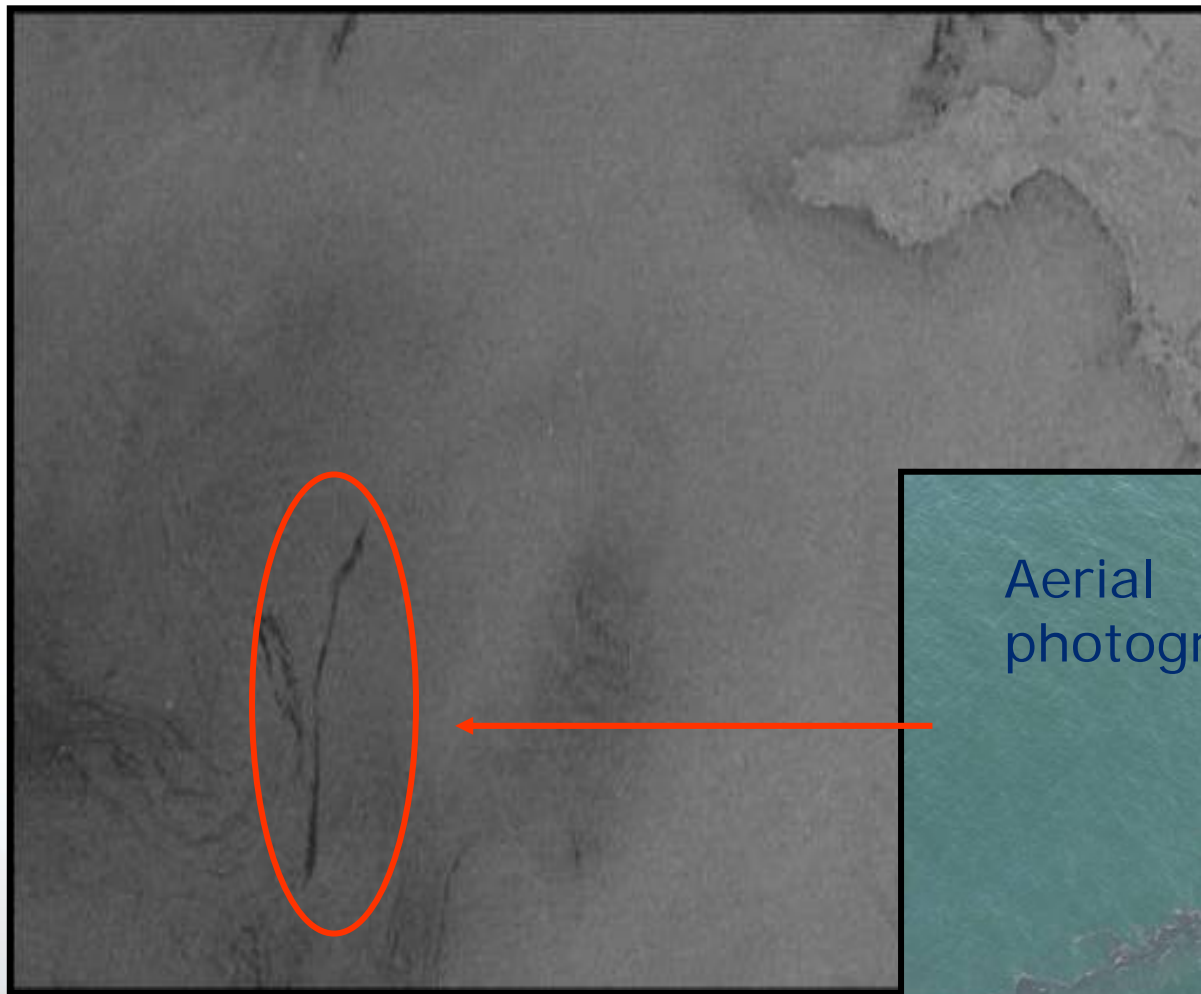
- Oil spill 'look alike' = false alarm = false positive
 - Natural surface films e.g. phytoplankton bloom
 - Rain cells, cold upwelling, bathymetry, internal waves, wind shadow
- Optimal wind speed (2-10 m/sec)
 - Under very high wind speeds the oil may mix rapidly leaving no surface effects visible
 - Similarly, heavy oil may sink below the surface after the initial spill
- Confidence levels attributed to every spill
- Analysis is a semi-automatic process
 - Algorithms
 - Trained operator to interpret the images



Radarsat image from the Baltic Sea (300km x 300km) showing a detected oil slick trailing discharge from a ship. Patches of low wind areas are also visible in the image

Suspect Oil Slick

Low wind Area



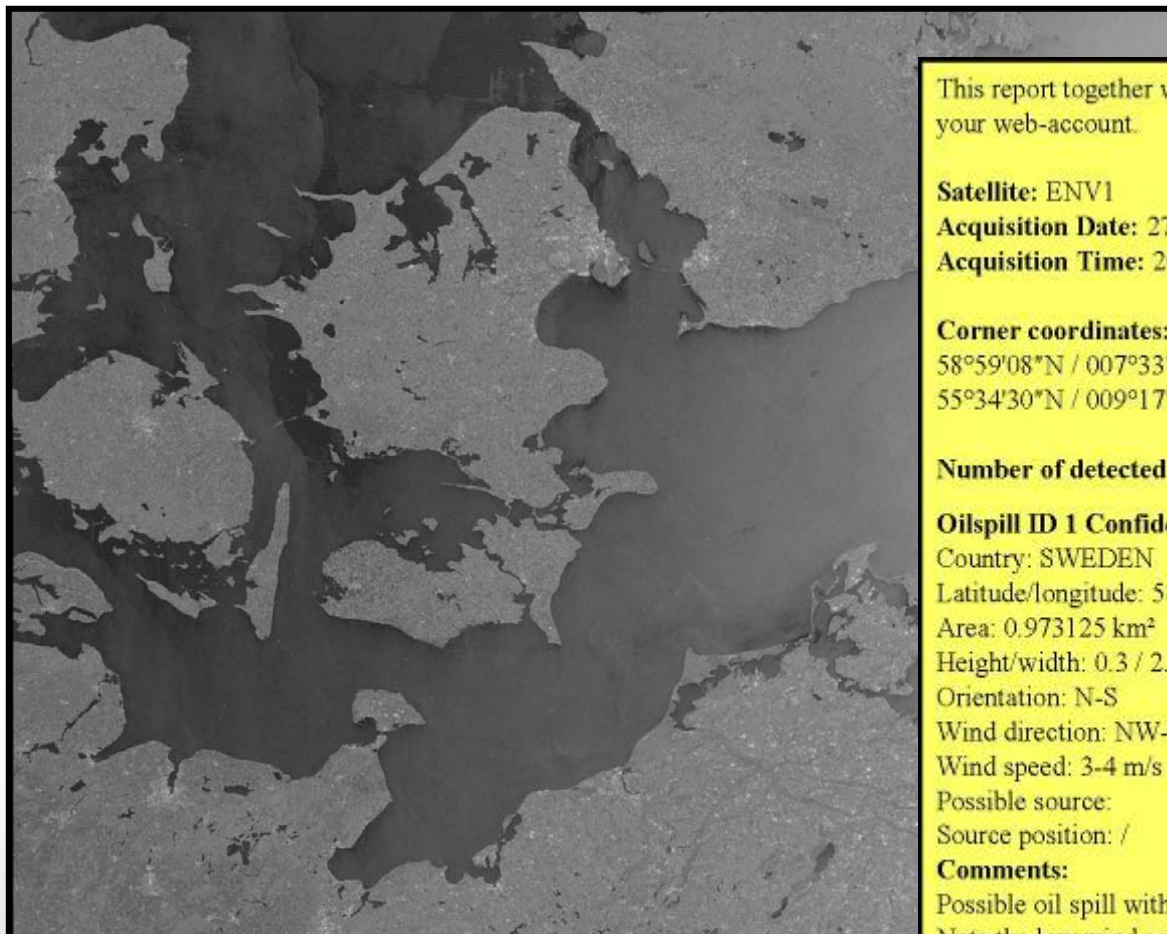
A detected oil slick from a ship which has been verified by aerial surveillance. The photographic image below was collected as evidence





Oil spill alerts to Coastal States

Notification	by email, FAX, SMS, or phone to the responsible Coastal State and neighbouring countries
Alert time	Nom. 30 min after satellite overpass (penalties for satellite operators after 30 min) CLEAN AREAS shall be reported
Images	Full and reduced resolution images available at the time of alert <ul style="list-style-type: none">- All images to be geo-referenced- Images in common format (GeoTIFF)



This report together with the H5-image will also be available at your web-account.

Satellite: ENV1

Acquisition Date: 27-FEB-2005

Acquisition Time: 20:46:06.039

Corner coordinates:

58°59'08"N / 007°33'05"E 59°48'01"N / 014°46'53"E

55°34'30"N / 009°17'21"E 56°21'14"N / 015°52'50"E

Number of detected oilspills: 1

Oilspill ID 1 Confidence: Medium

Country: SWEDEN

Latitude/longitude: 58°09'03"N / 011°10'36"E

Area: 0.973125 km²

Height/width: 0.3 / 2.1 km

Orientation: N-S

Wind direction: NW-SE

Wind speed: 3-4 m/s

Possible source:

Source position: /

Comments:

Possible oil spill with good contrast nearby a low wind area.

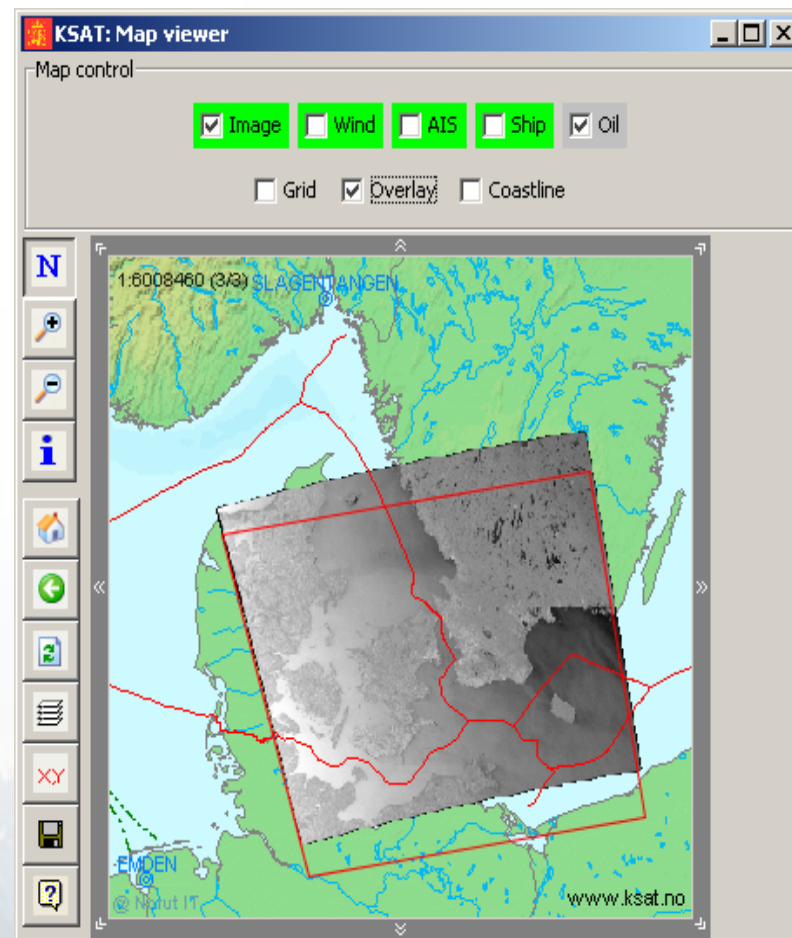
Note the low wind speed.


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Web Interface

- List of ordered scenes
- Oil slick identification
- Source identification potential polluters if possible (e.g. vessel, offshore platforms, pipelines, etc.)
- EEZ, territorial borders
- AIS data if provided by Coastal States
- Ability to define for each scene the country that is responsible for verification




KSAT : Finnish Enviroment Institute * 09:54:04 GMT * Thursday * 2006-09-07 * doy 250 * week 36 * Local ti...

File Auto reload Help


KONGSBERG




Kongsberg Satellite Services
Finnish Enviroment Institute


Search

Map control

From: 2006-09-04 To: 2006-09-15 Search ☐ Own data ☒ Group data

☒ Image Plain Grid Overlay

Date	Time	Sat	Customer	Response co...	Status	Files	Feedb...
2006-09-04	09:09:01	ENV	Sea Venture Bur...	RU	No slicks	3: 	N/A
2006-09-05	20:02:29	ENV	Sea Venture Bur...	RU	No slicks	3: 	N/A
2006-09-07	05:10:04	RSAT	Kustbevakningen	SE	No slicks	1: 	N/A
2006-09-08	04:40:05	RSAT	Finnish Envirom...	SE	Ready	N/A	N/A
2006-09-08	20:08:12	ENV	Sea Venture Bur...	RU	Ready	N/A	N/A
2006-09-10	05:23:11	RSAT	Kustbevakningen	SE	Ready	N/A	N/A
2006-09-11	04:52:41	RSAT	Finnish Envirom...	SE	Ready	N/A	N/A
2006-09-11	20:13:57	ENV	Sea Venture Bur...	RU	Ready	N/A	N/A
2006-09-12	15:51:37	RSAT	Finnish Envirom...	SE	Ready	N/A	N/A
2006-09-13	05:35:10	RSAT	Kustbevakningen	SE	Ready	N/A	N/A
2006-09-13	20:51:44	ENV	Kustbevakningen	SE	Ready	N/A	N/A
2006-09-14	05:05:20	RSAT	Finnish Envirom...	SE	Ready	N/A	N/A
2006-09-14	08:54:36	ENV	Sea Venture Bur...	RU	Ready	N/A	N/A



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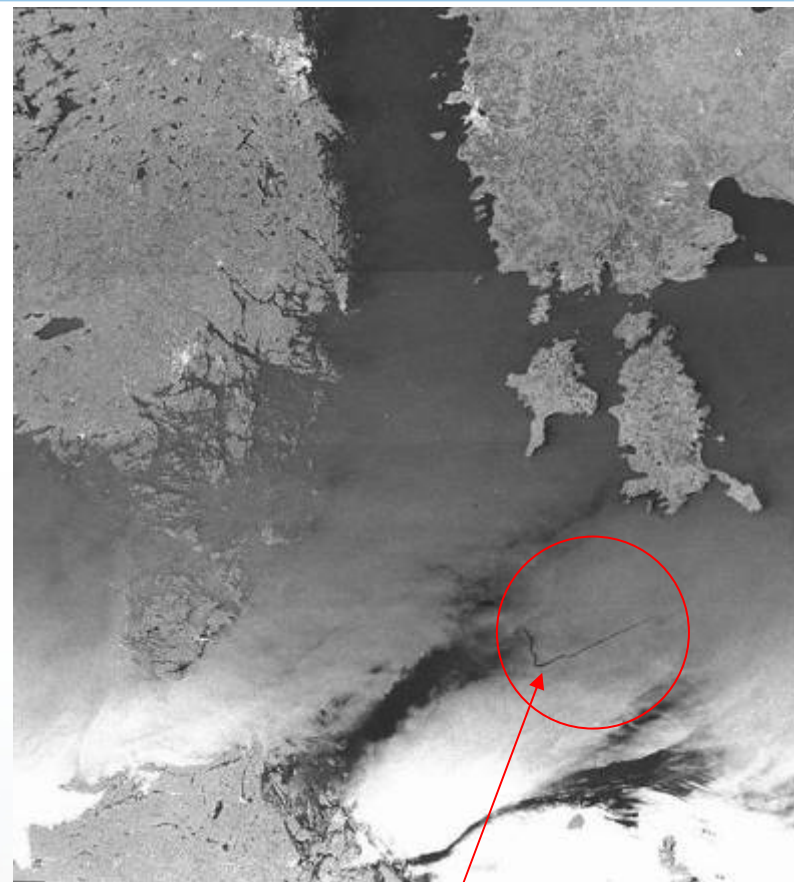
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Web Interface

- Delivered scenes together with pollution report can be viewed using the map interface
- Ability to define for each scene the country that is responsible for verification
- Wind, wave, surface currents
- Confidence level and slick characteristics
- Other value added products to be added later
- Feedback on detected oil slicks and service delivery



Suspect Oil Slick

ENVISAT ASAR image of the Gulf of Finland (405km x 405km). Length of the spill is approx. 100km

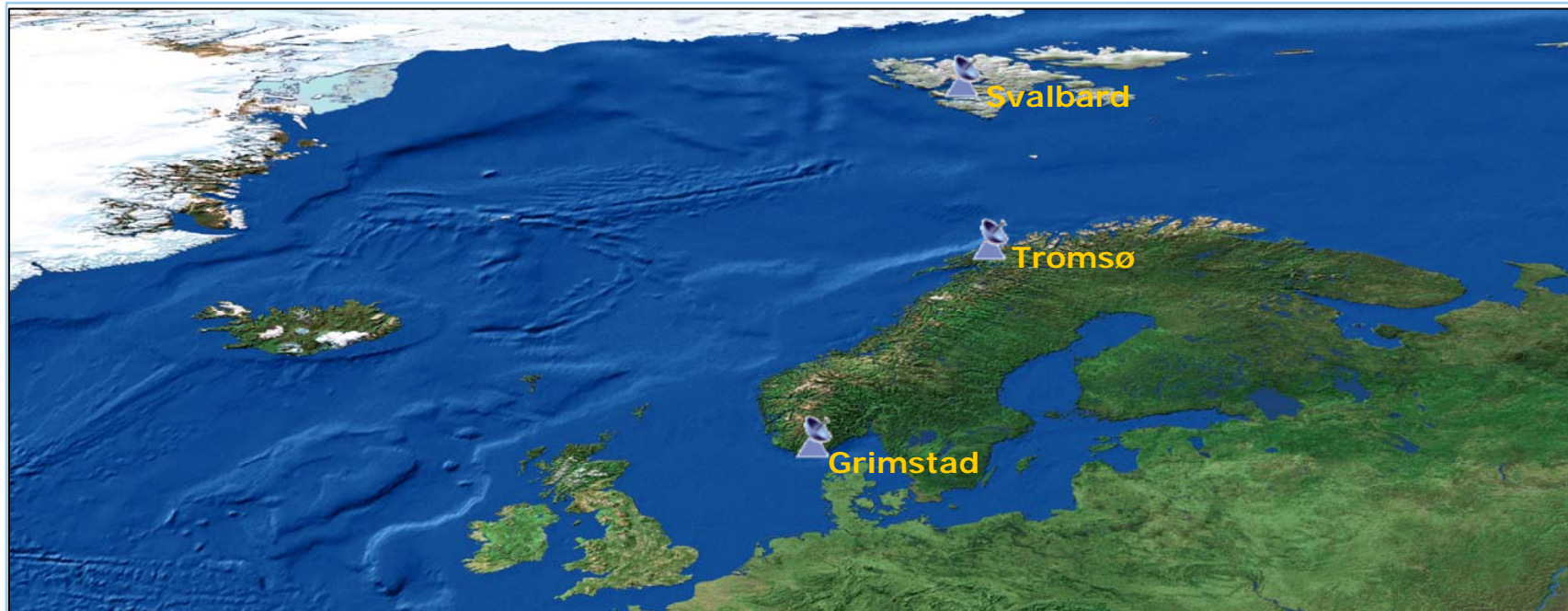
EMSA central database

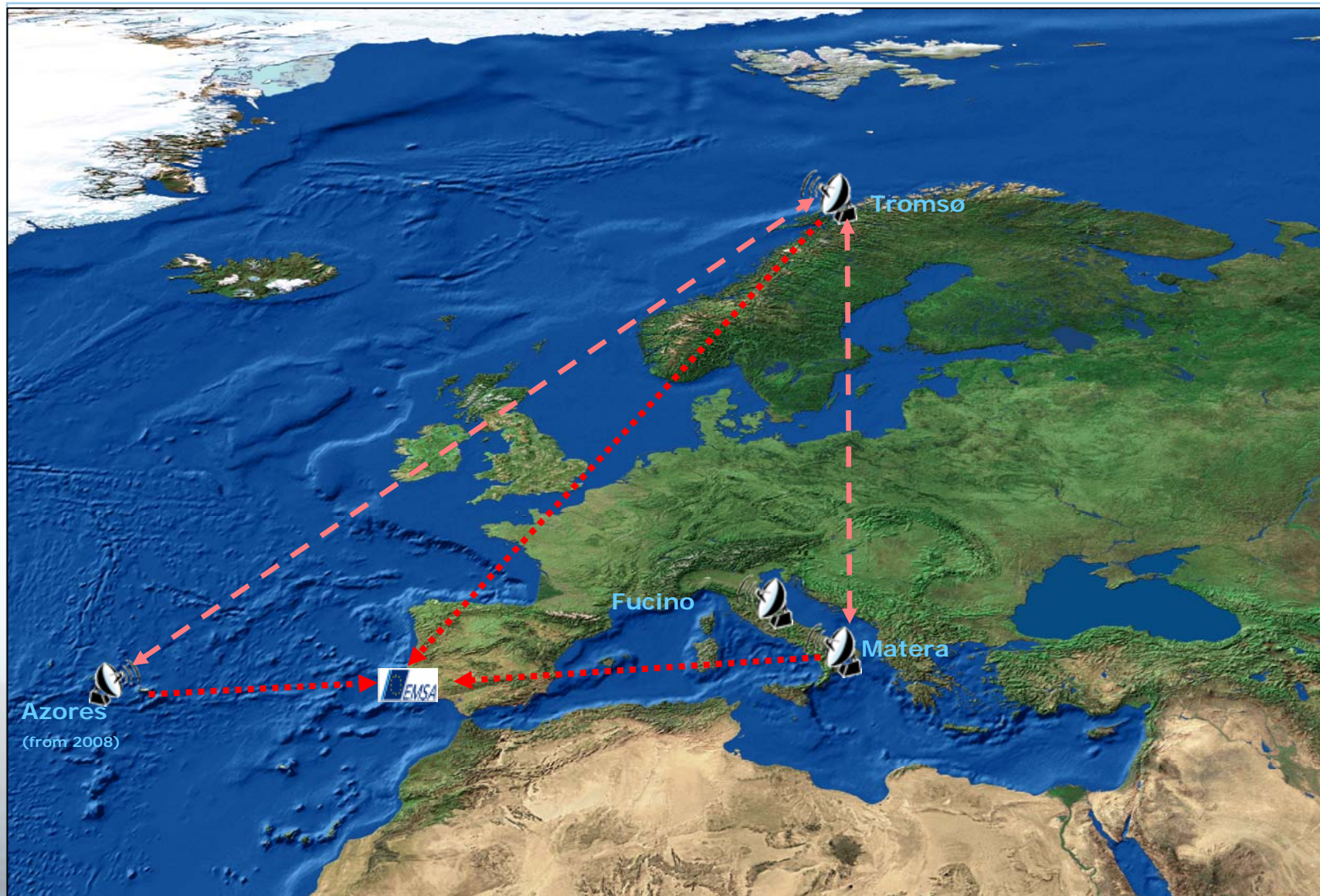
- All information e.g. imagery, analyses and feedback shall be stored in an EMSA controlled database
- All information will be accessible to the entitled Coastal States
- Database information will be used
 - for in-house documentation and reporting
 - for training of operators and users, performing independent validation activities, and
 - for running statistical analysis

Validation and verification

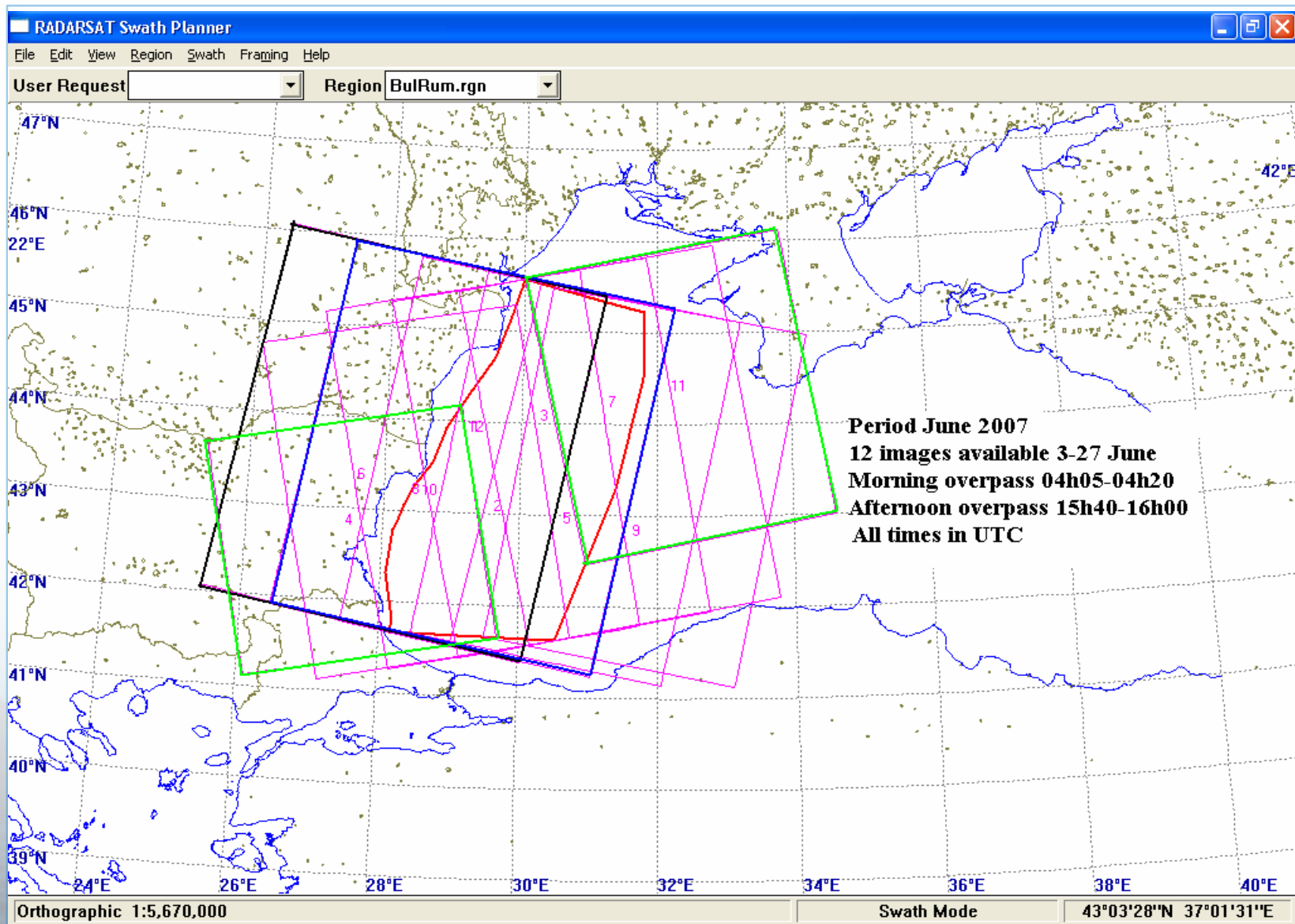
The aim is to improve confidence levels of the products and the effectiveness of the operational system.

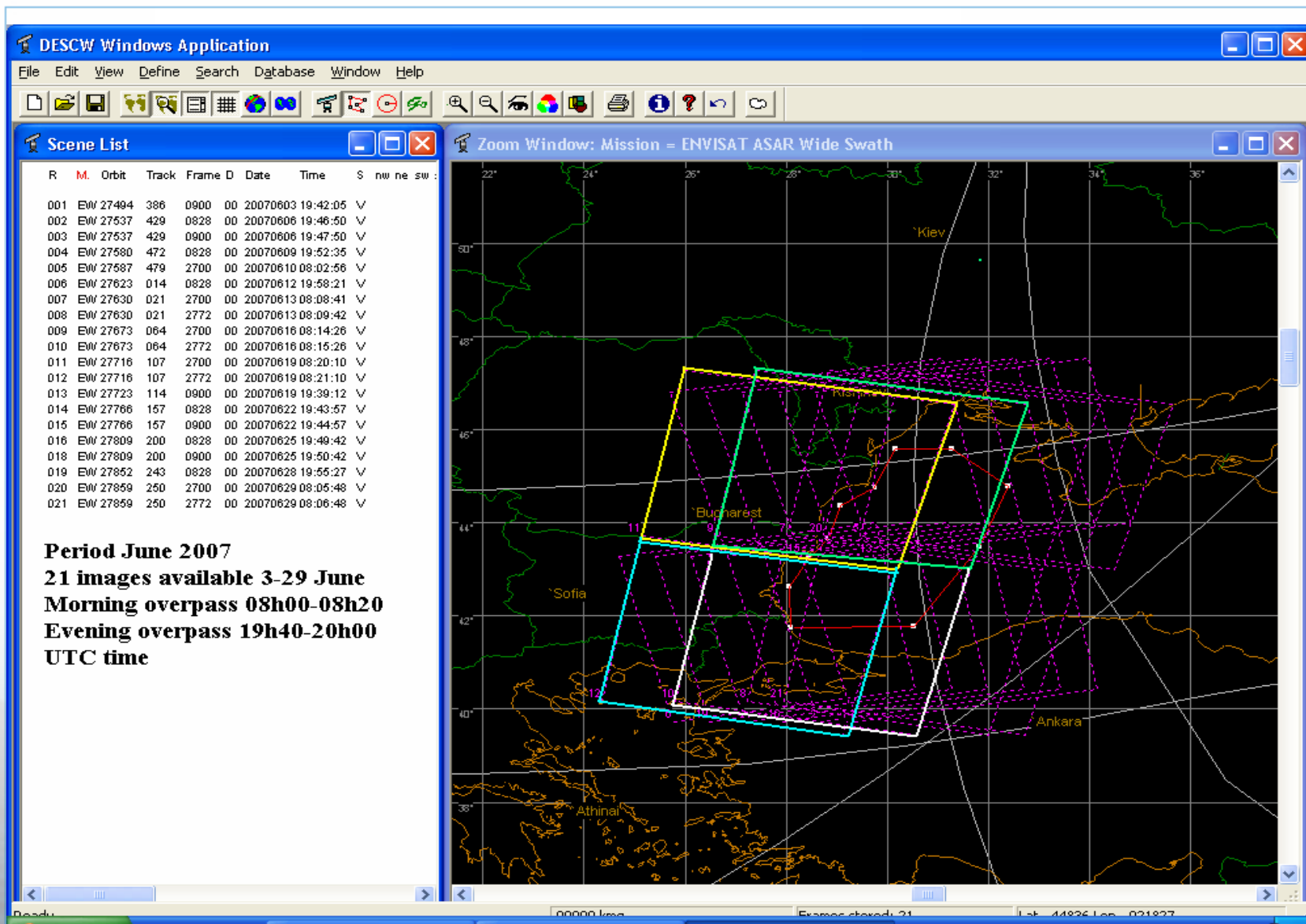
- On a regular (yearly) basis. Service review with CS
- Continuous quality protocols
- Requesting feedback from CS
- Validation in terms of delivery time, false positives/negatives











EMSA requests for all Coastal States

- Service integrated into the national response chain
- CS should attempt to verify as many spills as available aerial or vessel resources allow
- Defining the use of satellite images and defining what is an appropriate follow-up should be decided by the Coastal State
- The Agency should not provide satellite images to CS that are not capable of any appropriate follow-up
- EMSA needs feedback on verification results and service quality
- EMSA will establish satellite monitoring user group (in co-operation with EGEMP)

Next steps - 2007

- Complete the EMSA questionnaire – March
- Analyse number and location of satellite images required
- Sign terms and conditions on the use of data
- Define operational contact details and alert message mode
- Confirm returned image acquisition plan
- Training course for operational persons from CS– June
- Start receiving the CleanSeaNet service! - Possible from June

Thank you very much!

EMSA Oil Pollution Response
<http://www.emsa.europa.eu>