Use of SAR data for Maritime Application

Gianni Riccobono
Telespazio relevant experience

Processing and Archiving Facility - Development & Operations

SIRC/XSAR (1994)
Processing and Archiving Facility - Development & Operations

SRTM (1997)
Processing and Archiving Facility - Development & Operations

ENVISAT (2002)
Processing and Archiving Centre - Operations

COSMO (today)
Ground Segment - Development & Operations
Matera Ground Station

Remote Sensing Data Acquisition & Processing

- Landsat (USGS/ESA)
- ERS, Envisat (ESA/ASI)
- Terra, Aqua (NASA/ESA)
- Meteosat (Eumetsat)
- Tiros/AVHRR (NOAA)

Geodesy: Data Acquisition & Analysis

- GPS (ASI)
- VLBI (ASI)
- MLRO (ASI)

25 year satellite data archive

Buildings: 9,000 m²  Antennas: 11  People: 70
Users evolution

- Users
- Scientist
- Institution
- Commercial
Illegal oil spill since 1999 on Mediterranean Sea

SAR images processed = 1600
Oil spill detected = 1638

Source: JRC/Institute for the Protection and Security of the Citizen
SAR data for Oil Spill

- The monitoring of oil spots in sea is one of the problems more felt for the environmental protection considering the intense traffic of oil-tankers in all the navigable seas.

- The oil film smoothes the sea surface roughness producing a radar return reduced enough in comparison to the background limiting the backscattering.

- The SAR allows to quickly cover very great areas using low resolution and wide swath images.

- SAR allows day/night and all weather acquisition
Look-alike phenomena (false alarms)

On SAR images look-alike phenomena are generated by:

- natural slick due to biologic film
- some atmosphere phenomena
- Very low wind speed
The oil spill detection is mainly performed by means of photo interpretation. The required functions are:

- Automatic or manual identification of the Area of Interest.
- Automatic evaluation of the probability of the oil spot respect to false alarm
- Automatic determination of the extension and geographical position of the oil spot
Oil Spill software tool (2)

- Area selection
- Area classification
- Sub-area merging.

- The oil spill classification is performed by means of use of neural network properly trained.
• Final Report includes oil spill position (centre and corners) and extension.
• Final report can be exported as shape file for GIS application
The automatic ships detection in open sea represents an important application of the SAR both for civil purposes and military.

The ships normally produce an elevated radar return in comparison to the background of the sea surface due to the high reflectivity of the metallic parts.

The higher is the resolution the better is the capability to eliminate false alarms caused by the bad sea conditions.

The wakes displacement from the ship for the doppler effect allows to estimate the speed of the ship.
Ship Detection software tool (1)

- The required functionalities are:
  - Automatic ship detection
  - Automatic evaluation of ship dimension and geographic position
  - Automatic ship direction and speed estimation
Ship Detection software tool (2)

• Ship detection
• Dimension calculation
• Geographic position determination
• Ship route.
Ship Detection software tool (3)

- The final report includes the position, the dimension and the direction of the ships.
- Map of the ships is produced in the geographical area
- Oil Spill detected in the same area are displayed too
Satellite Oil Spill monitoring Service on Mediterranean Sea

Satellite

Emergency operation means

Matera GS

Time

User Operation Centre

Report

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The monitoring is based on the repetitive observation performed by Remote Sensing satellites.

Data gathered by the satellites are processed as soon as available (ERS-2, RADARSAT, ENVISAT).

Image products are generated.

Meteo-ocean data and forecast over the interested area are provided.

The Value Adder analyses the image and apply specific algorithms on it, to detect and localise the oil spill.

- **VA is an expert in detection of oil-slicks on SAR images**
The VASCO Service OS Detection
The VASCO Service: Images preview

Image Localization Screen

Property Name | Value
--- | ---
SatelliteName | ERS
SensorType | SAR
OrbitNumber | 28668
Track Number | 437
Frame Number | 2746
Product | ERS_MRI
Acquisition Date: YEAR | 2002
Acquisition Date: MONTH | 9
Acquisition Date: DAY | 26
Acquisition Time: HOUR | 10
Acquisition Time: MIN | 7
Acquisition Time: SEC | 22
An analysis of the oil spill is performed.
1st of February: Sinking place

Speed vector
(0.436, 0.405) Km/h
Speed module 0.594 Km/h

<table>
<thead>
<tr>
<th>trace</th>
<th>Lat</th>
<th>Lon</th>
<th>area [m²]</th>
<th>perimeter [m]</th>
<th>note</th>
</tr>
</thead>
<tbody>
<tr>
<td>003t1425</td>
<td>42°10’57”N</td>
<td>12°01’57”W</td>
<td>961632</td>
<td>10932</td>
<td>lengthened irregular form</td>
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<td>12°01’57”W</td>
<td>1379052</td>
<td>18096</td>
<td>lengthened irregular form</td>
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</tbody>
</table>
## Telespazio in GMES Program

<table>
<thead>
<tr>
<th>FUNDING PROGRAM</th>
<th>PROJECT</th>
<th>LEADER</th>
<th>THEME</th>
<th>TELESPAZIO ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESA GSE</td>
<td>Risk Eos</td>
<td>EADS-Astrium</td>
<td>Forest fires, floods</td>
<td>Burn Scar Mapping (BSM) Service in Italy, Spain and France.</td>
</tr>
<tr>
<td>ESA-EARTH WATCH (FUEGO)</td>
<td>Fuegosat</td>
<td>INSA</td>
<td>Forest fires</td>
<td>Forest fires detection from geostationary satellites.</td>
</tr>
<tr>
<td>ESA GSE</td>
<td>Roses, Marcoast</td>
<td>AAS</td>
<td>Oil spill, water quality</td>
<td>Oil spill NRT detection over the Mediterranean Sea.</td>
</tr>
<tr>
<td>ESA GSE</td>
<td>Forest Monitoring</td>
<td>GAF</td>
<td>Forest monitoring, mapping of land use changes</td>
<td>Forest inventory and mapping with Italian Min. of Environment</td>
</tr>
<tr>
<td>ESA GSE</td>
<td>MARISS</td>
<td>Telespazio</td>
<td>Maritime surveillance services for security.</td>
<td>Demonstration of pre-operational maritime surveillance services.</td>
</tr>
<tr>
<td>ESA GSTP3</td>
<td>MASS</td>
<td>Telespazio</td>
<td>ASP services</td>
<td>Integration of EO services in the ESA Portal. Oil spill services.</td>
</tr>
<tr>
<td>EC FP6 IST</td>
<td>WIN</td>
<td>AAS</td>
<td>Distributed architecture for risk management in GMES.</td>
<td>Analysis and demonstration for different kinds of risk.</td>
</tr>
<tr>
<td>EC FP6 A&amp;S</td>
<td>LIMES</td>
<td>Telespazio</td>
<td>Security</td>
<td>Development &amp; demonstration of EO based services (maritime, borders, emerging threats)</td>
</tr>
<tr>
<td>EC FP6 A&amp;S</td>
<td>EURORISK - PREVIEW</td>
<td>EADS-Astrium</td>
<td>Risk management</td>
<td>Leader of the geo-hazard cluster (floods, seismic and volcanic risk)</td>
</tr>
<tr>
<td>EC FP6</td>
<td>HUMBOLDT</td>
<td>FHG-IGD</td>
<td>INSPIRE</td>
<td>EO data armonization models and prototype sw implementation.</td>
</tr>
</tbody>
</table>
Fusion of information from all sources to create a more effective Reference Maritime Picture.
How to contact us

www.telespazio.it

Gianni Riccobono
+3906 40793777
+3906 40999805
gianni_riccobono@telespazio.it