Geospatial for Environment

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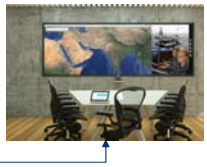

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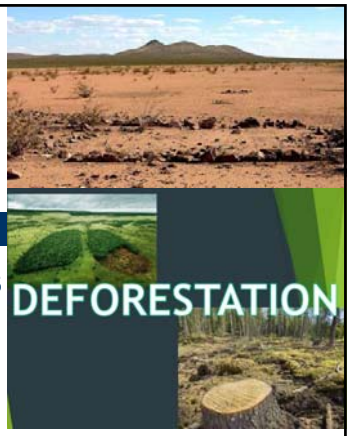
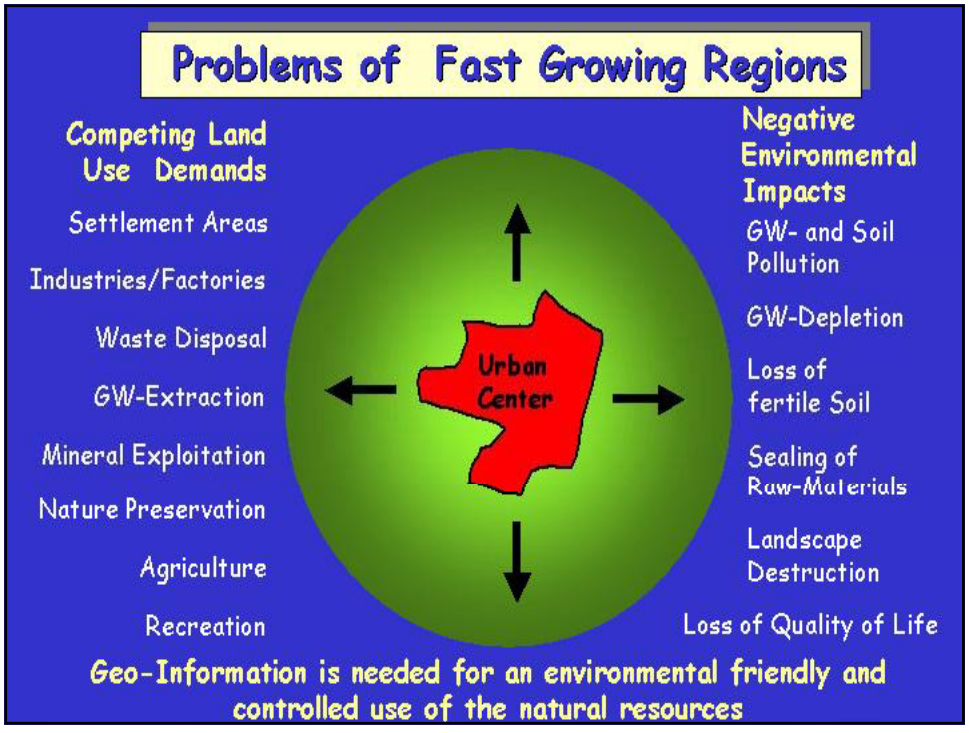
Natural Environment

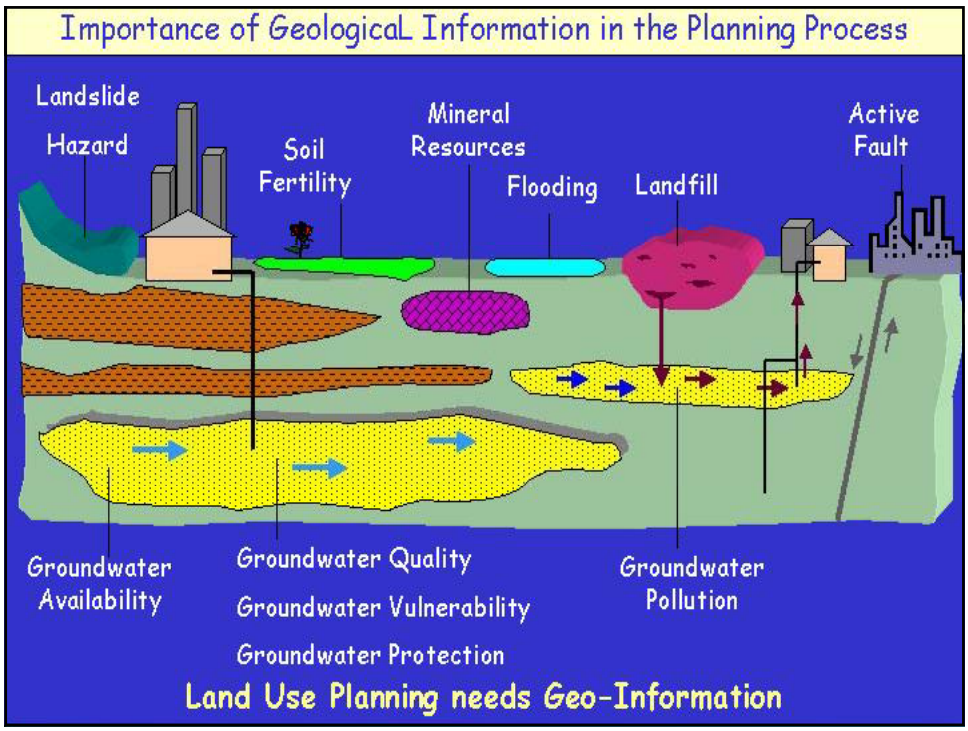
- All living and non-living things occurring naturally on Earth.
- Interaction of all living species.
- It is the climate, weather, and natural resources.
- All components affect human survival and economic activity

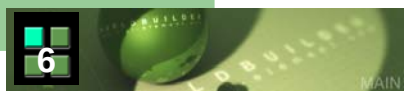
Human Impact



- man transformed landscapes into such as urban settings and agricultural land conversion,
- The natural environment is greatly modified and diminished: deforestation, waste, over population, pollution, overuse of natural resources,…







Environmental Information- Scope

- Create policy, implement plan and regulations, and manage enforcement, example: geospatial intelligence (movement of controlled waste)
- easy access to sensor and imagery data gives the power to detect and monitor pollution, weather, hazards and make environmental analysis.
- Data analysis and visualization in 2D and 3F improve assessment and building scenarios for decision makers.
- Publish interactive online environmental data will spread the information and increase the public awareness.

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Environmental Information- Scope

- **Economy –**

  Providing economic expansion opportunities to maintain a diverse economy, rich in resources

- **Transportation –**

  with specific focus on integrating transportation systems with land use and the environment

- **Settlement Pattern –**

  Balanced growth, focusing on accommodating growth so development is sustainable

- **Environment –**

  Protecting the environment so our vast open spaces and clean lakes & waterways are maintained & enhanced

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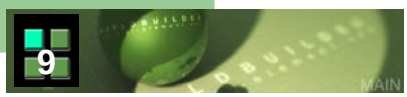
Answering Key Questions

- What locations are regionally significant to support economic expansions?
- What type of transportation investment do we want to facilitate growth?
- Where should we encourage settlement areas over the next 25 years?
- How do we protect our environmental assets?
- What problems fast growing region like Dubai is facing?



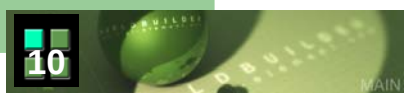
Why Geospatial Information System

1. Better understanding of land resource and utilization

2. Urban & regional Planning:

1. Available land is used in most optimal way.
2. Prepare comprehensive and operational infrastructure studies and development plans.
3. Wise and orderly use, management, and conservation of vegetation, soil and water resources.
4. Regional impact assessment studies.
5. Site selection for diverse activities

Continue…

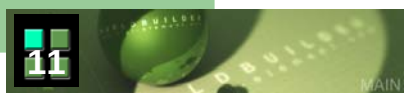


Why Geospatial Information System

3. Vegetation Conservation & management:

1. Determination of species conservation values
2. landscape conservation, planning and management
3. Monitoring vegetation stress.
4. Define Protected or natural reserved Area Categories Based on Management Purpose.
5. Biodiversity conservation

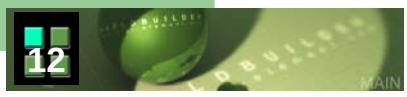
Continue…



Why Geospatial Information System

4. Soil Conservation & Management:

1. Determine soil limitations for building and development
2. Evaluate the capability of a soil for agriculture activities
3. Determine the soil and water conservation practices necessary to maintain the soil.
4. Determine the limitation of the soil for sanitary landfill sites, and waste water renovation.



Why Geospatial Information System

1. **Mineral, Oil, Gas and Water Explorations**
2. **Site Selection for:**
   1. Waste disposal
   2. Settlement or industrial developments
   3. Dams, artificial recharge & harvesting rainfall water
   4. Recreational development
3. **Protection and Conservation of Groundwater Resource**

Continue…

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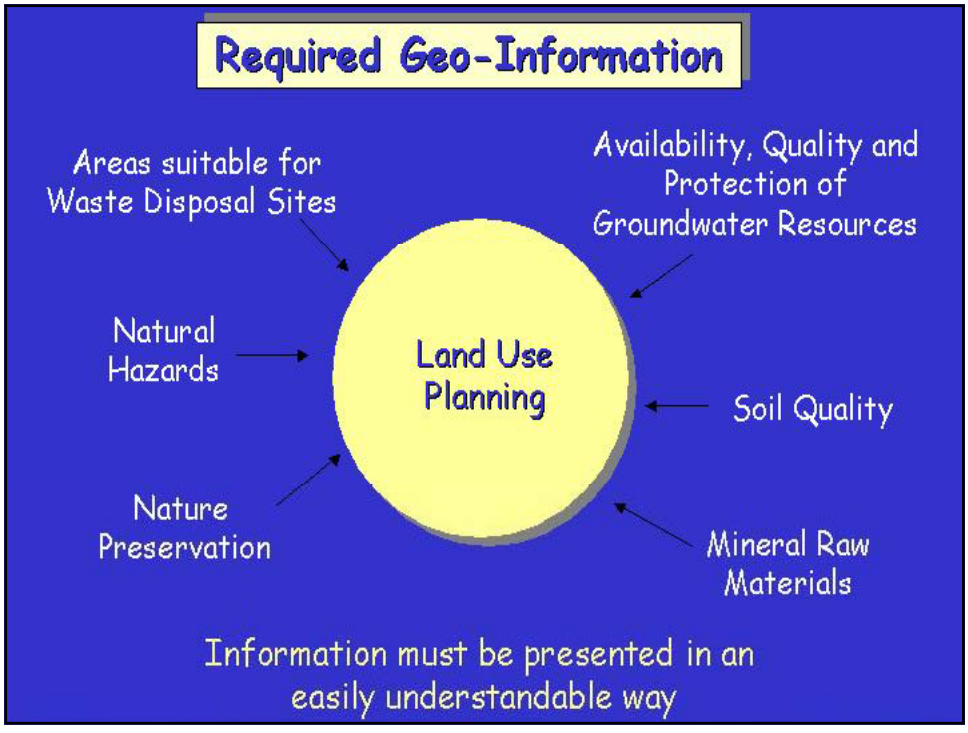
Why Geospatial Information System

4. Answer some important equation

- where the natural underground has a hydraulic permeability
- watershed classes and characteristics
- flood prone areas,
- Stable ground,
- Landslides hazards
- Seismic activity (fault zones),
- Groundwater resources (high yield, good quality),
- Potential areas for mining of important mineral resources.



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Case Studies

- Sustainable Site Selection
- Land Degradation
- Oil Spill

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Site selection for Desert Resorts Development.

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Methodology

Input Parameters

Soil | Land use | Geomorphology | Natural Vegetation | Hydrogeology

GIS Analysis
Multi-criteria Evaluation

Potential Site for Desert Resort Development

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Criteria & Rules

- Good Landforms (with **low slopes** and **Natural Vegetation**)
- Good **Soils** (Useful for afforestation and vegetation development)
- Good Hydrogeological zones (availability of **groundwater**)
- Nearness to the existing Road network (**accessibility**)
- Good Land use (Vacant and **non-commercial land**, far from main city excluding coastal areas)
- In-general, area should be plain area to avoid huge leveling cost
- **Minimum** available area should be 25 Sq. km

* **These rules can be modified as per the problem under investigation**

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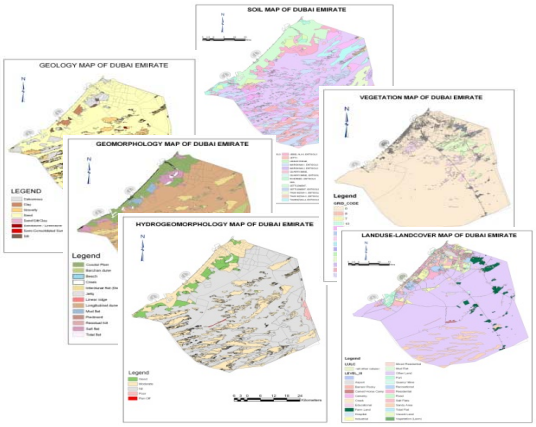
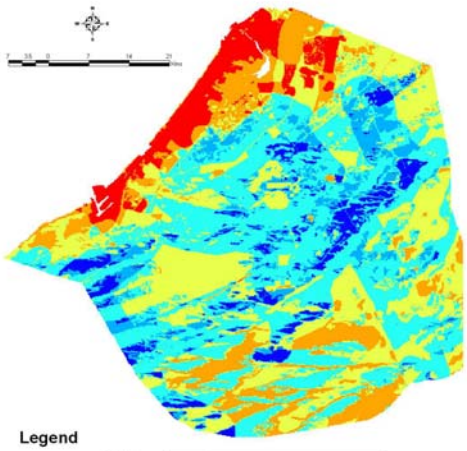
Geospatial Information(layers)



GLOBALSCAN

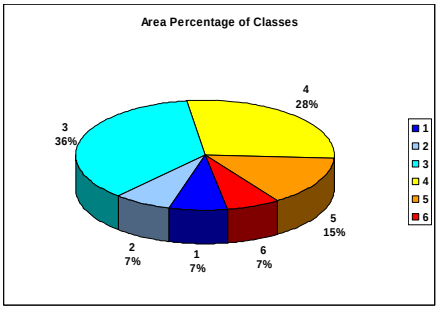
Site selction for Desert Recreation and Tourist Attraction Resorts



Legend

Suitability Class - 6
Suitability Class - 5
Suitability Class - 4
Suitability Class - 3
Suitability Class - 2
Suitability Class - 1

S.No	Parameters considered
1	Land use- land cover
2	Geomorphology
3	Soils
4	Hydrogeology
5	Vegetation
6	Road proximity



Suitability Class	Area in Sq. Km
1	273.329725
2	273.775125
3	1369.924625
4	1066.475675
5	554.12435
6	256.06705

GLOBALSCAN

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Land Degradation and Desertification

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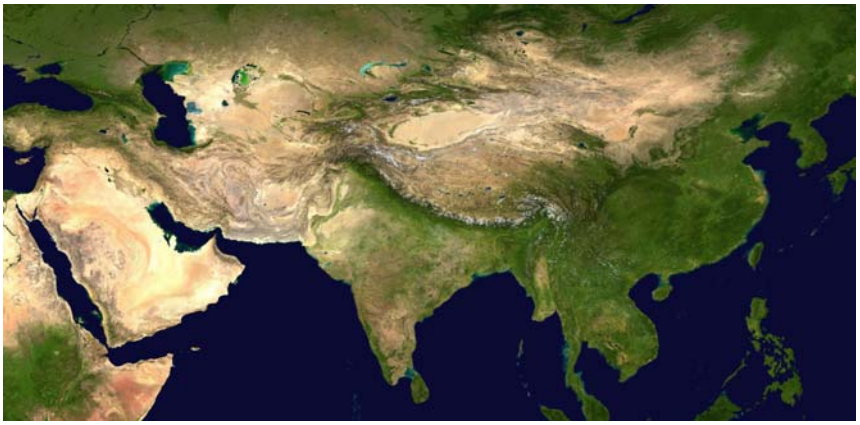
Desertification of Drylands of Asia



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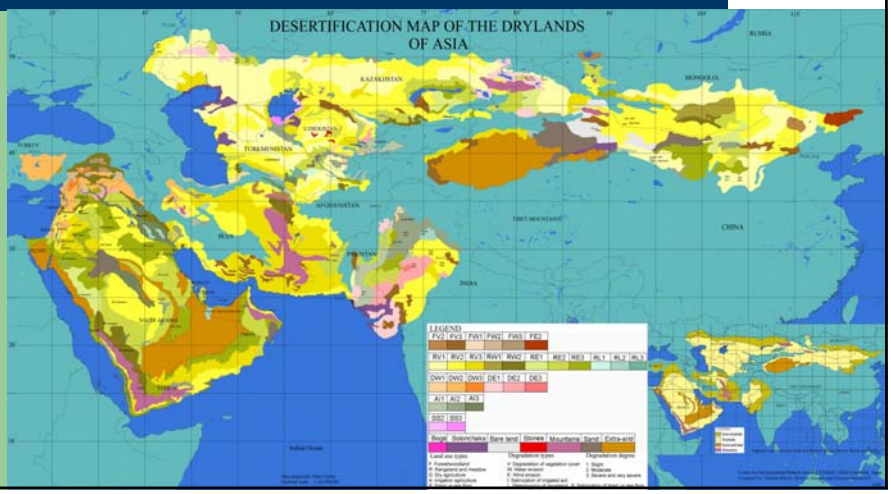
Desertification of Drylands of Asia



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Desertification of West Asia

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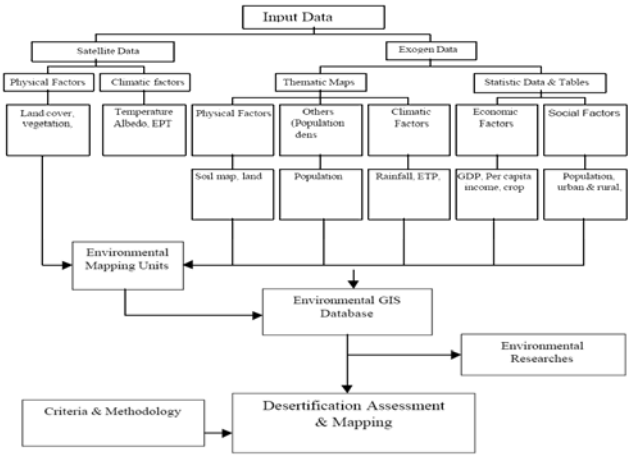
Desertification of West Asia Methodology



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Desertification of West Asia -Results

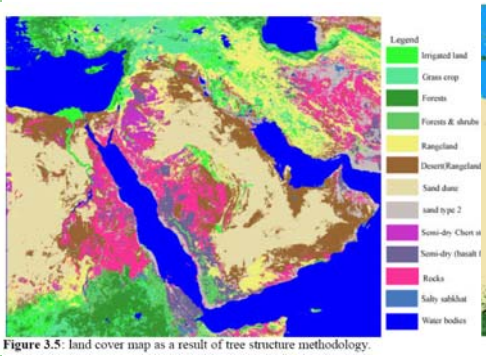

Figure 3.5: land cover map as a result of tree structure methodology.

Figure 3.1 Vegetated cover map, extracted from 12 monthly NDVI NOAA AVHRR data from April 1992 through March 1993.

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Desertification of West Asia -Results

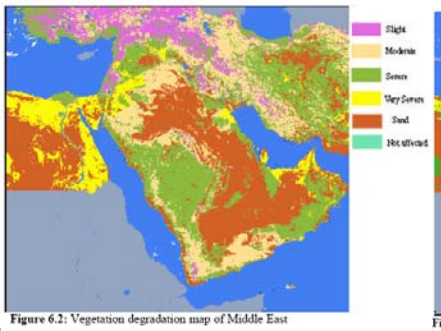

Figure 6.2: Vegetation degradation map of Middle East

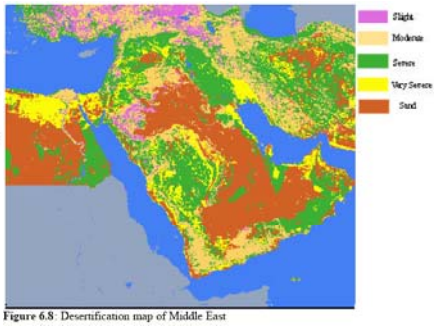

Figure 6.8: Desertification map of Middle East

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Desertification in North of Jordan

Objectives

If unplanned human activities persist in semi-arid/arid area, an irreversible situation of desertification will occur in the near future. It is necessary to assess desertification.

It is very important to monitor and estimate distribution of desertification in vast area by using remote sensing and GIS techniques.

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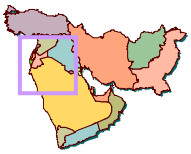
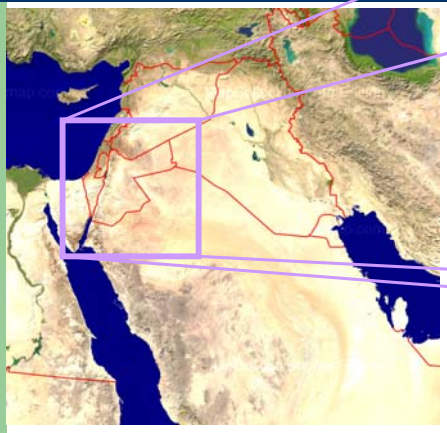
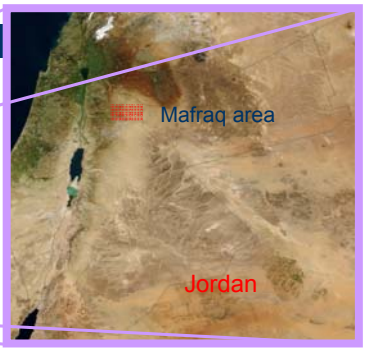
Study Area







- Area = 1300km^2
- Climate : semi-arid/arid
- Rainfall < 200mm

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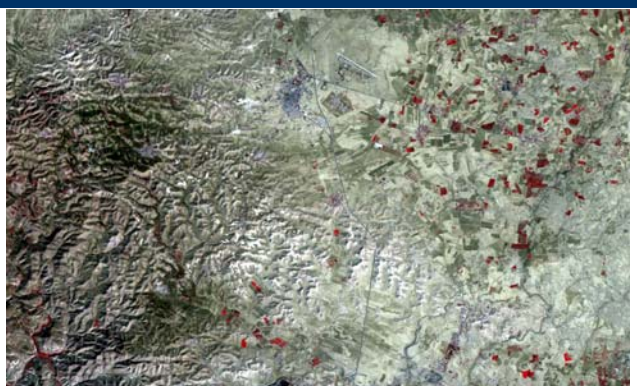
Satellite Image of Study Area



Landsat TM image (1997/11) of Mafraq area

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Methodology and techniques for Desertification mapping

Remote sensing data

Statistical data

Satellite images

Socioeconomic factors

- Natural factors

Thematic map

GIS database

Erosion susceptibility maps

Land Degradation maps

Water erosion map

Wind erosion map

Vegetation degradation map

Salinization map

Desertification map

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Desertification Mapping Units (DMU)

Combination of Geomorphology and Land use Information

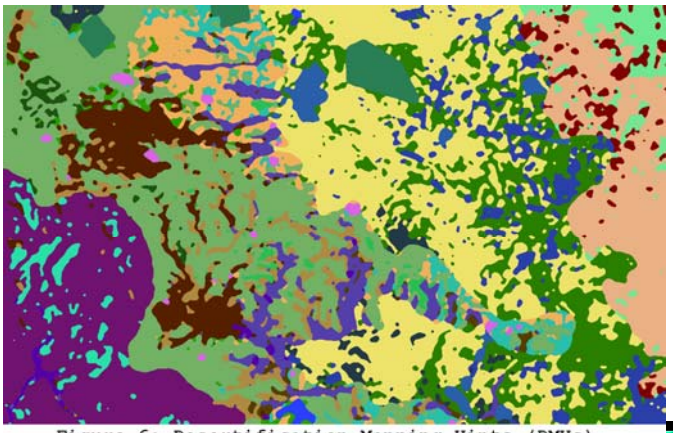

Figure 6: Desertification Mapping Uints (DMUs)

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Environmental GIS database

- Satellites images
- Land use
- Soil
- Geomorphology units
- Slope
- Drainage system
- Natural vegetation
- Vegetation index
- Expansion of irrigated lands
- Rainfall distribution
- Susceptibility to wind erosion
- Susceptibility to water erosion
- Desertification Mapping Units(DMUs)

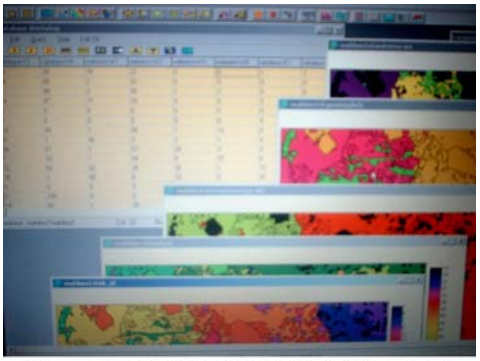

Figure 7: GIS database of Mafraq area under IDRISI environment

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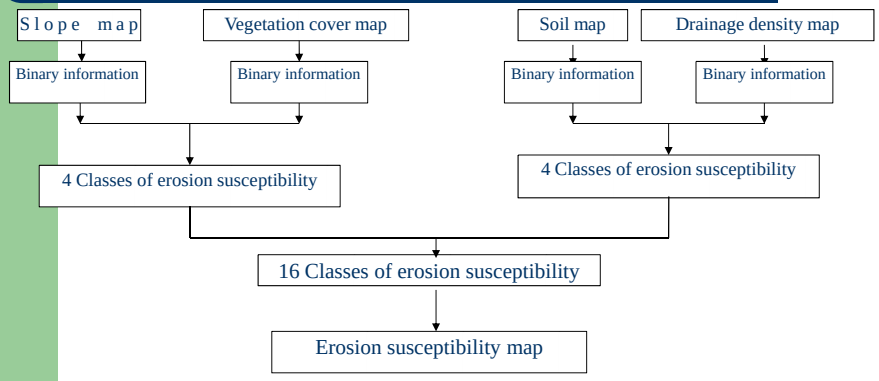
Water erosion susceptibility Modeling



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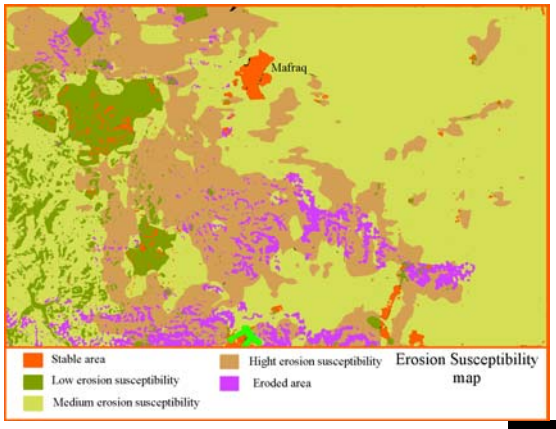
Water erosion susceptibility Map



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Modeling of land degradation
Multi-Criteria Evaluation (MCE) Approach

- *weighted linear combination* (WLC)" procedure:

- $S = \Sigma w_i x_i$

where S = suitability (land degradation type)
wi = weight of factor i
xi = criterion score of factor i

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Multi-Criteria Evaluation (MCE)

- Step 1: factors identification
  Factors depend on degradation type
- Step 2: Standarization of factors
  Original values were assigned new values which progressively increased from 0 to 255
- Step 3: Weighting
  - A pairwaise comparison matrix weighting procedure
  - Weights must sum to one
  - The comparisons concern the relative importance of the two criteria involved in determining "suitability"
  - Ratings are provided on a 9-point continuous scale, from extremely less importance (1/9) to extremely more importance (9).
- Step 4: Applying the model
  The result map has a range of value from 0-255, increasing with the degradation
- Step 5: Threshold
  The result divided into four classes of degradation; slight to very high

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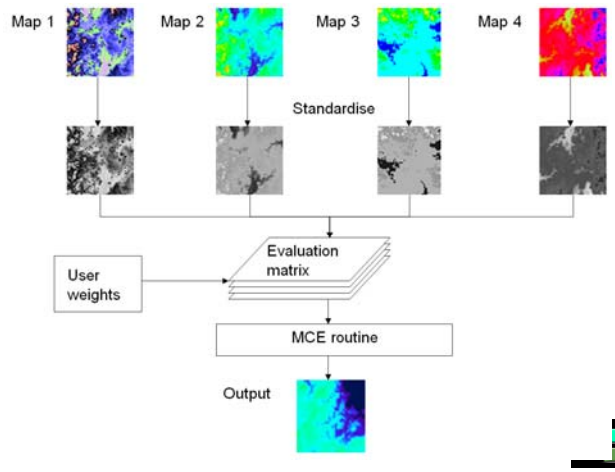
Multi-Criteria Evaluation (MCE)



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Water erosion modeling

Step 1: **factors identification for water erosion (WRE):**

- Water erosion susceptibility- WREF1
- increasing of abundant farmlands- WREF2
- Decreasing in vegetation cover index- WREF3

Where, Water Erosion = Σ Wi WREFi i=1,2,3

Wi : weights to be assigned for water erosion factors

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Water erosion modeling Continuo…

- Step 2: Standarization of factors 0-255 values

Following standardized factors layers were created:

- SWREF1- Water erosion susceptibility
- SWREF2- Increasing of abundant farmlands-
- SWREF3- Decreasing in vegetation cover index-

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Water erosion modeling Continuo…

- Step 3: Weighting

A pairwaise comparison matrix weighting procedure was used to assign for each factor a weight value reflect its importance for land degradation type in equation, as a result:

- Water erosion susceptibility- W1 = 0.687
- increasing of abundant farmlands- W2 = 0.186
- Decreasing in vegetation cover index- W3 = 0.127

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Water erosion modeling Continuo…

- Step 4: Applying the model

The previous process lead to create Water Erosion Map base on the following model:

- Water erosion = 0.687 * SWREF1 + 0.186 * SWREF2 + 0.127 * SWREF3
- The resulting image map has a range of value from 0-255, increasing with the increase of water erosion.

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Water erosion modeling Continuo…

- Step 5: Threshold

The result was divided into four classes of degradation;

- slight,
- moderate,
- high and
- very high.

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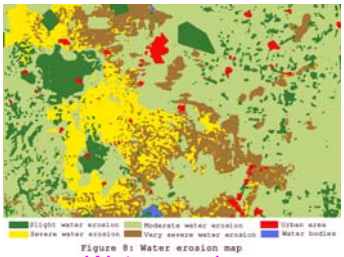
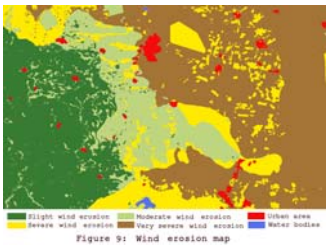
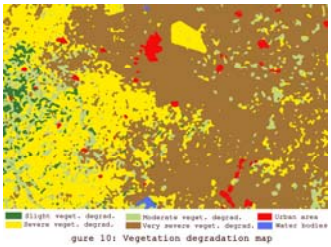
Land degradation Maps



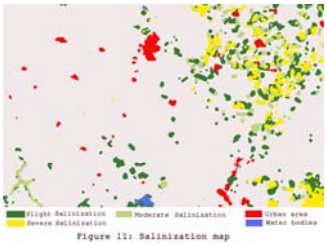
Water erosion



Wind erosion



Vegetation degradation



Salinization

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Desertification map

The general desertification map, which synthesize all types of land degradation, is achieved through the three next steps:

- **Step1: Soil erosion map**
- **Step2: combination of soil erosion with vegetation degradation**
- **Step 3: Integration of salinization**

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Desertification Map

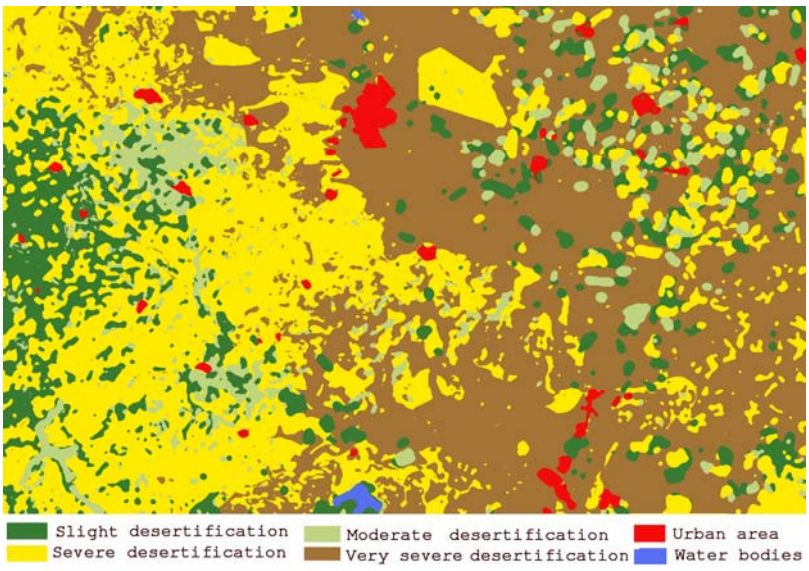


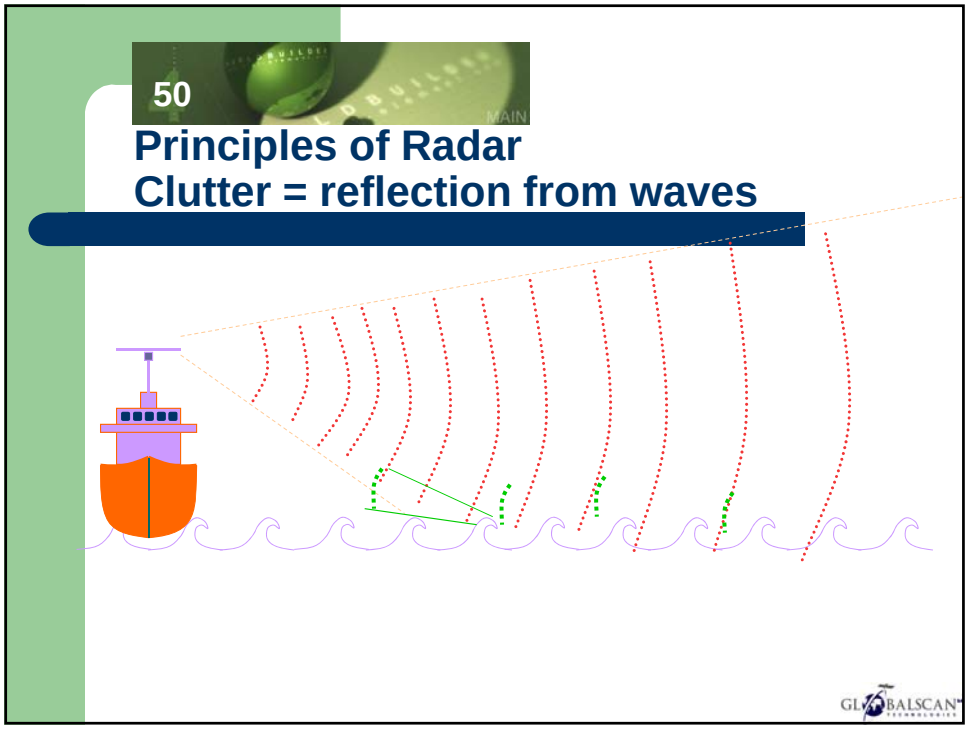
Figure 12: Desertification map

Oil Spill Detection and Monitoring

Operational Remote Sensing Solutions

- Navigation Radar monitoring system
- Satellite Imagery monitoring system
- Aircraft Photography monitoring system


Real Time Oil Spill Detection and Monitoring
SEA DARQ
SeaDarq System


50
Principles of Radar
Clutter = reflection from waves

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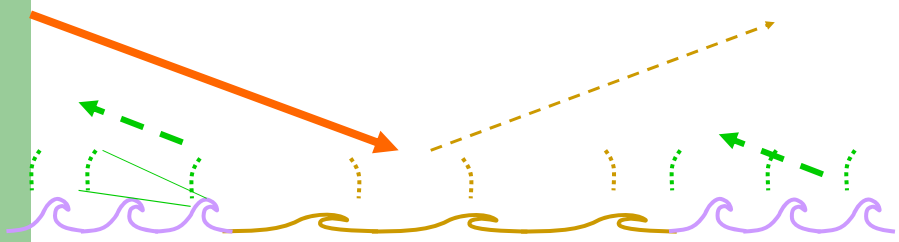
Clutter with Oil Spill



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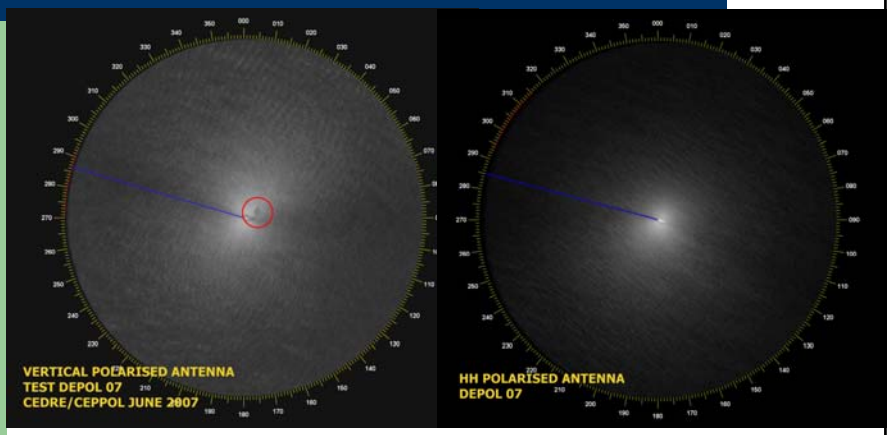
HH/VV



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2 principles of operation

- Capillary waves

- Water waves
  - On short pulse
    - 0.5 M high
    - 15 M length

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2 principles of operation

- Water waves
- On short pulse
  - 0.5 M high
  - 15 M length

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Functionality

Capilar waves only

- Bottom topography
- Oil detection
- Saline/Fresh water interfaces
- Ship's wake
- Land/Water borders
- Small objects detection
- Bird detection

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FUNCTIONALITY

Water waves

In addition of capilar wave functionality,..

MEASUREMENT OF:

- Wave frequency / length
- Wave speed
- Wave direction
- Wave height *
- Water depth
- Current speed vector
- Small object detection

* With calibration

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SeaDarQ Functionality Models

- Oil Spill Detection
- Hydrographic measurements
- Small Target Detection

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Oil Spill Detection Features

- All weather capability *
- Day and night
- Spill area determination
- Prediction of drift
- Relative layer thickness

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- Prevents illegal spills
  - 100% chance to be caught
- Damage control following accidents
  - Fast reaction
  - Early warning system
  - Well planned cleaning strategies
  - Prediction of drift
- Ships can operate independently of helicopters during cleaning operations

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OIL SPILL DETECTION RANGE

- **Operational detection range is dependant on:**
  - Height of antenna above the water surface
  - Opening angle antenna
    - the longer the better (min 8 feet)
  - Radar transceiver
  - The weather & water condition
- * Min. wind speed: 2 m/s
- Accuracy and resolution = radar dependant

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Economic model

- Benefits:
  - Increase number of penalties (illegal spills)
  - Minimise damage and protect fishing grounds, beaches, rocks etc.
  - More oil can be removed from the water, thus reducing costs of cleaning shores
  - Cost of a helicopter 6000 € /hour
  - Day and night operation = double useage time
  - Eliminates need for wave buoy/current pole
  - Additional calibration with models
  - Enhanced small target detection

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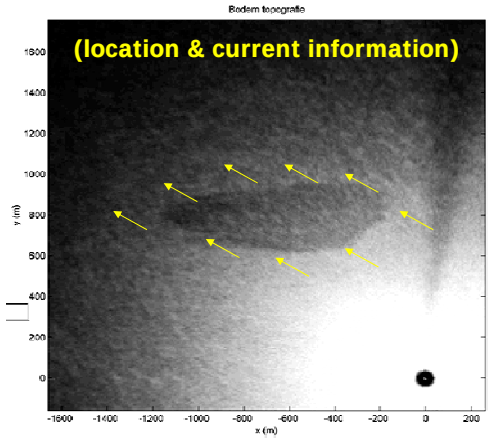
Oil Spill Detection



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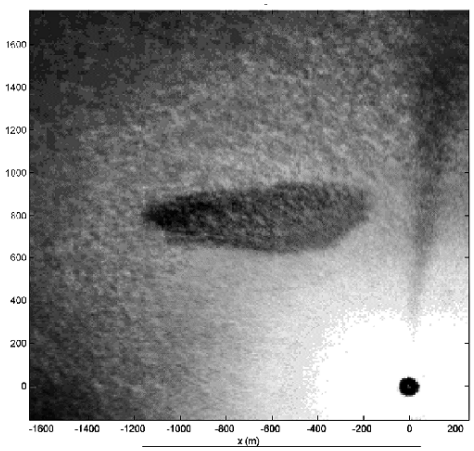
SeaDarQ Radiagreen

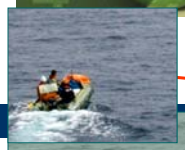
Radiagreen



64

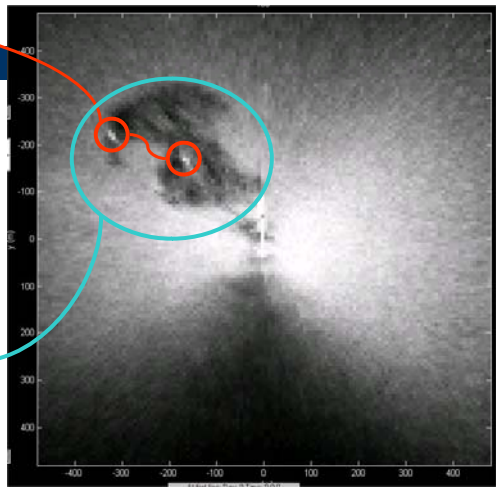
SeaDarQ radar image

BONNEX



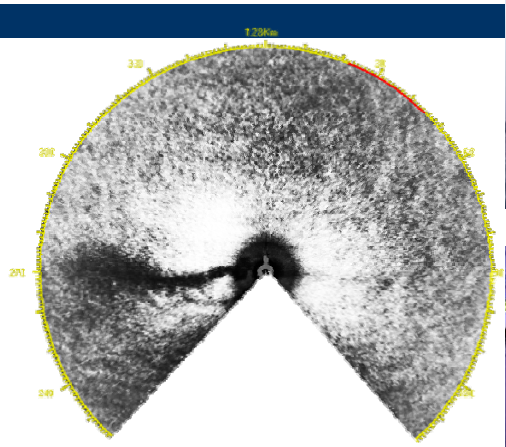
Slick with thickness differences

Picture and image taken on the same time and place



65

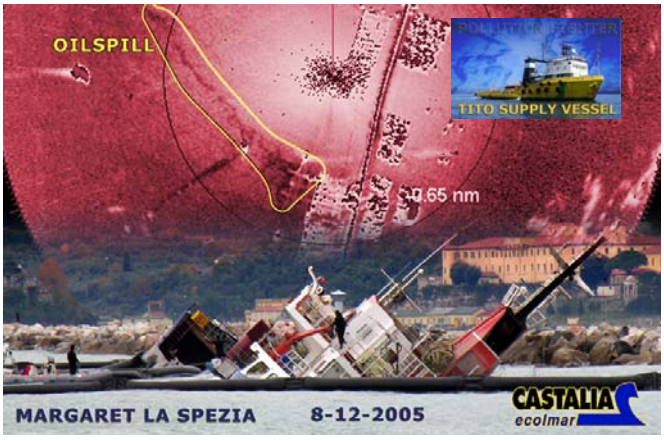
SeaDarq Detecting “Prestige Oil Sludge”



66

Margaret wreckage La Spezia

DECEMBER 2005



67

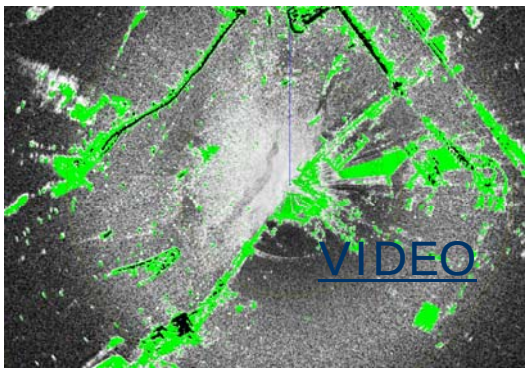
Inland water Moerdijk

Radiagreen

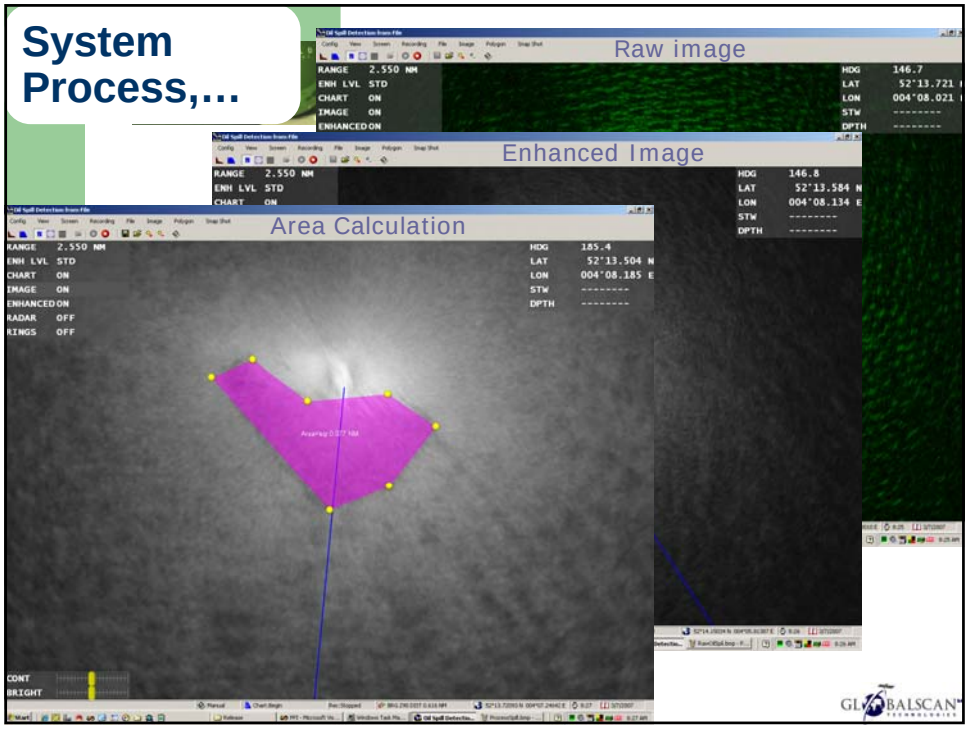
- Land mobile system

68

Inland water Moerdijk

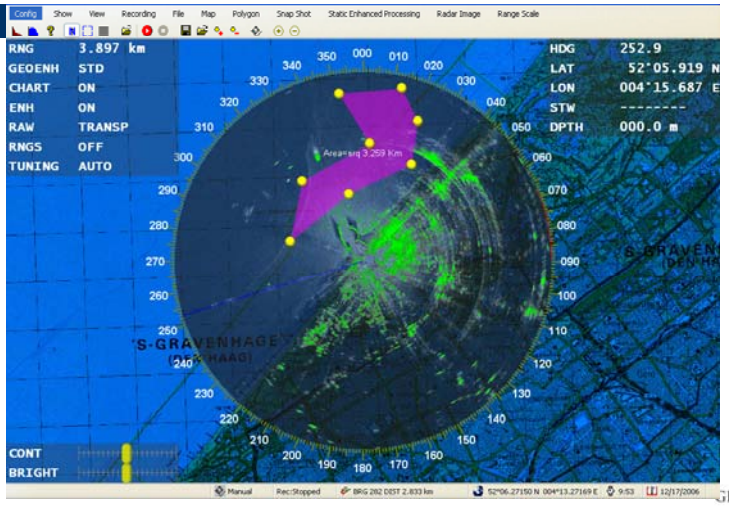


System Process,...



70

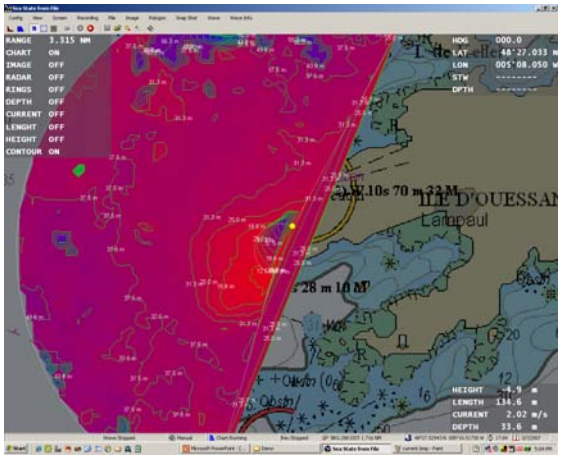
Charts overlay



71

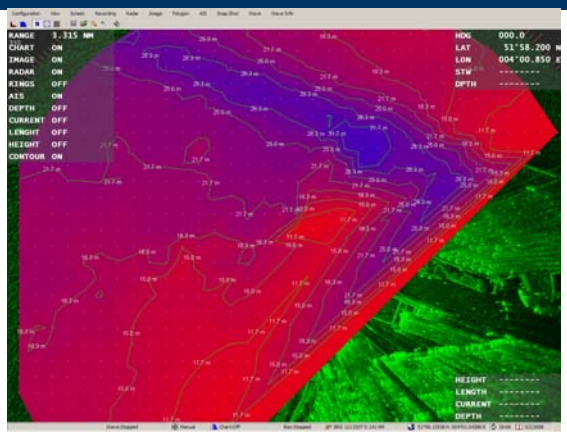
Hydrography

Depth Contours



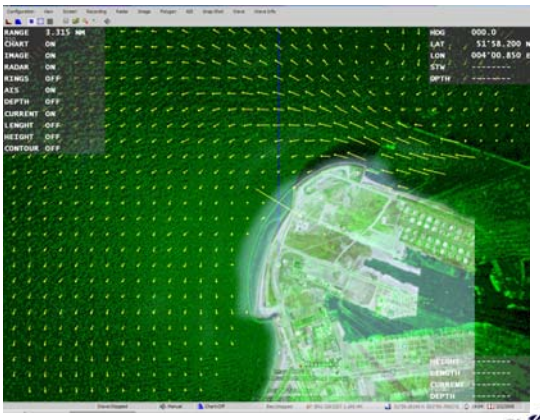
72

Water depth



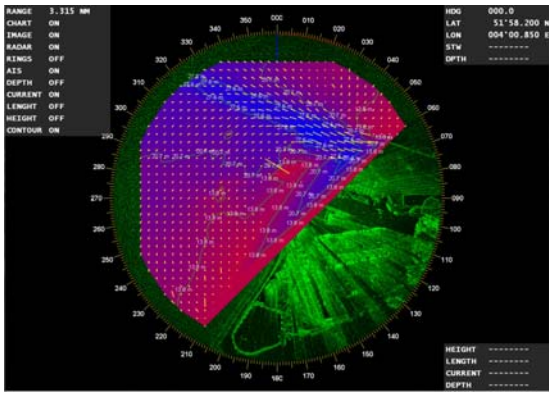
73

Current



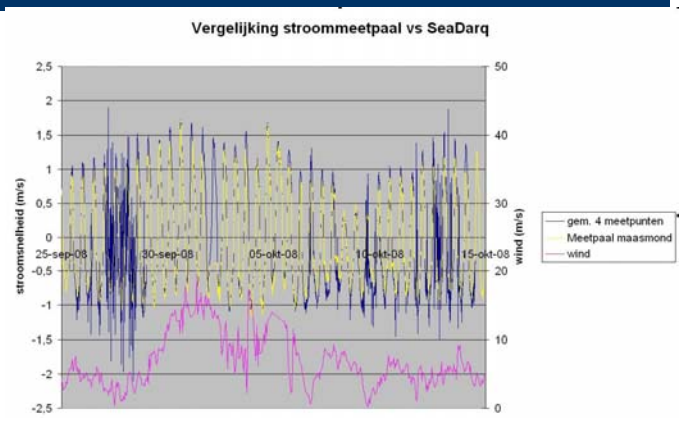
74

Bottom, Current & Contour lines



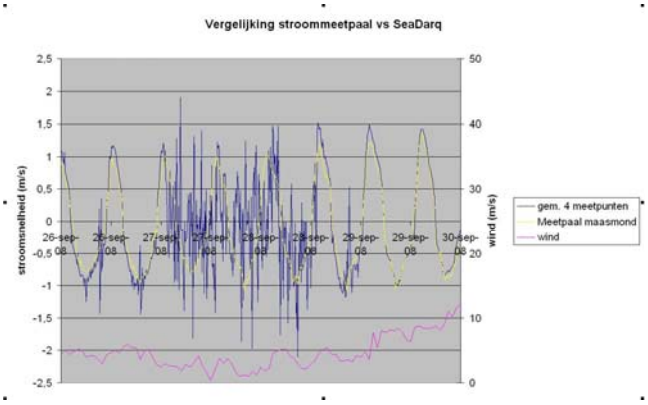
75

Current Pole measurements versus SeaDarQ results, 200 ns



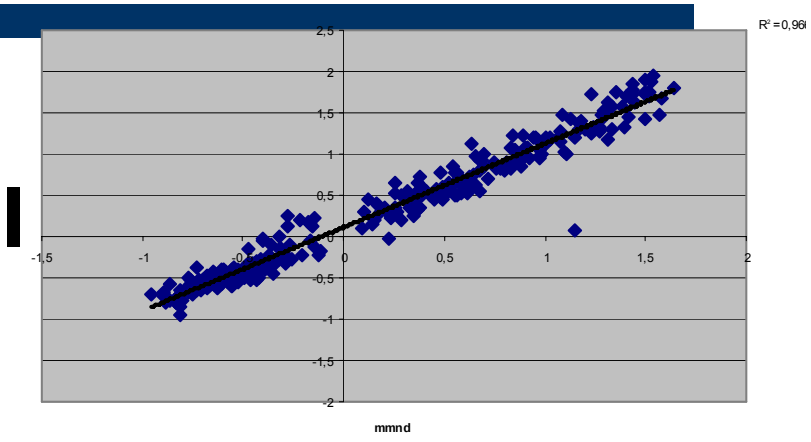
76

Current Pole measurements versus SeaDarQ results, 50 ns



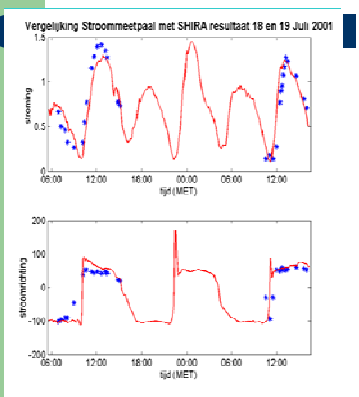
77

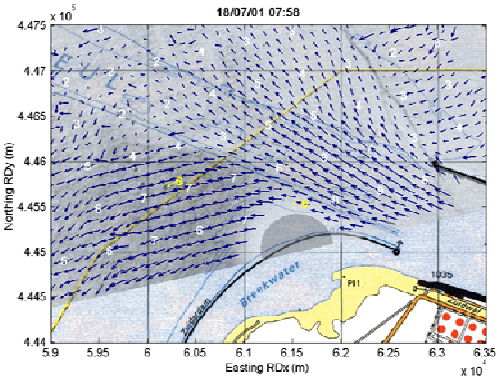
Correlation coefficient better than 0.96



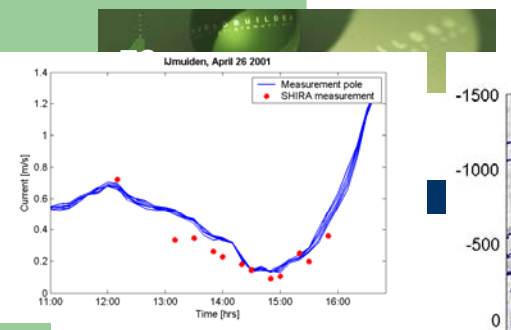
78

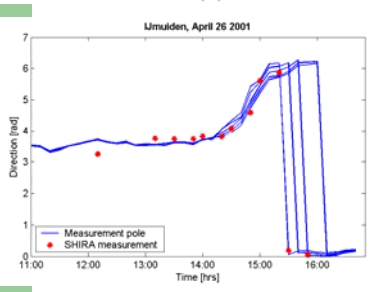
Time lapse Current measurement

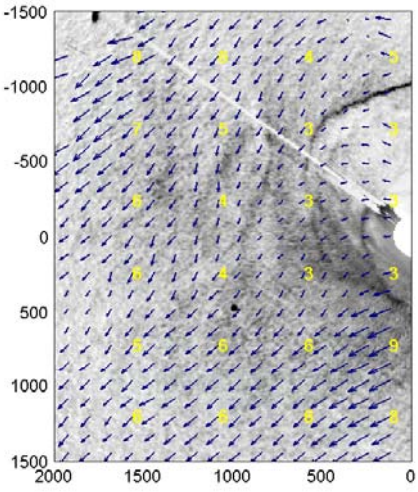




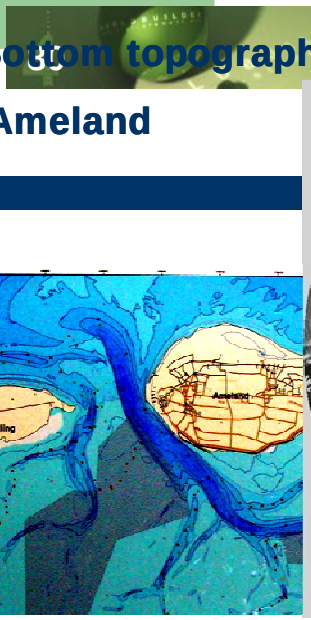
Video





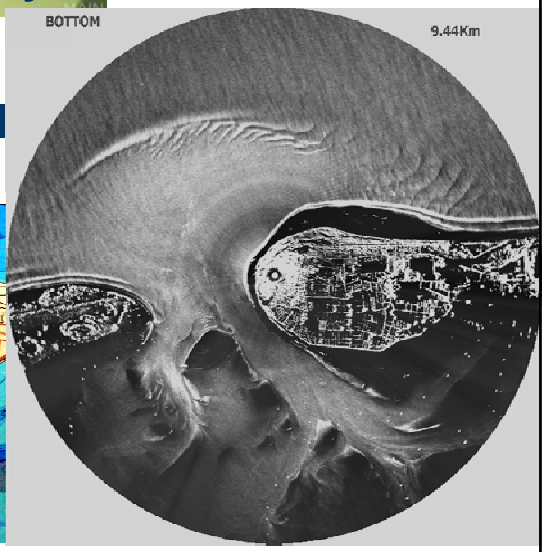


video



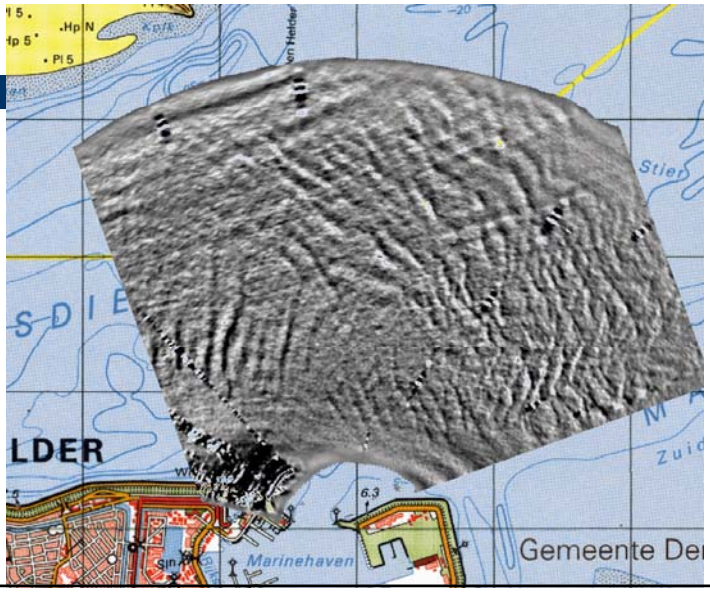
Bottom topography

Ameland



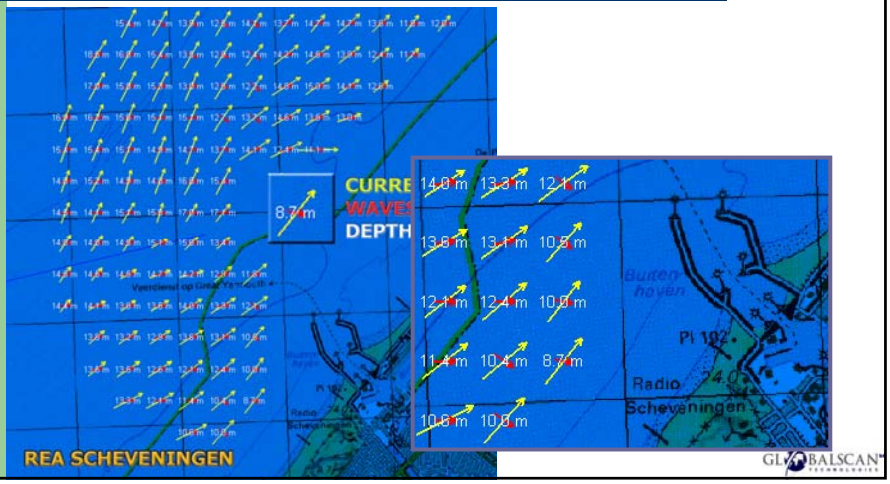
81

Sea Bottom Topography: Marsdiep

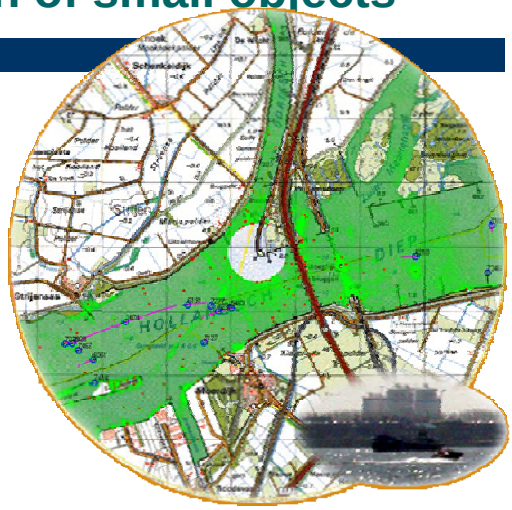


82

Prediction of drift

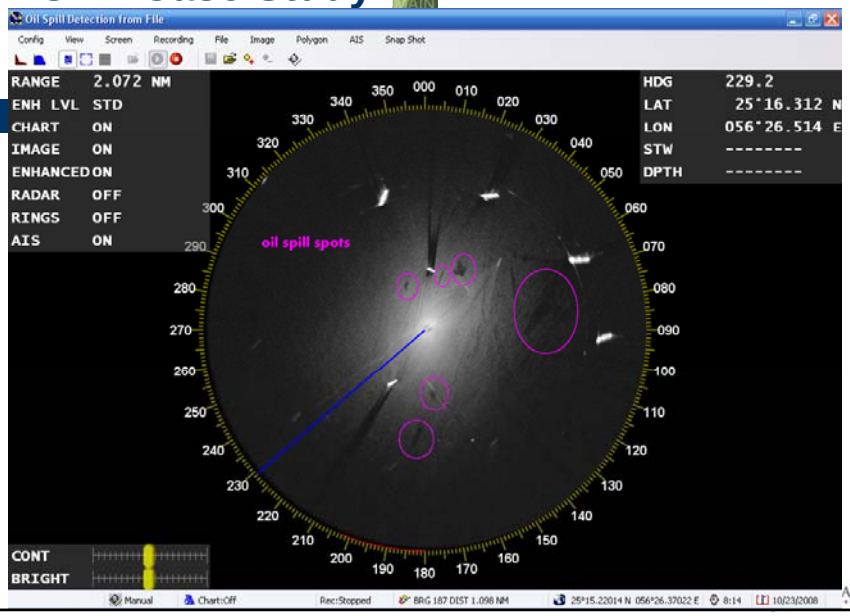


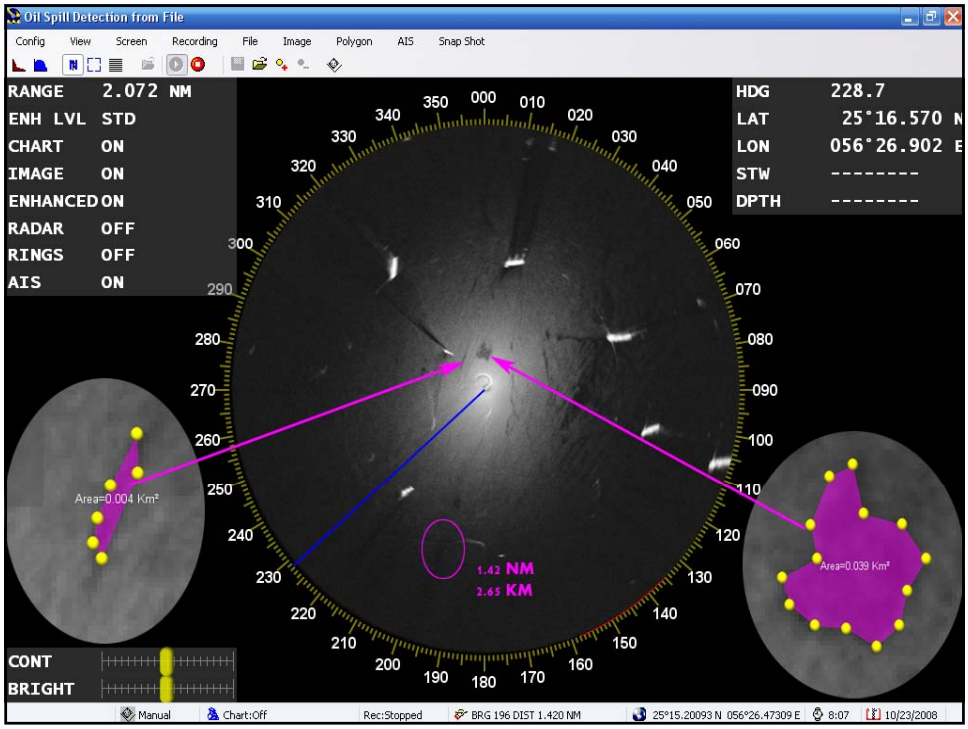
Detection of small objects

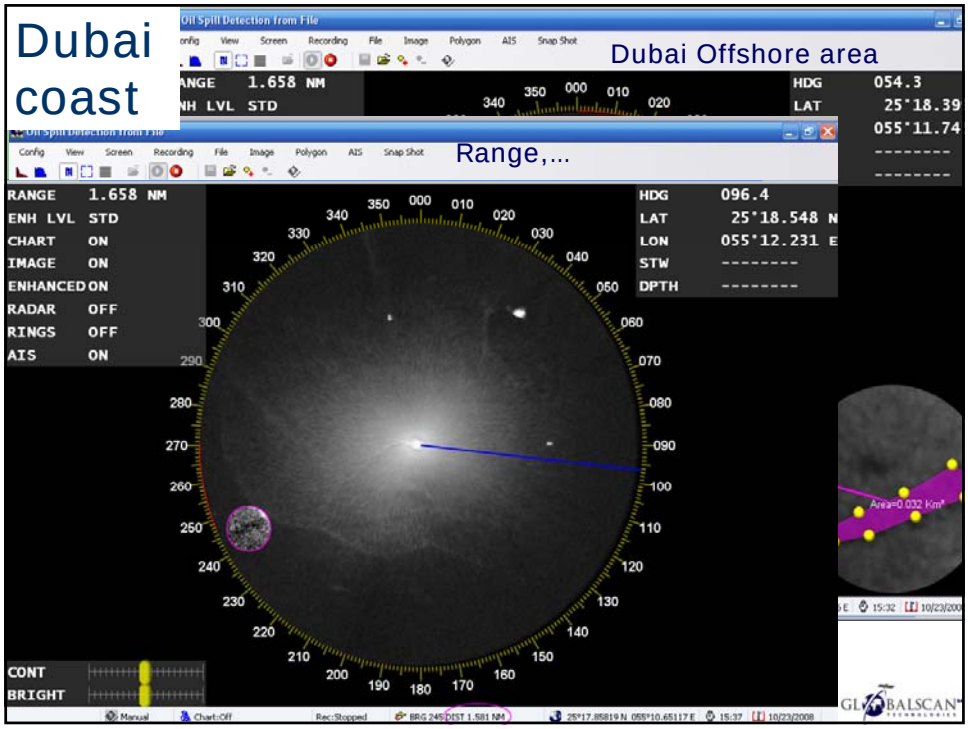


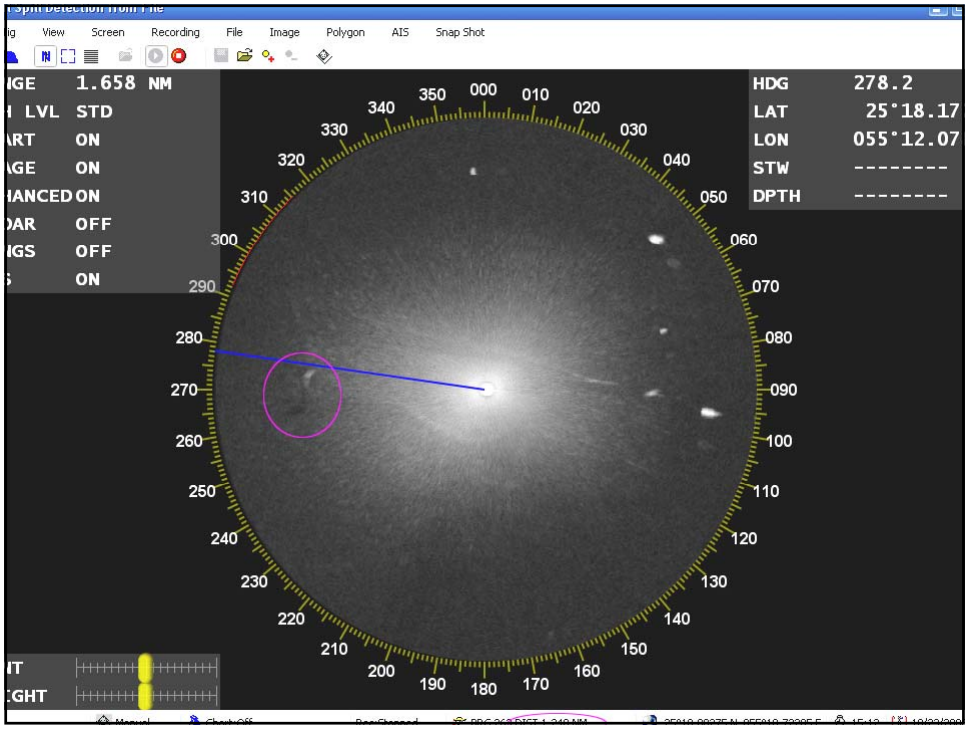
SHIPS /STATIONARY/MOBILE

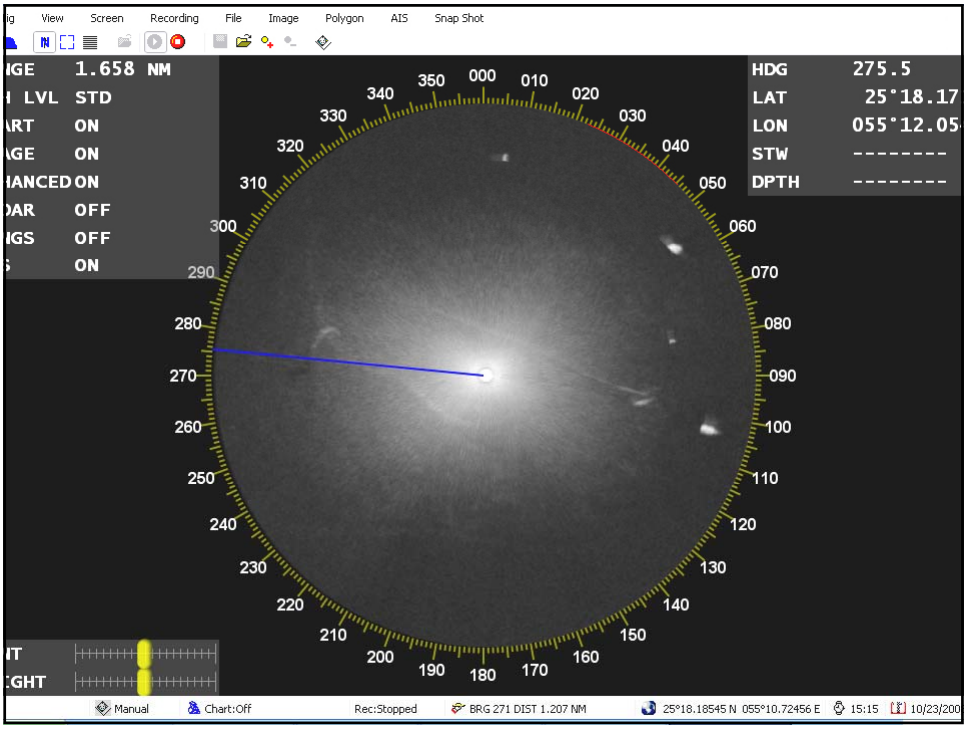
UAE Case Study

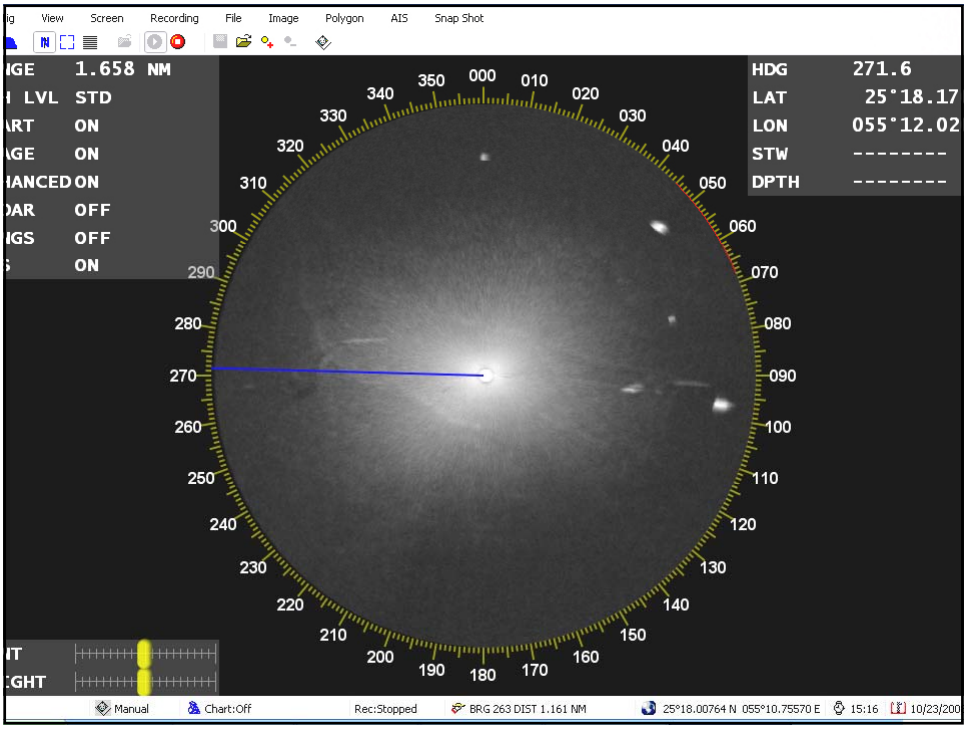





Dubai coast
Dubai Offshore area
Range,...
RANGE 1.658 NM
ENH LVL STD
CHART ON
IMAGE ON
ENHANCED ON
RADAR OFF
RINGS OFF
AIS ON
HDG 096.4
LAT 25°18.548 N
LON 055°12.231 E
STW --------
DPTH --------
CONT
BRIGHT


HDG 278.2
LAT 25°18.17
LON 055°12.07
STW --------
DPTH --------


View Screen Recording File Image Polygon AIS Snap Shot
1.658 NM
STD
ON
ON
ON
OFF
OFF
ON
HDG 275.5
LAT 25°18.17
LON 055°12.05
STW --------
DPTH --------
Manual
Chart:Off
Rec:Stopped
BRG 271 DIST 1.207 NM
25°18.18545 N 055°10.72456 E
15:15
10/23/200


View Screen Recording File Image Polygon AIS Snap Shot
1.658 NM
STD
ON
ON
ON
OFF
OFF
ON
HDG 271.6
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LON 055°12.02
STW --------
DPTH --------
Manual
Chart:Off
Rec:Stopped
BRG 263 DIST 1.161 NM
25°18.00764 N 055°10.75570 E
15:16
10/23/200

91

Near Real Time Oil spill Monitoring

The Challenge

- Rapid report of above-mentioned oil spills through alerting
- A usable and effective decision support and incident management response solution

Our Solution

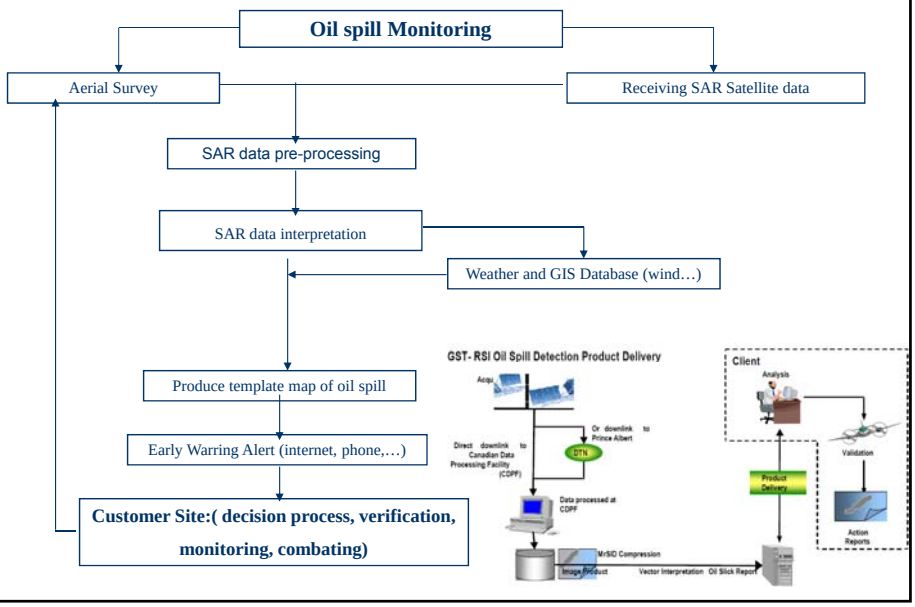
- SeaView, a fully managed web based service using space-based Synthetic Aperture Radar (SAR) from multiple satellites.

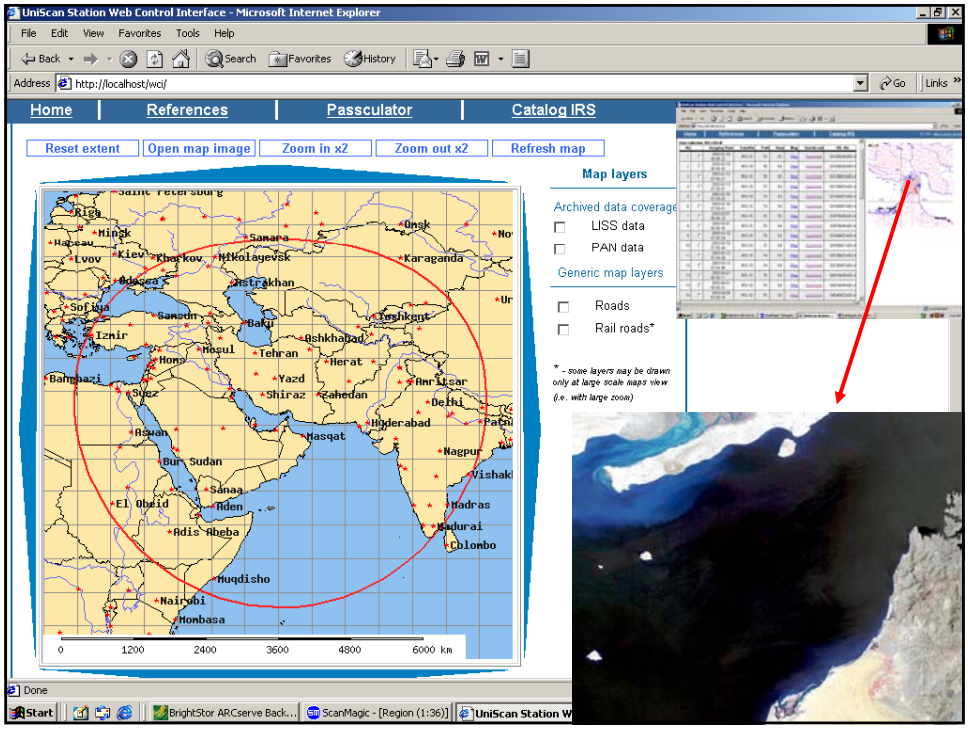
The SeaView solution offers:

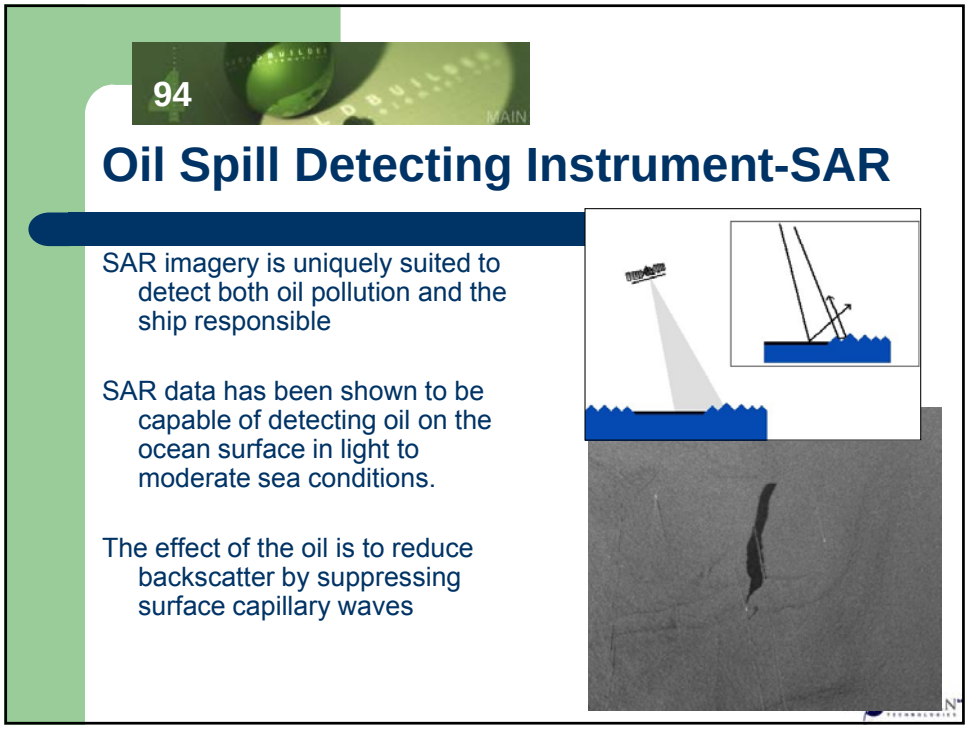
- broad-area based coverage – a key advantage of SAR satellite imaging
- high revisit frequency – using multiple satellites
- zero footprint - user not have to purchase any hardware or software
- no maintenance - since GST/MDA will be operating the system 24x7
- intuitive & easy to use – with a user interface built on top of Google Earth technology
- Additional options that further enhance and extend the oil spill detection capabilities

GLOBALSCAN

Near Real Time Oil spill Monitoring procedure




UniScan Station Web Control Interface - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Address http://localhost/wci/
Home
References
Passculator
Catalog IRS
Reset extent
Open map image
Zoom in x2
Zoom out x2
Refresh map
Map layers
Archived data coverage
LISS data
PAN data
Generic map layers
Roads
Rail roads*
* - some layers may be drawn only at large scale maps view (i.e. with large zoom)
Riga
Minsk
Lvov
Kiev
Kharkov
Nikolayevsk
Samara
Orsk
Karaganda
Astrakhan
Sofiya
Izmir
Mosul
Tehran
Baku
Ashkhabad
Tashkent
Herat
Yazd
Shiraz
Zahedan
Amritsar
Delhi
Hyderabad
Masqat
Nagpur
Aswan
Bur Sudan
Sanaa
Aden
El Obeid
Adis Abeba
Madras
Madurai
Colombo
Huqdisho
Nairobi
Mombasa
0 1200 2400 3600 4800 6000 km
Done
Start


94
MAIN
Oil Spill Detecting Instrument-SAR
SAR imagery is uniquely suited to detect both oil pollution and the ship responsible
SAR data has been shown to be capable of detecting oil on the ocean surface in light to moderate sea conditions.
The effect of the oil is to reduce backscatter by suppressing surface capillary waves

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Detecting Instrument Housing



	RADARSAT-1	RADARSAT-2	Envisat ASAR
Launch Date	1995	2007	2002
Nominal Design Life	5 years	7 years	5 years
Orbital Revisit	24 days	24 days	35 days
Spacecraft Location	S/C ranging	GPS on-board	Radio-positioning
Imaging Frequency	C-Band, 5.3 GHz	C-Band, 5.405 GHz	C-Band, 5.333 GHz
Spatial Resolution	10 to 100 metres	1 to 100 metres	30 to 150 metres
Polarization	HH	HH, HV, VV and VH	HH, VV and HV
Look Direction	Right-looking	Routine left-and right-looking	Right-looking

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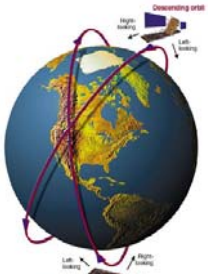
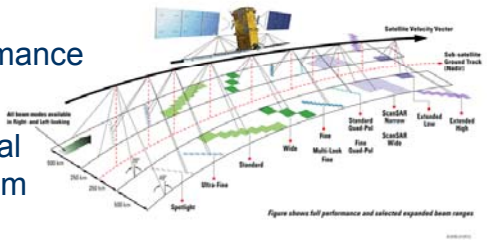
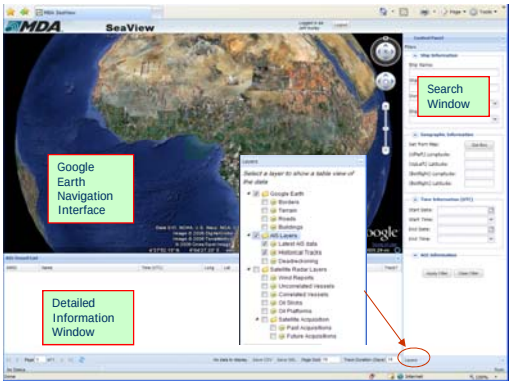
RADARSAT-2 Features & Benefits

- Powerful range of modes and capabilities
- Huge imaging capacity
- Fast tasking timelines
- Proven C-band performance
- RADARSAT operational experience and program continuity

SeaView

- SeaView service is a fully managed web-based service and allows the user to have access to SAR derived oil spill information with no hardware or software installation.
- It is intuitive and uses familiar functionality based on Google Earth's Plugin technology .



- Users can view different layers of information including Oil Spills, SAR Ship Detects and Wind Maps (and optionally space-based AIS).
- They can filter information based on time, on geographic region and on vessel characteristics (if AIS is incorporated).
- Because SeaView uses Google Earth Plugin, users can zoom and pan to areas of interest quickly and easily

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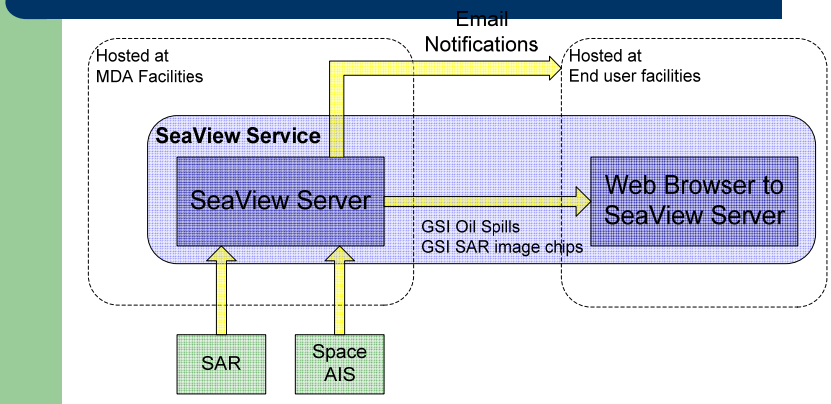
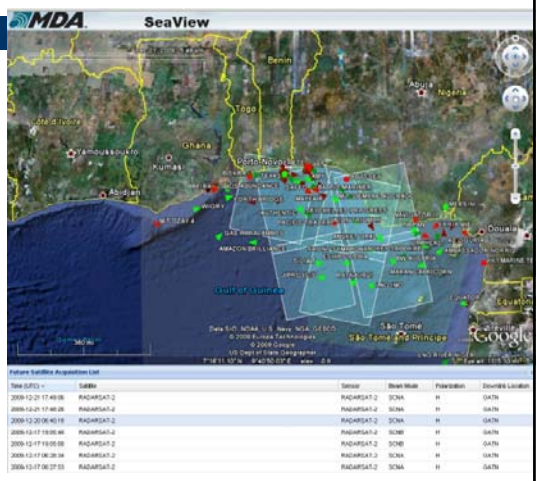
SeaView: Architecture



99

SeaView: Acquisition Planning

The ability to see the future acquisition schedule is key to cueing interdiction assets such as Coast Guard vessels or aircraft to deal with oil spills quickly and effectively. As shown in the following figure, the acquisition information is listed in a table format and overlaid on the map display.

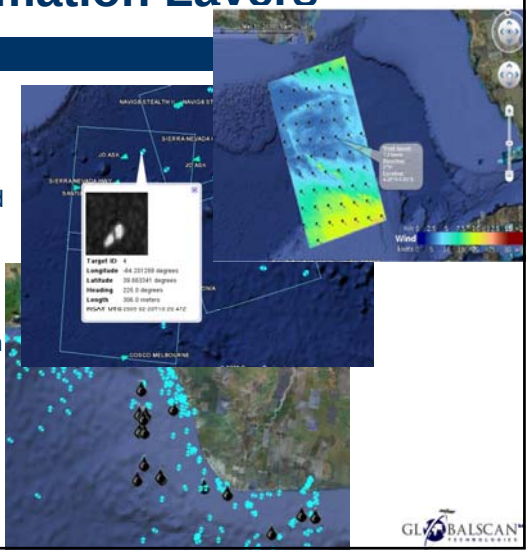


100

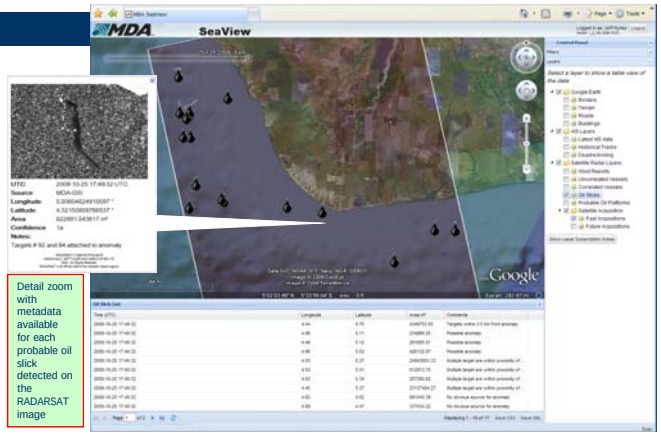
SeaView: Information Layers

Supported Various Information

1. Oil Spill
2. Ship Detects
3. Query past and present oil spills by region and date and to view multiple oil spills within the system.
4. With the AIS option integrated into SeaView, Ship tracks can be viewed in conjunction with ship movement in the region.
5. Wind Maps. Wind vector information derived from the Image displayed as raster
6. Google Earth,..



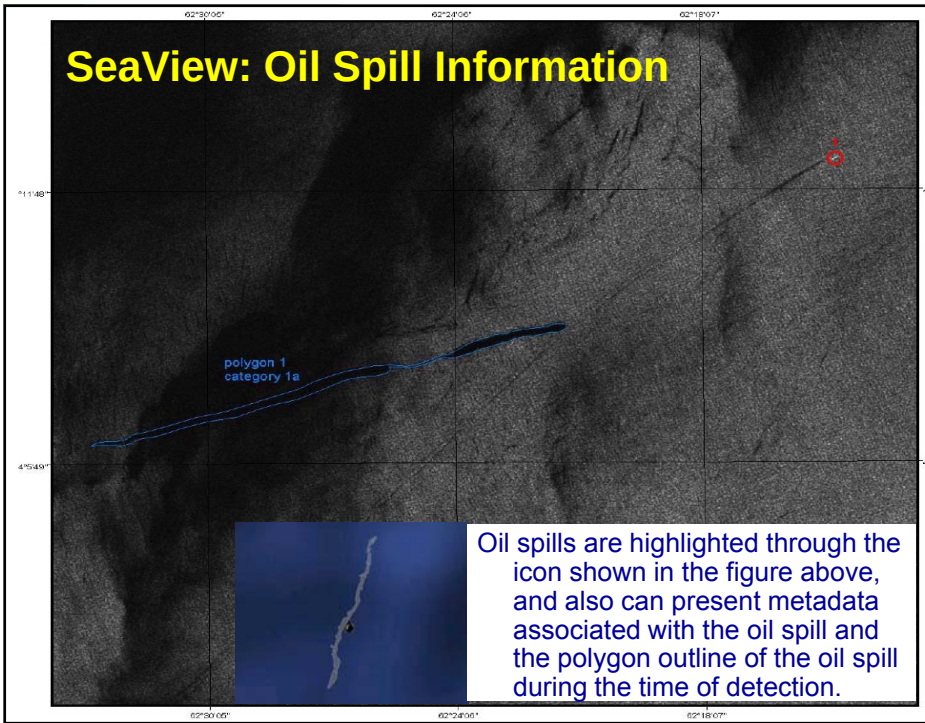
SeaView: Oil Spill Details



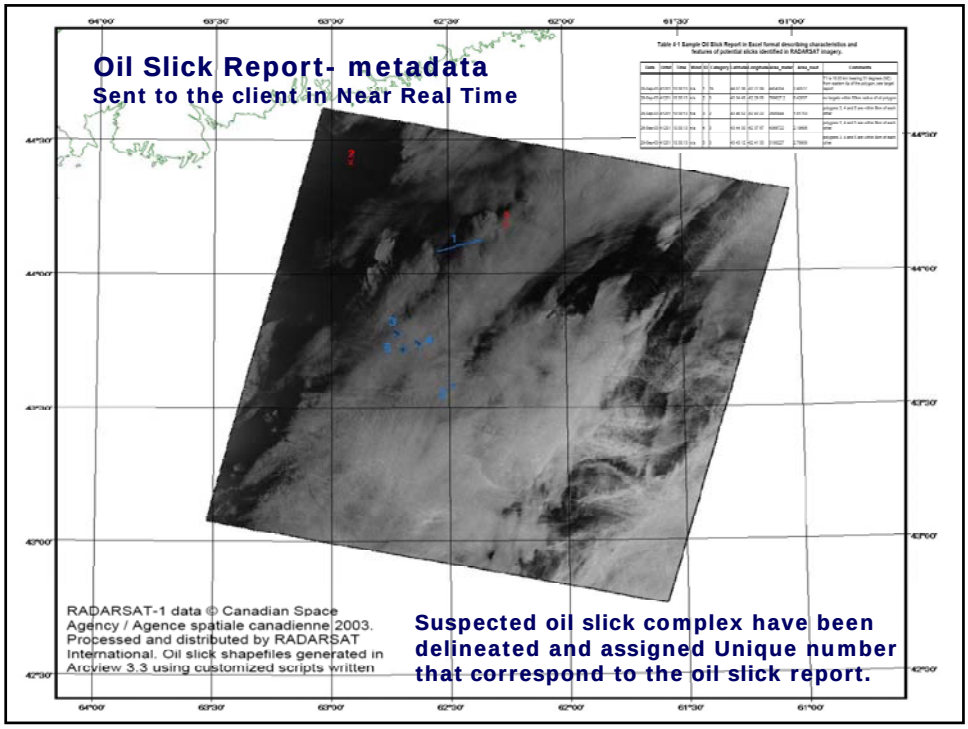
Detail zoom with metadata available for each probable oil slick detected on the RADARSAT image

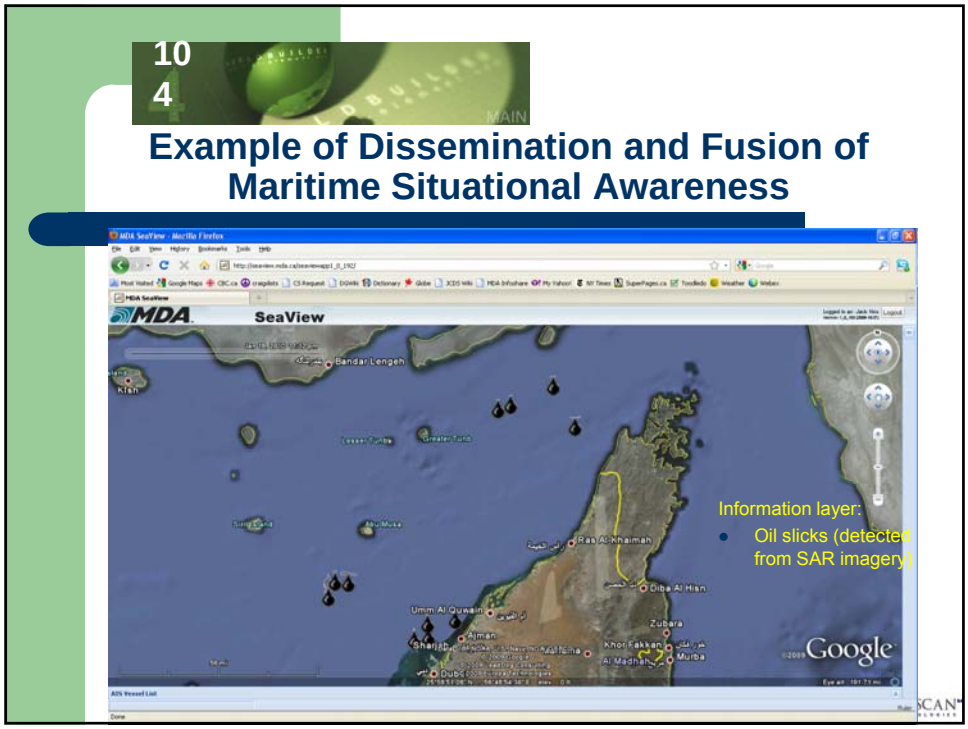
When a user queries for oil spill detects, the oil spills can be displayed visually, and also are presented in a table format:

SeaView: Oil Spill Information



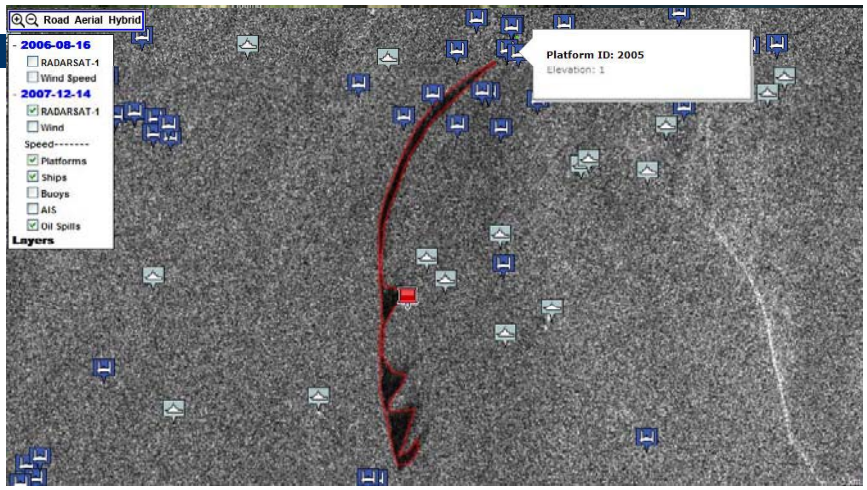
Oil spills are highlighted through the icon shown in the figure above, and also can present metadata associated with the oil spill and the polygon outline of the oil spill during the time of detection.


Oil Slick Report- metadata
Sent to the client in Near Real Time
RADARSAT-1 data © Canadian Space Agency / Agence spatiale canadienne 2003. Processed and distributed by RADARSAT International. Oil slick shapefiles generated in Arcview 3.3 using customized scripts written
Suspected oil slick complex have been delineated and assigned Unique number that correspond to the oil slick report.


10
4
MAIN
Example of Dissemination and Fusion of Maritime Situational Awareness
MDA SeaView
Information layer:
Oil slicks (detected from SAR imagery)
Google

10
5

Example: SAR Derived Data Integration

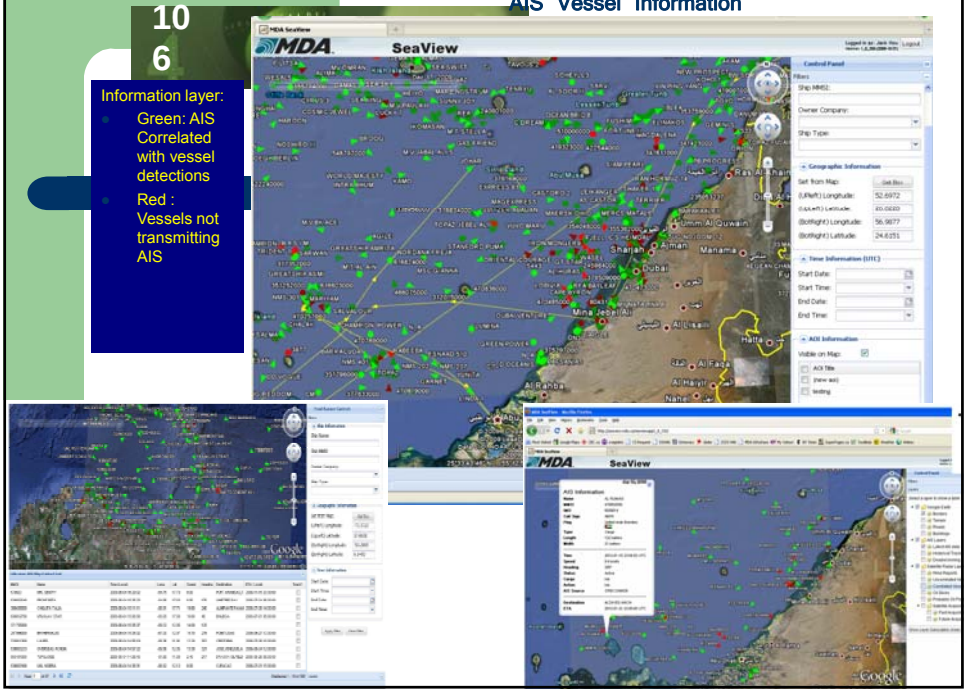


10
6

AIS Vessel Information

Information layer:

- Green: AIS Correlated with vessel detections
- Red : Vessels not transmitting AIS

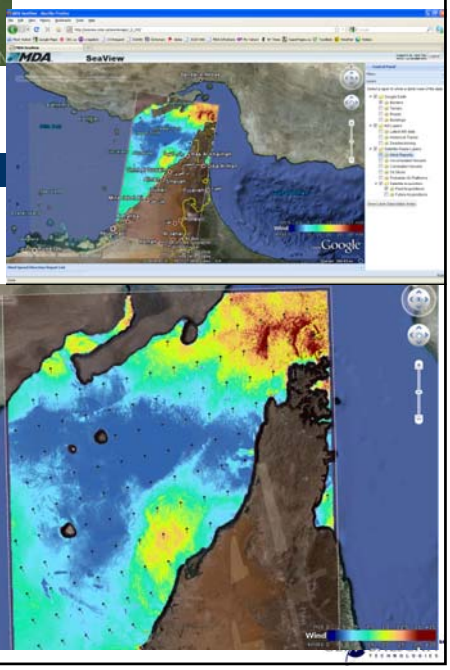


10
7

Wind information

over the ocean surface can be estimated directly from the same SAR image utilized for oil and ship detection.

- This rapidly derived information can be used as a key input for weather modeling/forecasting and oil spill trajectory modeling.



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Example: Oil Slick, Gulf of Mexico

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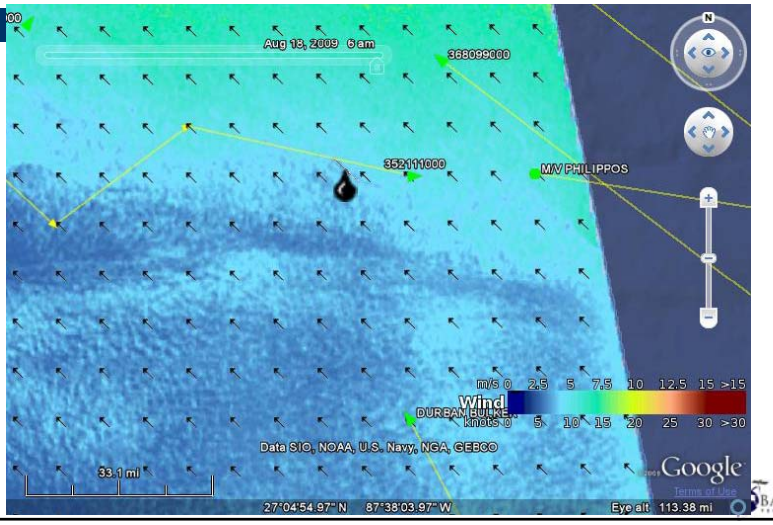

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Sample Concept Operational scenario CONOPS

- Acquisition and Detection
- Viewing and Notification
- Incident Response
- Tracing Responsibility (AIS Option)
- Spill Trajectory Predictions

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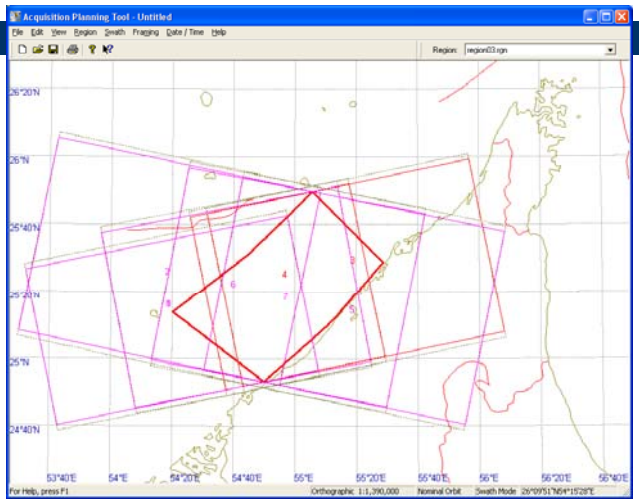
Acquisition and Detection

1. Users examine the upcoming acquisition schedule and surveillance area through SeaView.
   - The key to effectively use SAR satellites is to understand when and where data acquisitions will occur.
2. User communicates with the organizations (eg. Coast Guard) with interdiction assets and prepares them to respond if a critical oil spill is detected
3. SAR satellite passes over the region and acquires data
4. GST/MDA receives the SAR data, processes it and then performs oil detection. The results are quality checked to confirm the detection is accurate

Example of SAR Acquisition Planning



Acquisition are planned to provide the best possible coverage of the area using the available satellites

SAR Acquisition and Processing

Enhanced Service Operations using GST station

Two criteria for a satellite based oil Spill monitoring program:

The frequency of imaging

The latency (time of information delivery)

- Sensors: RADARSAT-1 & RADARSAT-2 data
- Frequency: Minimum time between imaging opportunities: about 12 hours.
  Average time between imaging opportunities: less than 1.5 days
- latency : Minimum Latency: less than 2 hours.
  Average Latency: 2 hours
- SeaView allows for easy integration of additional data sources

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Viewing and Notification

2. An oil report is generated and emailed to the appropriate end users as an alert. An XML version of the oil report is also generated and made available on MDA's FTP server.

3. The Oil Report indicates certain spills have a high degree of hazard identification. The user visits SeaView and graphically locates the relevant oil spill polygons. He determines that one of the oil spills may indeed require intervention.

4. He starts the a modeling application and ingests the oil detection report XML file generated by SeaView. He uses the model to determine where the oil spill is now and where potentially it will go

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Reporting

SeaView will deliver a reporting solution that summarizes the oil spill events:

- Time of detection
- Spill coordinates
- Area of the spill at time of detection
- Hazard identification
- Expected level of uncertainty in the detection

Two oil spill detection reports are generated:

- a text report meant for users and
- an XML report.

Reporting

Samples of each report are as follows:

Spill ID: 240
UTC Date: 2009-12-16 00:00:00+00
Source: MDA RADARSAT2
Area (m^2): 30000.7
Confidence: 99%
Notes: No distinct direction. Does not appear associated with targets in the vicinity
Hazard Category: MODERATE
Spill Centroid (Lat/Long): 54.6316560352117, 25.5033159358982
Spill Centroid (DLTM): 429455.780909534, 2821995.81674016

Figure 2-12 Sample ASCII Formatted Report Suitable for Email

Reporting

Figure 2-13 Sample XML Formatted Report

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Incident Response

with the relevant intervention agency (eg. Coast Guard) and informs them where to find the oil spill.

2. The agency dispatches the relevant intervention assets (eg. a vessel) to examine the spill and decide on next steps.

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Tracing Responsibility (AIS)

The user visits SeaView and turns on the AIS layer and Oil spill layers. He looks at the historical tracks associated with various vessels, and adjusts the timeline as needed to analyze ship traffic patterns, trying to potentially trace responsibility to a specific vessel.

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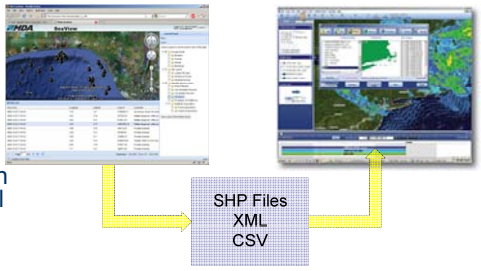
Spill Trajectory Predictions

- The GST solution supports integration of any spill trajectory prediction solution (model).
- SeaView can support export of SHP (shape), KML or CSV data which can be ingested by models. In this way, a user can import the parameters of the oil spill detection into the model.
- The Model would take this information, and combine it with known meteorological data to predict how/where the oil spill will migrate.



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THANK YOU

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