



OIL POLLUTION MONITORING and SHIP DETECTION

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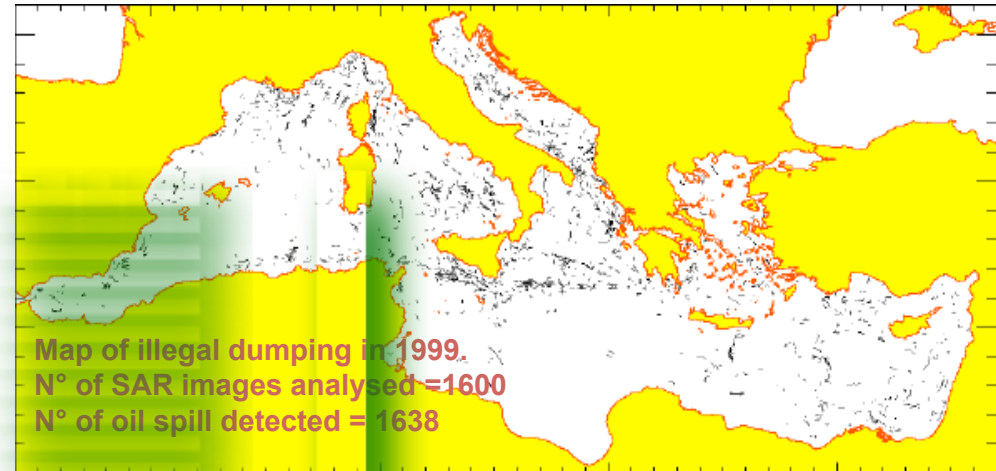
Sea Oil Pollution



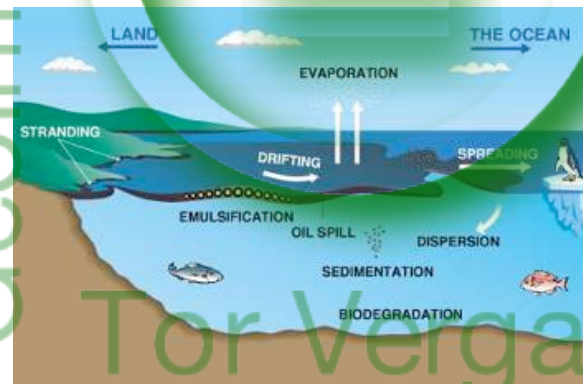
Project based on

- Oil Spill Detection
- Monitoring Oil Spill Evolution
- Ship Detection

using ERS, ENVISAT data



(JRC / Institute for the Protection and Security of the Citizen)



The presence of oil slicks have dramatic effects on the marine ecosystem and can severely damage many activities related to sea

Sea Oil Pollution

Oil spills over the sea surface dramatically pollute the marine environment when large oil tanker accidents occur

But the total oil pollution worldwide is also contributed (more than 45%) to illegal dumping of oil from ships that clean their tanks!

Hence:

Oil Spill Detection
Monitoring Oil Spill Evolution

Ship Detection



Geoinformation
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- ✓ Radar cross section of sea is mainly contributed by short gravity and gravity-capillary waves (1÷100 cm), according to Bragg scattering theory.
- ✓ An oil film on the sea surface damps these kinds of waves reducing the measured backscattering (Marangoni theory).

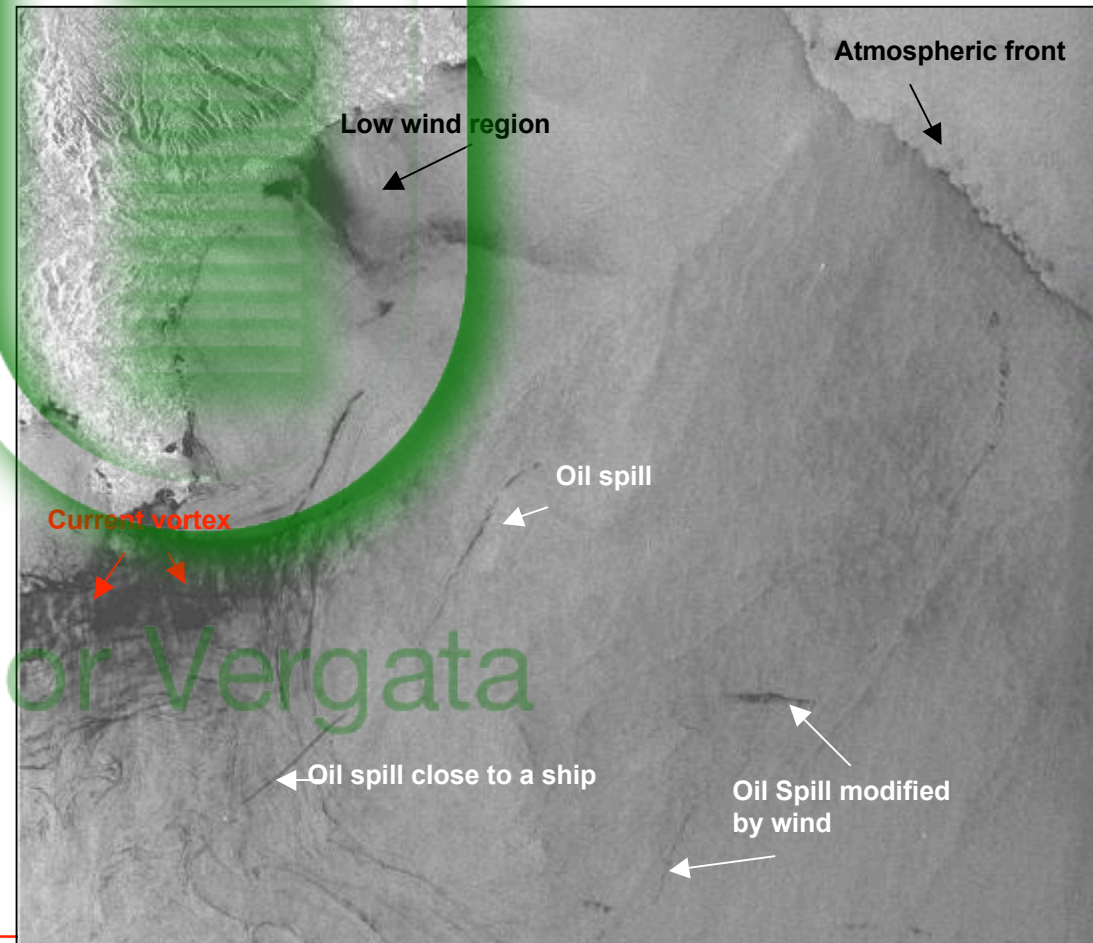
However, careful image analysis is required because low backscattering areas might also be caused by natural phenomena:

- natural slicks
- particular atmospheric conditions
- particular water circulation patterns

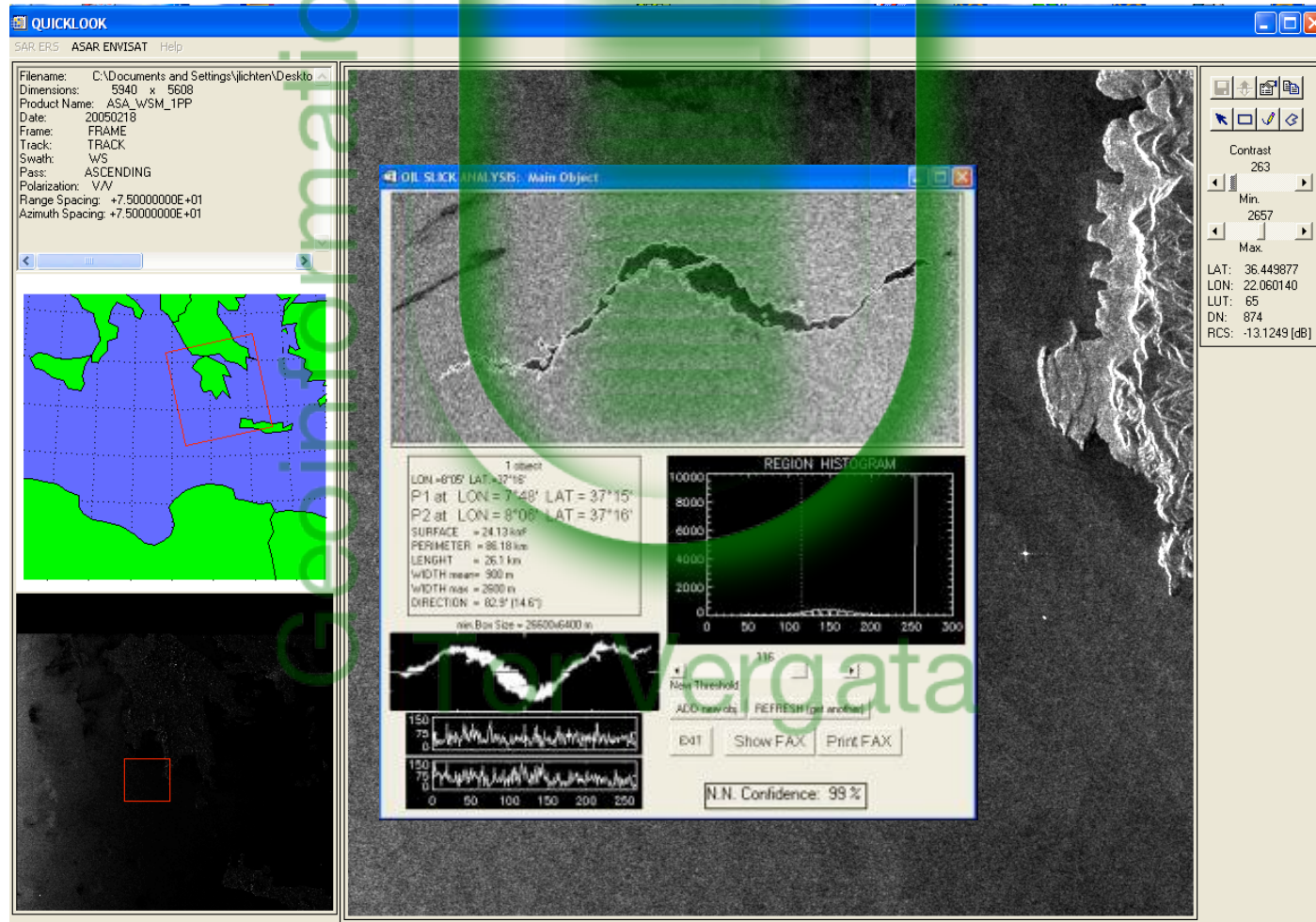
These phenomena are called:

"look-alikes"

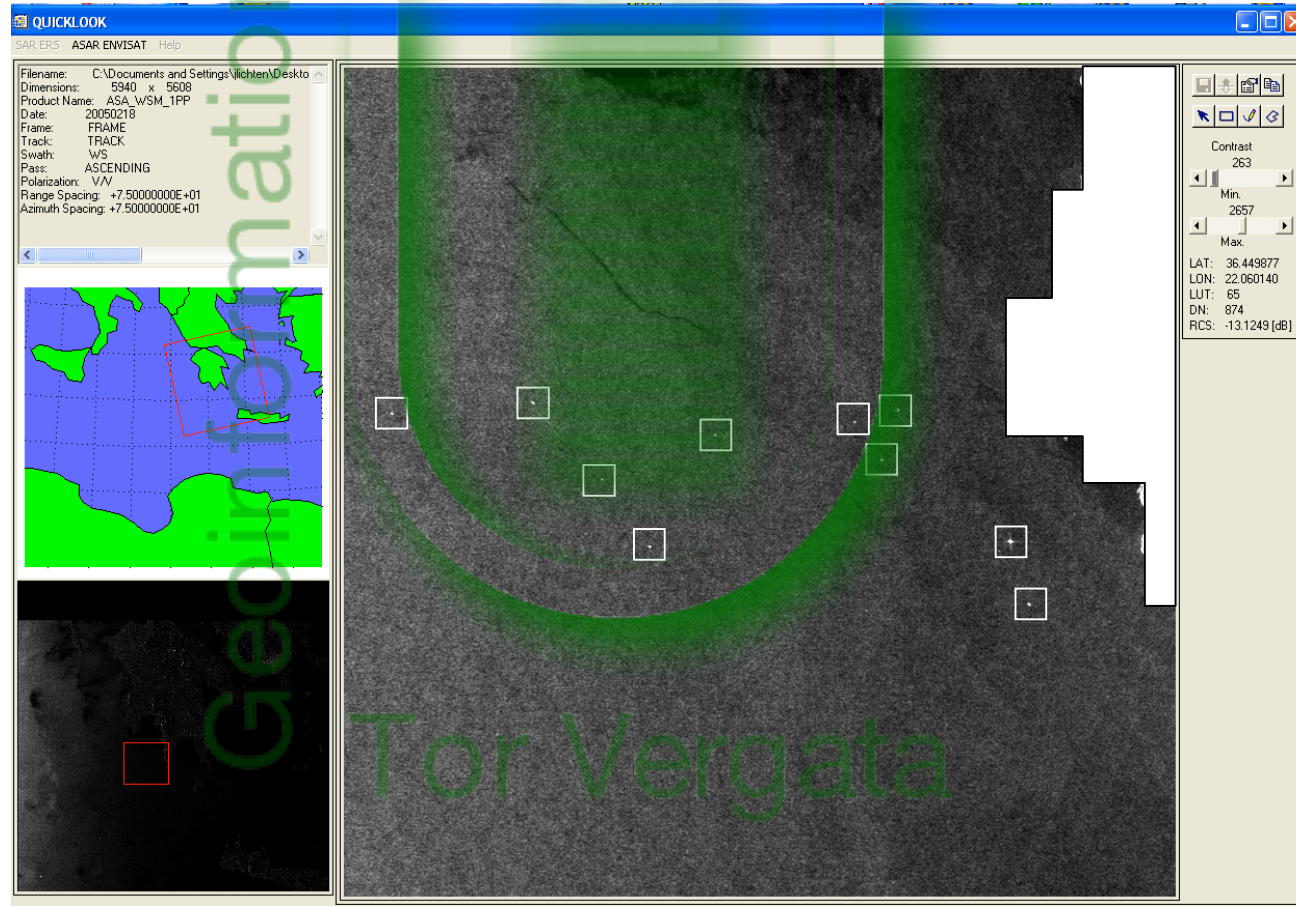
Neural Networks are a valid tool for Oil Spill Detection



The Tor Vergata Earth Observation Laboratory has developed POSEIDON (*P*ollution and *O*il Spill *E*valuation, *I*dentification and *D*etecti*ON*), a semi-automatic SAR Processor for large-scale sea surface monitoring and Oil Spill Detection



... and SHARK (*Ship Automatic Ranger and trackER*) an automatic tool for Ship Detection

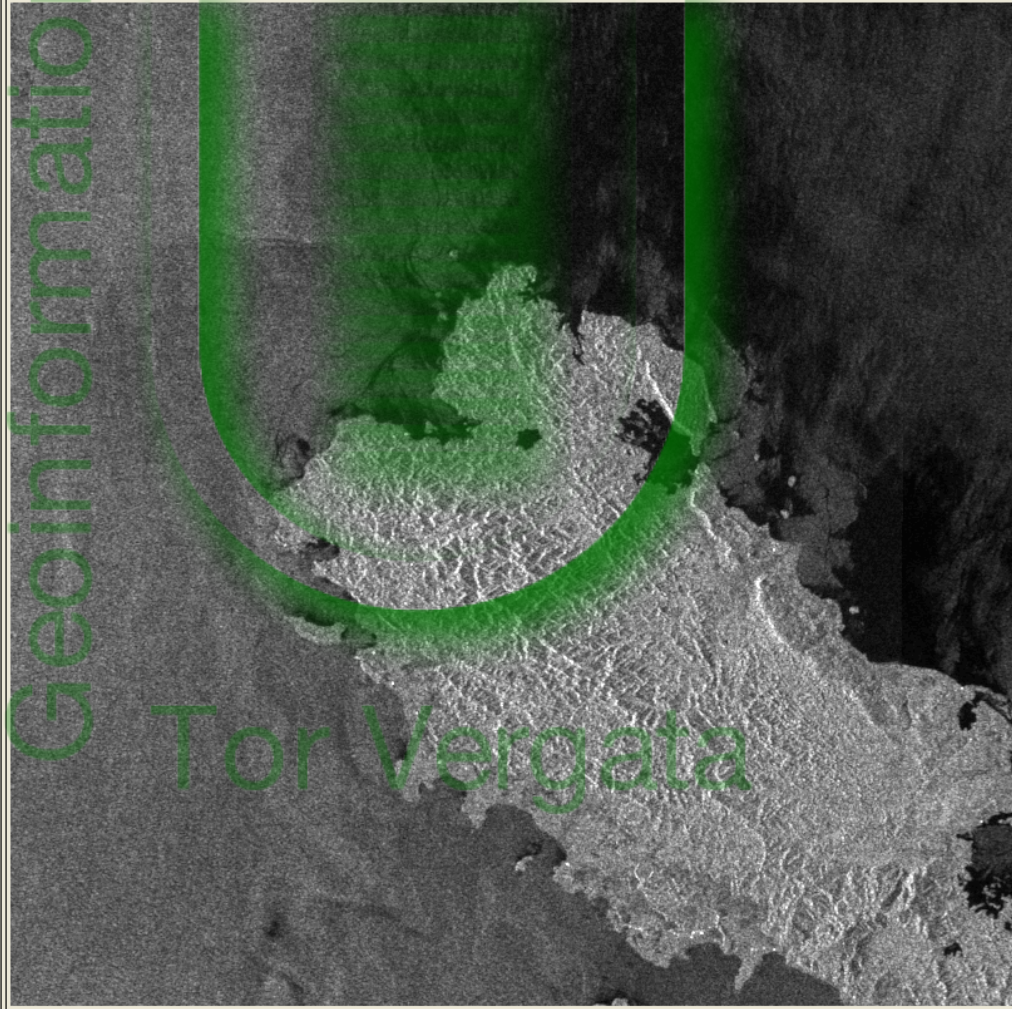


Ship Detection from SAR Images



QUICKLOOK
SAR ERS ASAR ENVISAT Help

Filename: D:\ASA_WSM_1PP\IPA20031104_154552_
Dimensions: 5940 x 5606
Product Name: ASA_WSM_1PP
Date: 20031104
Frame: FRAME
Track: TRACK
Swath: WS
Pass: ASCENDING
Polarization: V/V
Range Spacing: +7.50000000E+01
Azimuth Spacing: +7.50000000E+01



Contrast: 0
Min: 3712
Max:
LAT: 2.9389538
LON: 95.924828
LUT: 23
DN: 348
RCS: -21.1369 [dB]

Geoinformation
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SHIP and WAKE DETECTION

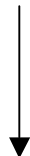


LAND MASKING



AVERAGING BOX

$$\mu_B = \frac{1}{K} \sum_{(i,j) \in B} X(i, j)$$

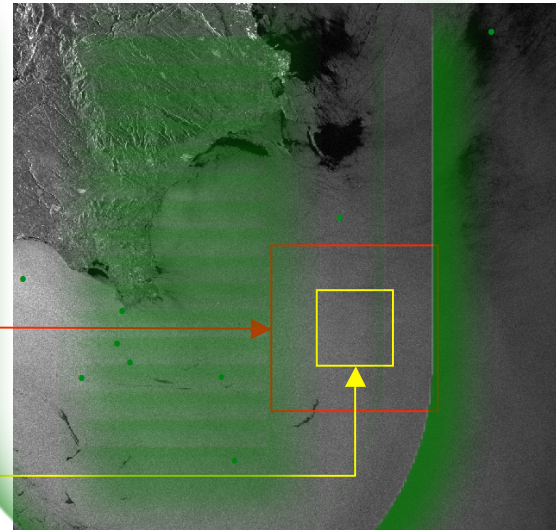


$$T(i, j) = X(i, j) + X(i, j + 1) + X(i + 1, j) + X(i + 1, j + 1) - 4\mu_B$$

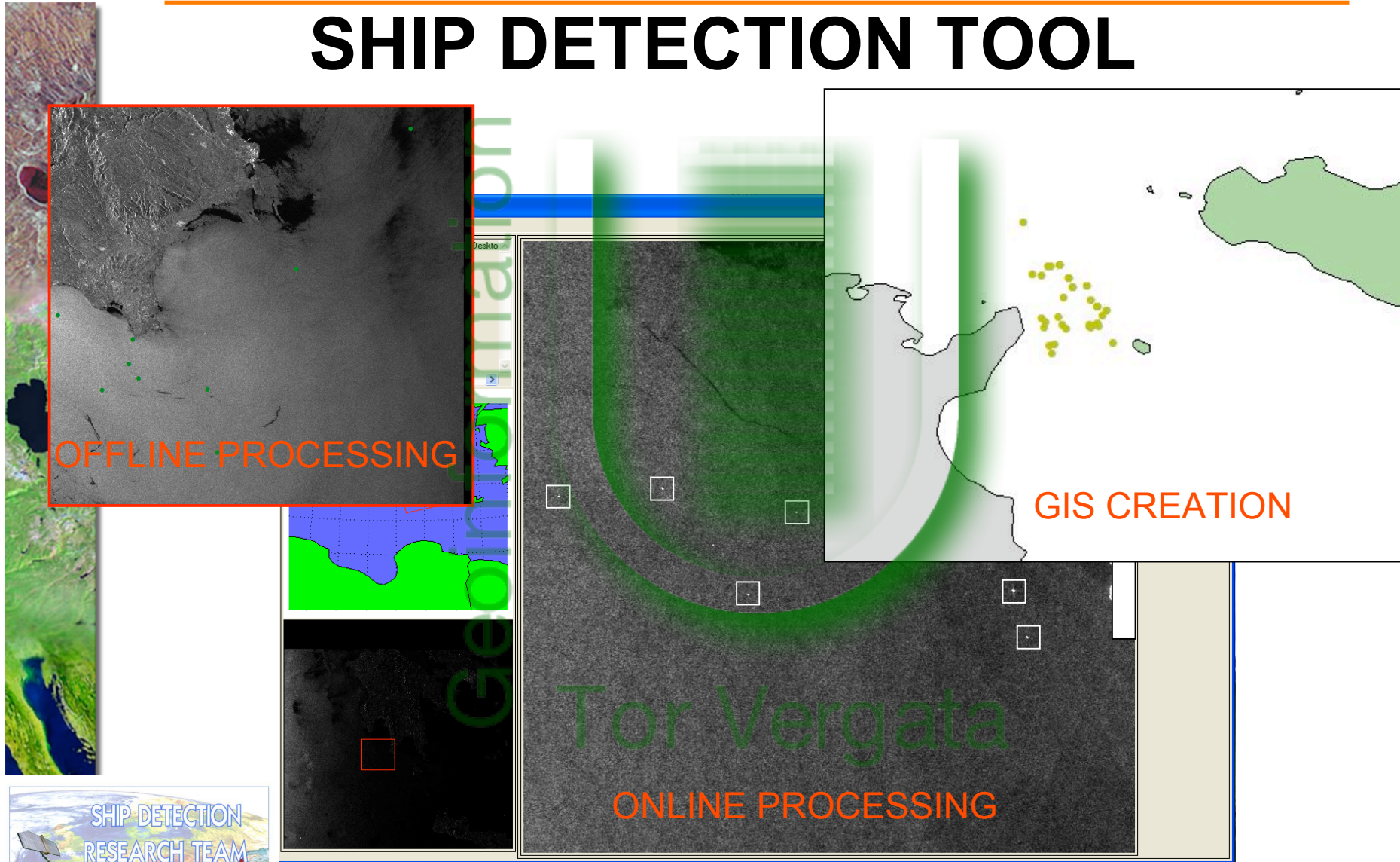
EDGE DETECTION



Detection of ship candidates



SHIP DETECTION TOOL



Ship Detection Tool Built on CAESAR Processor