



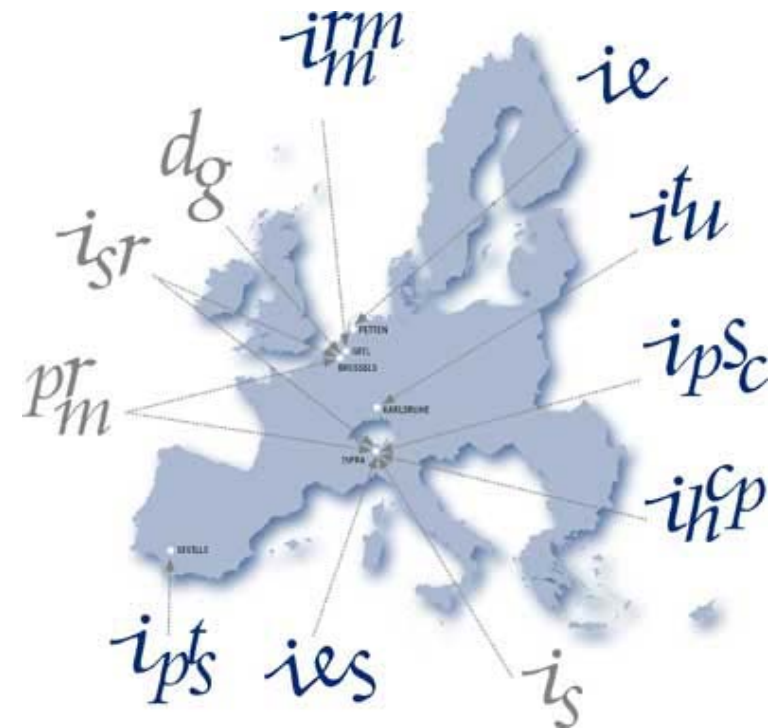
Research in Maritime Surveillance

Harm Greidanus

European Commission – Joint Research Centre

Joint Research Centre (JRC)

- JRC is a Directorate General of the European Commission
- Scientific and technical support for European Union policies (conception, development, implementation and monitoring)
- For European Commission, Agencies, Member States
- Reference centre of science and technology for the EU
- Serves the common interest of the Member States
- Independent of special interests (private or national)
- 7 Institutes, 5 sites



Maritime surveillance R&D at JRC

- Surveillance concepts
 - Satellites
 - Use of UAVs
- Ship detection in satellite images (SAR)
- Data fusion

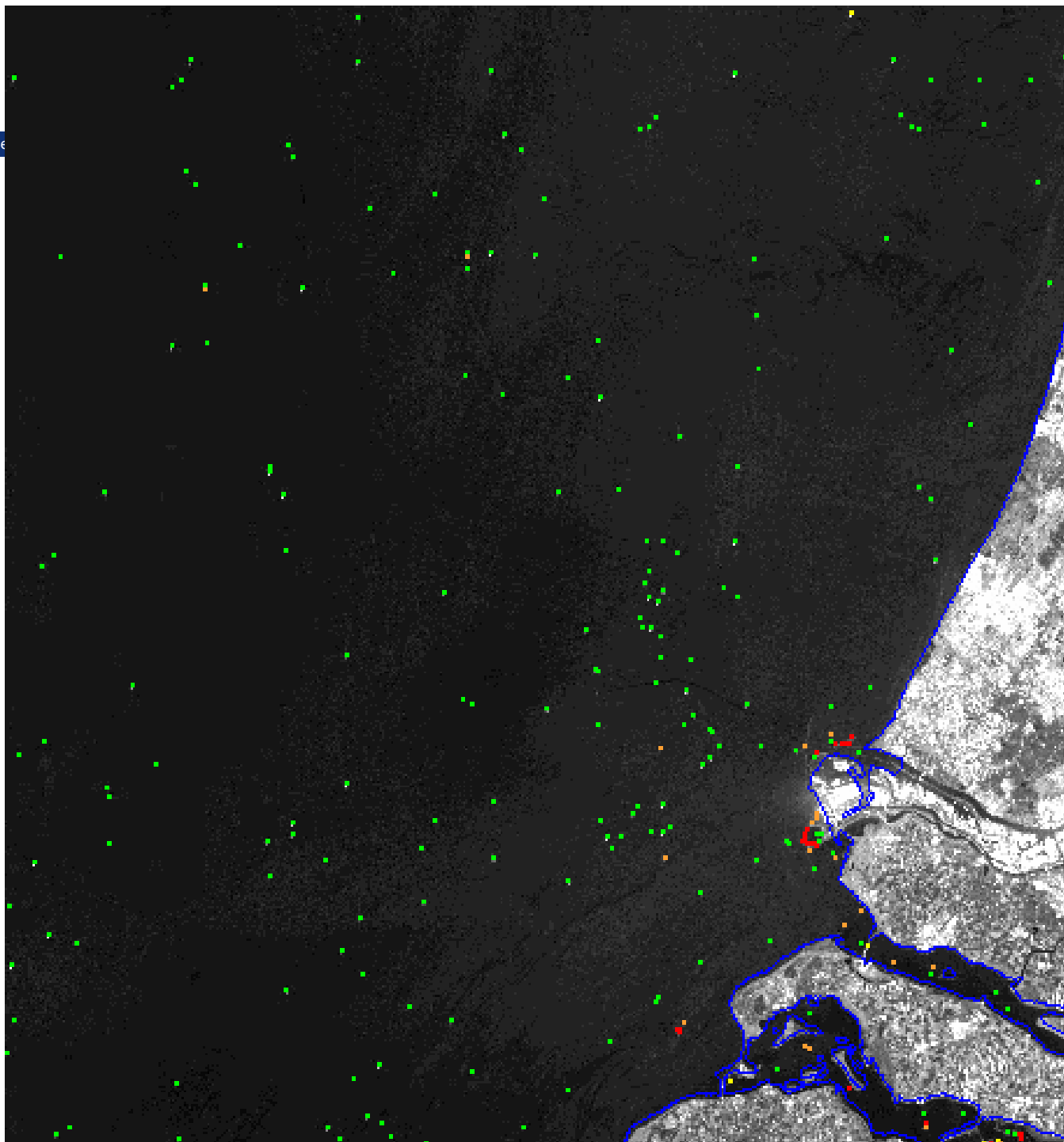
Technical support of EU policies:

- Maritime safety
- Maritime security
- Mar. border security
- Fisheries control
- Integrated maritime policy

Satellite SAR

Synthetic Aperture Radar

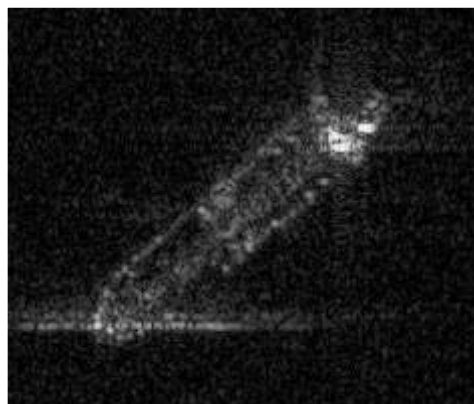
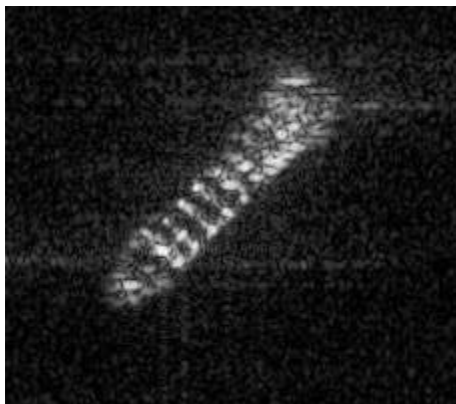
- Wide overview for bigger ships (>30 m)



Sailing boat



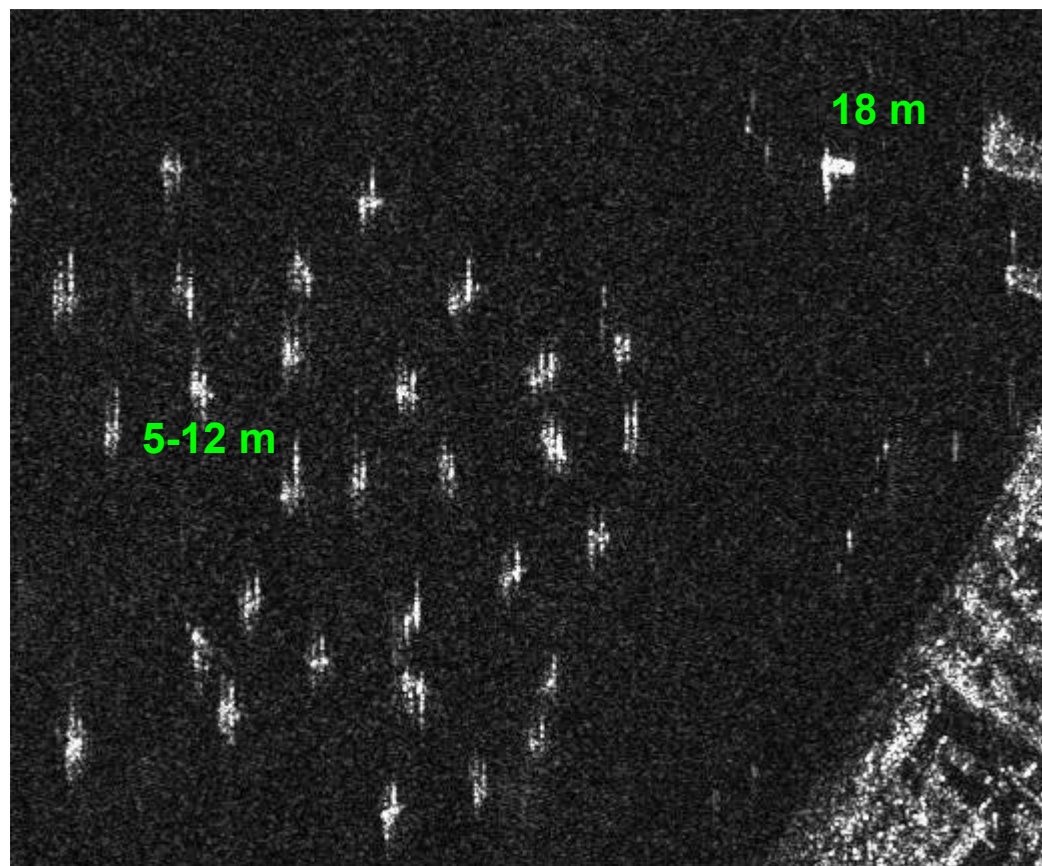
Fishing vessel



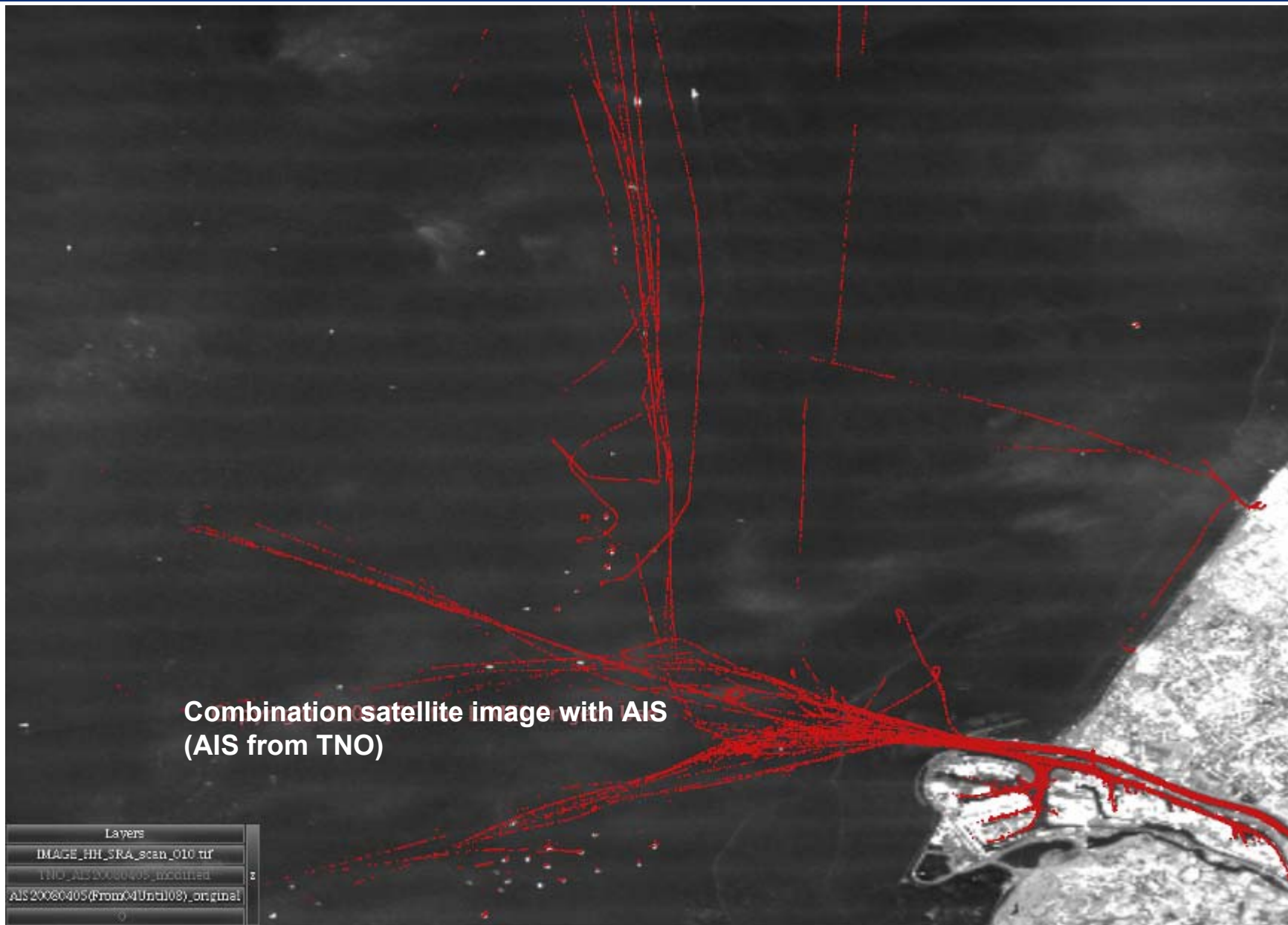
RADARSAT © CSA/MDA 2009



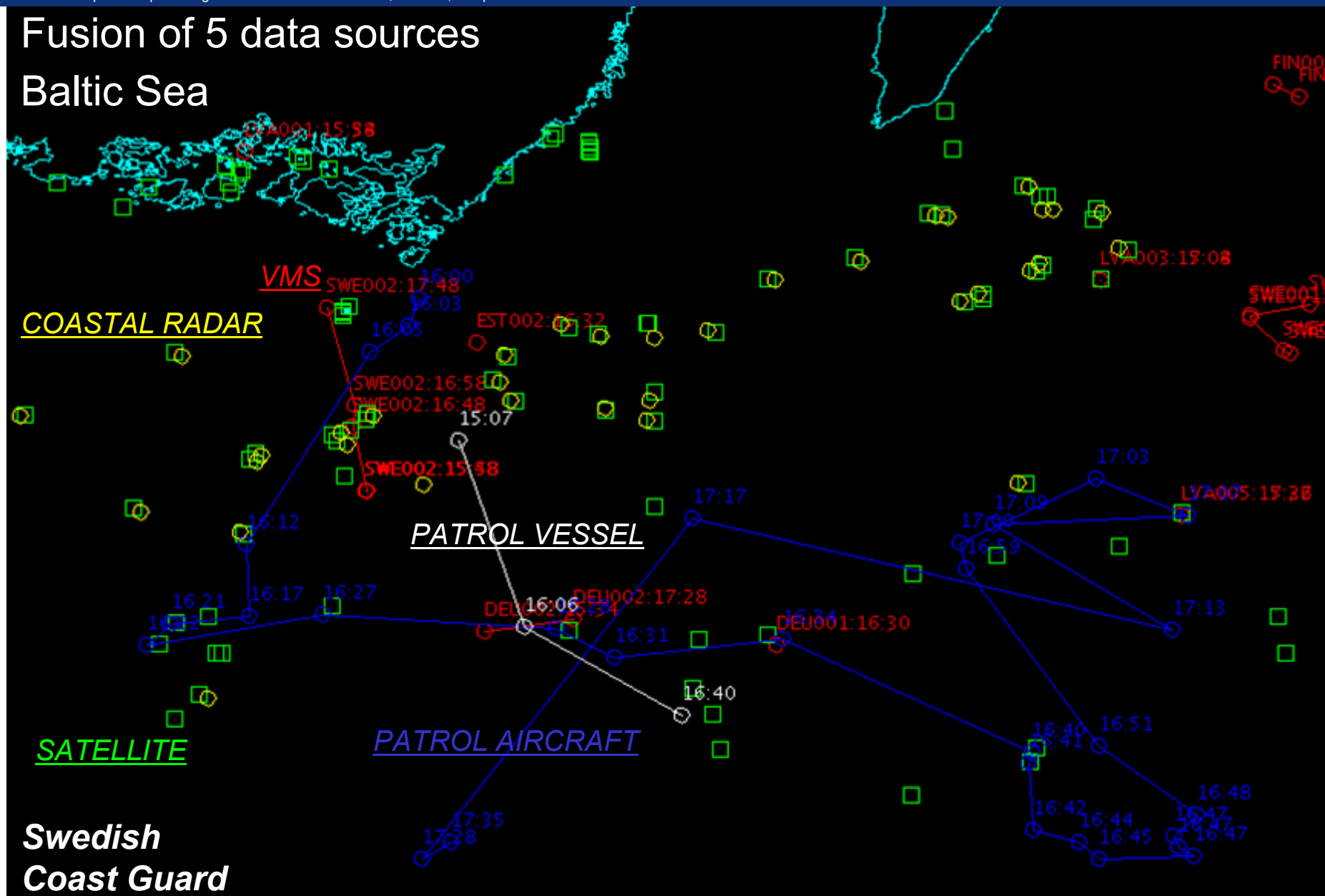
**Radarsat-2
UltraFine HH
Jan 2009**

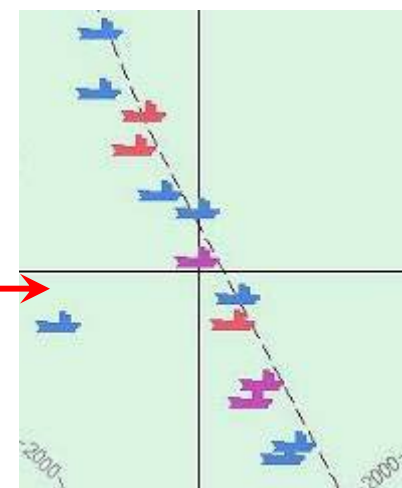
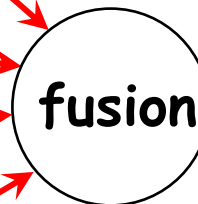
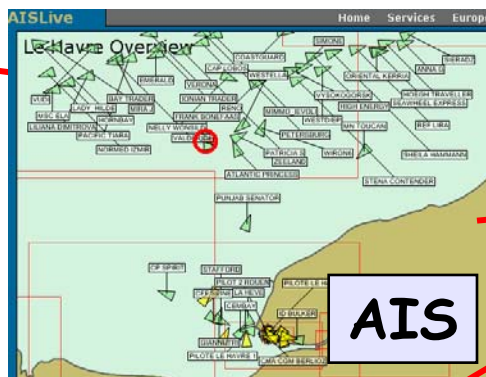
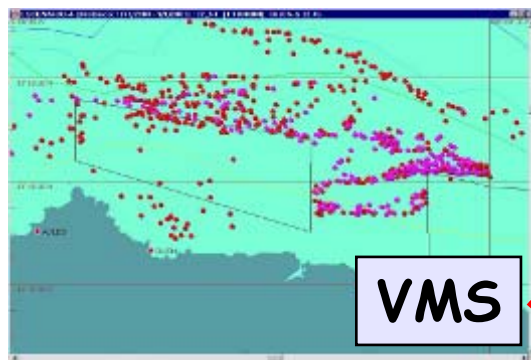
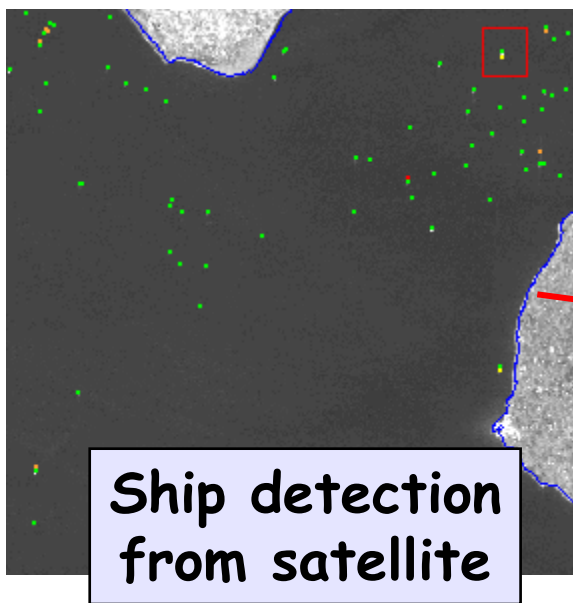


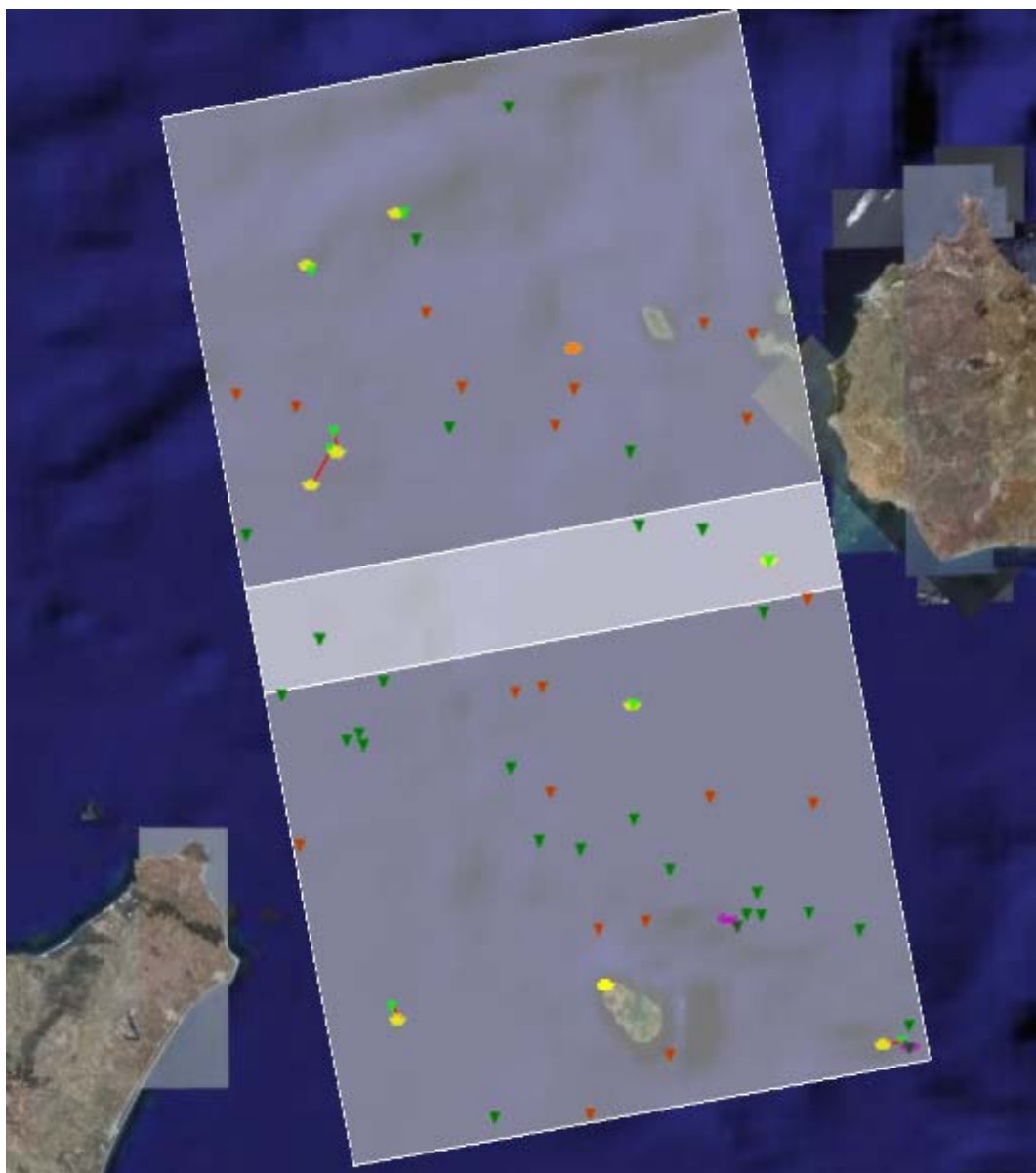
**TerraSAR-X Spotlight 1.5 m resolution
Caribbean, June 2008**



Fusion of 5 data sources Baltic Sea







Two Radarsat Standard images Mediterranean Visualise results in Google Earth

- 57 VDS (satellite targets)
 - Strong signatures
 - Others
- Correlations with VMS & AIS data
- AIS data
 - 2 cargo vessels
 - all correlated
- VMS data
 - 9 Fishing vessels out of port
 - 8 correlated
 - 1 uncorrelated
- 20 additional VDS reported to surveillance means as “suspected targets” possible illegal fishing (to check)





31 May – 31 July 2007
250 ENVISAT + RADARSAT

1 May – 15 July 2008
110 RADARSAT



SUMO Application - Vessel Detection Software from the European Commission Joint Research Centre

System Help Import Tools

ImageView NASA WorldWind View

Overview

MSSIS
S 07° 04' 20", E 39° 42' 53"

Zoom HH

Zoom HV

12 Aug 2009, 02:53 UT

Info
Tue Aug 11 20:24:41 CEST 2009

Navigation

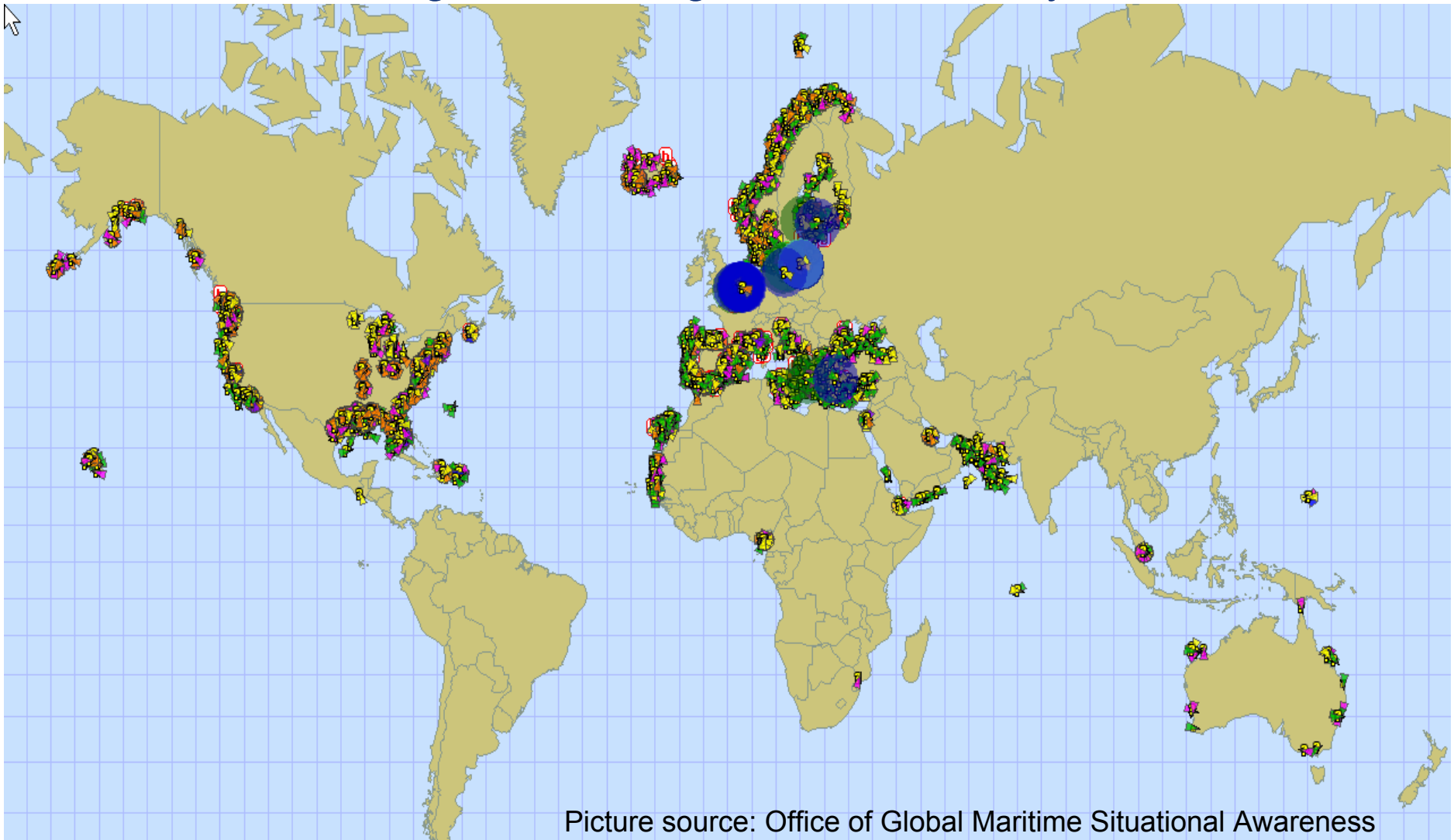
Global CSDIS Local Mask
VDS analyzer HH
VDS analyzer HV
VDS analyzer all bands merged
HH
HV

Radarsat-2 SCN
© MDA/CSA 2009

- Tracking the “Jolly Verde”: Genova – Horn of Africa – South Africa and back
- Coastal AIS, Satellite AIS, Ship-logged AIS, Satellite SAR

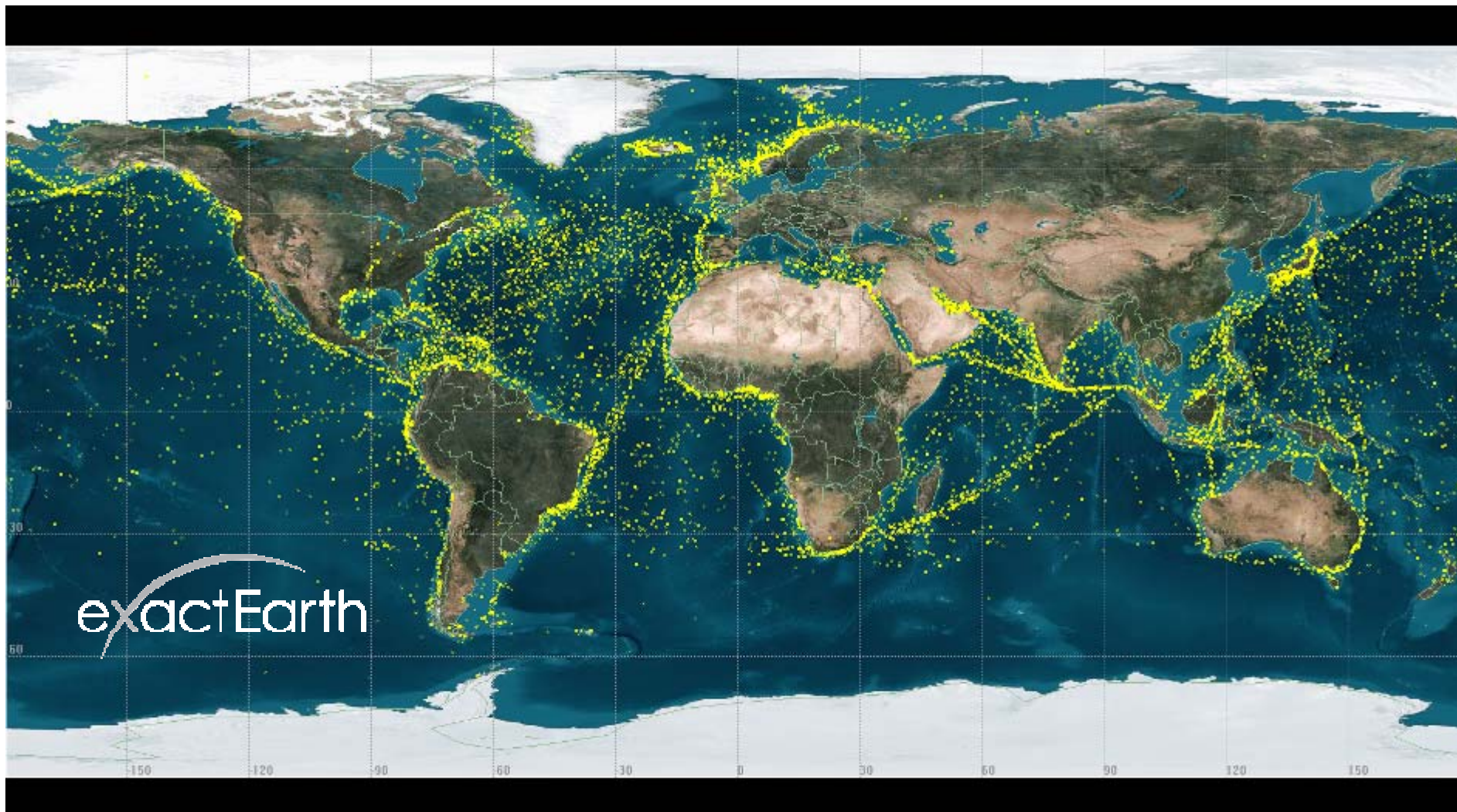
Maritime Safety & Security Information System

- Global data sharing network of government AIS systems

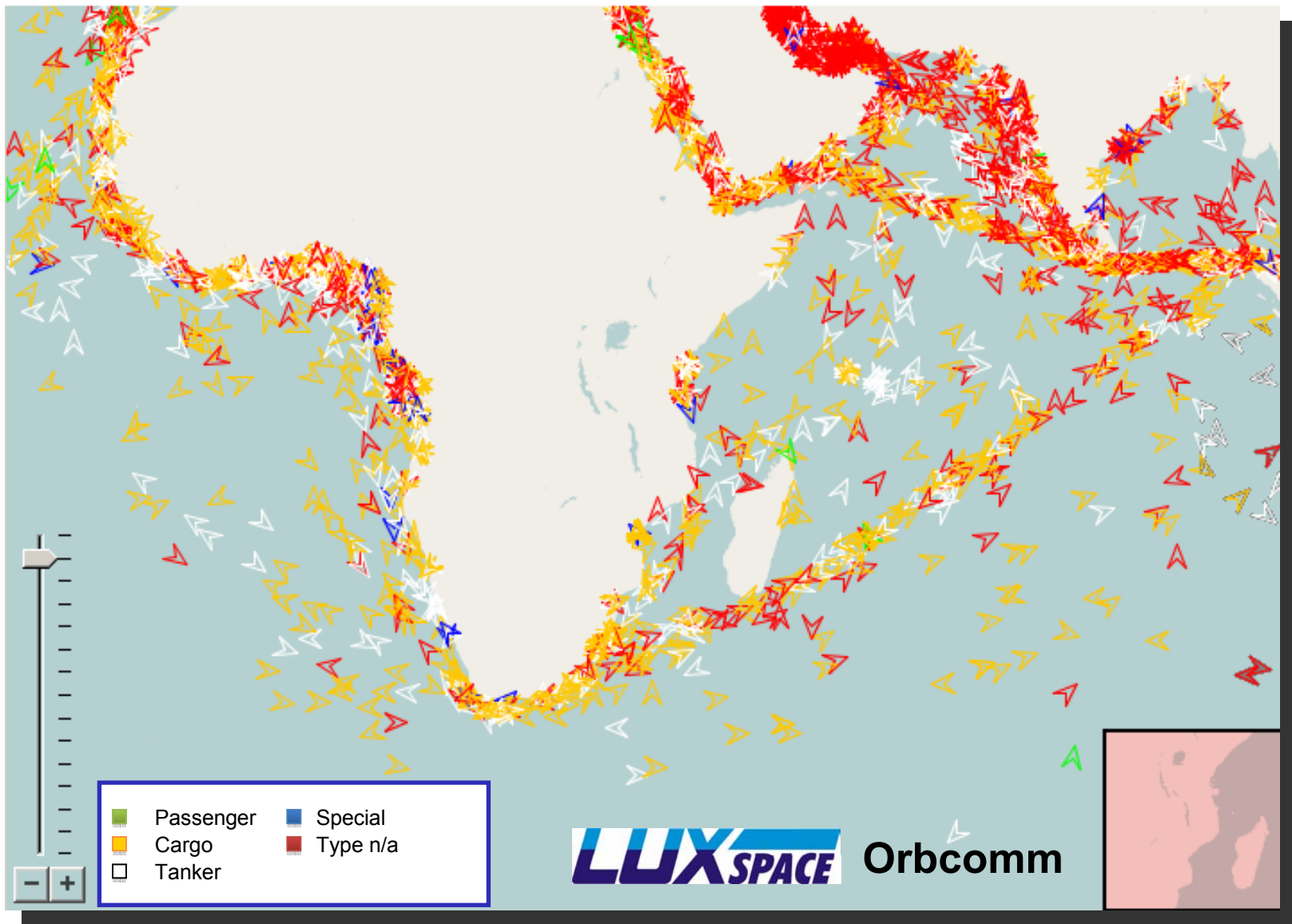


Picture source: Office of Global Maritime Situational Awareness

COMDEV / exactEarth

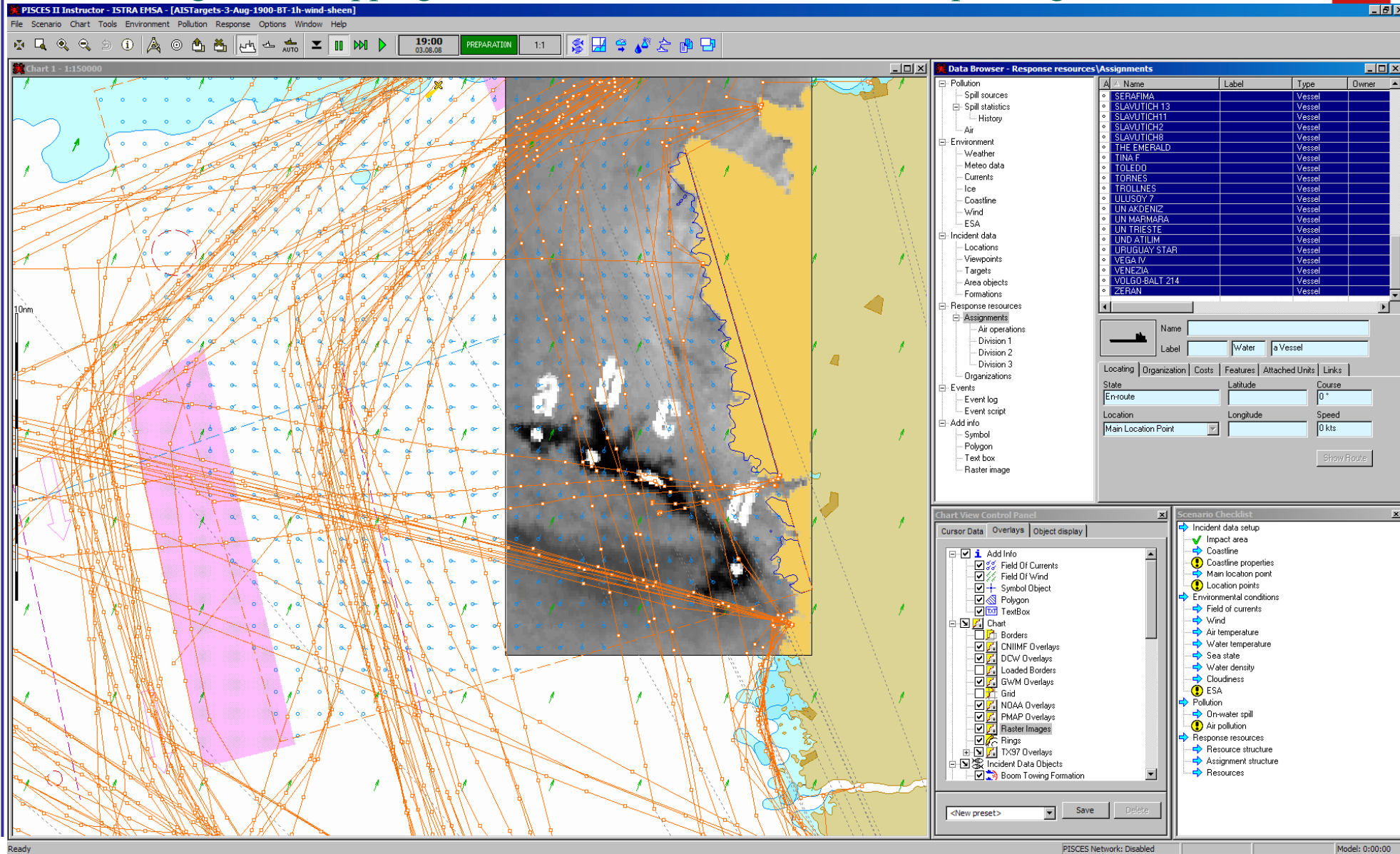


LuxSpace / Orbcomm



Sat image, AIS shipping, HF currents and Wind Stress on top Navigational chart

Joint Research Centre



PISCES II Instructor - ISTRA EMSA - [AISTargets-3-Aug-1900-BT-1h-wind-sheen]

File Scenario Chart Tools Environment Pollution Response Options Window Help

19:00 03.08.08 PREPARATION 1:1

Chart 1 - 1:150000

Data Browser - Response resources/Assignments

Name	Label	Type	Owner
SERAFIMA		Vessel	
SLAVUTICH 13		Vessel	
SLAVUTICH11		Vessel	
SLAVUTICH2		Vessel	
SLAVUTICH8		Vessel	
THE EMERALD		Vessel	
TINA F		Vessel	
TOLEDD		Vessel	
TORNES		Vessel	
TROLLNES		Vessel	
ULUSOY 7		Vessel	
UN AKDENIZ		Vessel	
UN MARMARA		Vessel	
UN TRIESTE		Vessel	
UND ATILIM		Vessel	
URUGUAY STAR		Vessel	
VEGA IV		Vessel	
VENEZIA		Vessel	
VOLGO-BALT 214		Vessel	
ZERAN		Vessel	

Chart View Control Panel

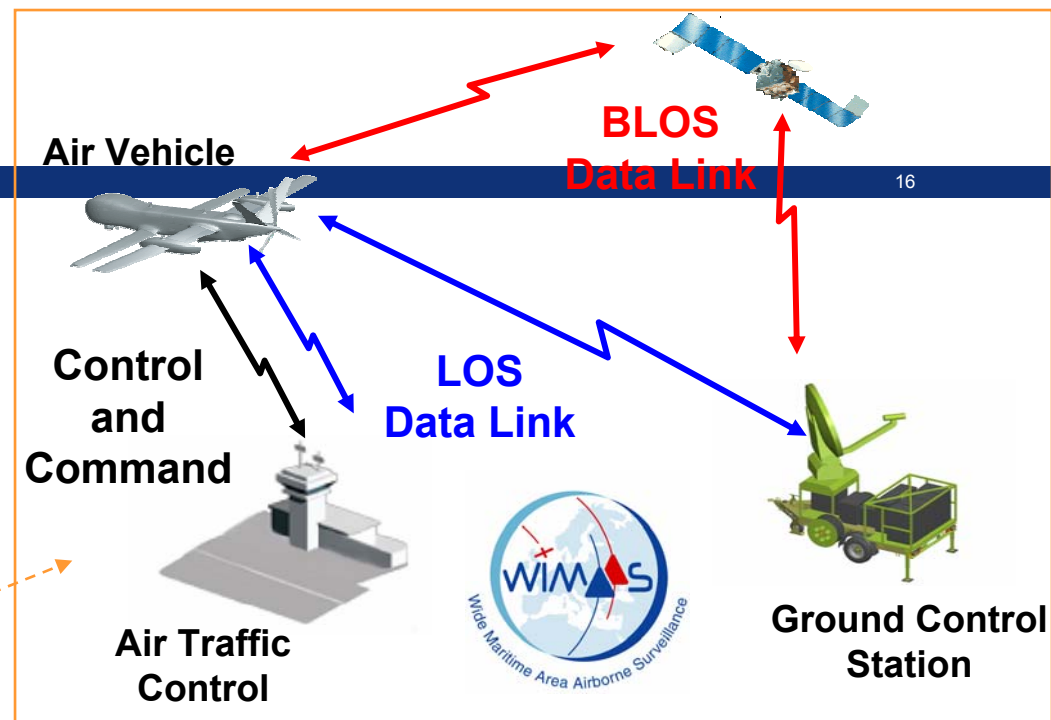
- Cursor Data
- Overlays
 - Add Info
 - Field Of Currents
 - Field Of Wind
 - Symbol Object
 - Polygon
 - TextBox
- Object display
 - Chart
 - Borders
 - CNIMF Overlays
 - DCW Overlays
 - Loaded Borders
 - GWM Overlays
 - Grid
 - NDAA Overlays
 - PMAP Overlays
 - Raster Images
 - Rings
 - TX37 Overlays
 - Incident Data Objects
 - Boom Towing Formation

Scenario Checklist

- Incident data setup
 - Impact area
 - Coastline properties
 - Main location point
 - Location points
- Environmental conditions
 - Field of currents
 - Wind
 - Air temperature
 - Water temperature
 - Sea state
 - Water density
 - Cloudiness
- ESA
- Pollution
 - On-water spill
 - Air pollution
- Response resources
 - Resource structure
 - Assignment structure
 - Resources

Way ahead for R&D

- Improved sensors
 - Detecting small targets in wide areas
- New sensor platforms – UAVs, UUVs, buoys, networks
 - Affordable persistency
- Improved sensor data processing for ship detection & recognition
- Further data fusion
 - Algorithms
 - Data communication
 - Also use environmental data (GMES)
- Software for detecting anomalies & risks



The end

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