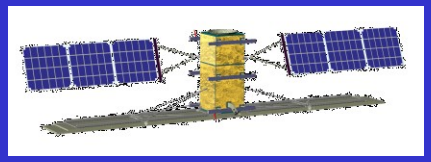

OCEANSUITE: A RADARSAT-2 EXPLOITATION TOOL

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Canada

OceanSuite

- **OceanWinds**
  - Wind direction from wind rows
  - Wind speed extraction using CMOD
- **OceanWorks**
  - Ship detection using bright return
  - Sea Clutter based on K-distribution
- **OceanOil**
  - Oil spill detection from dark patches

Design Philosophy

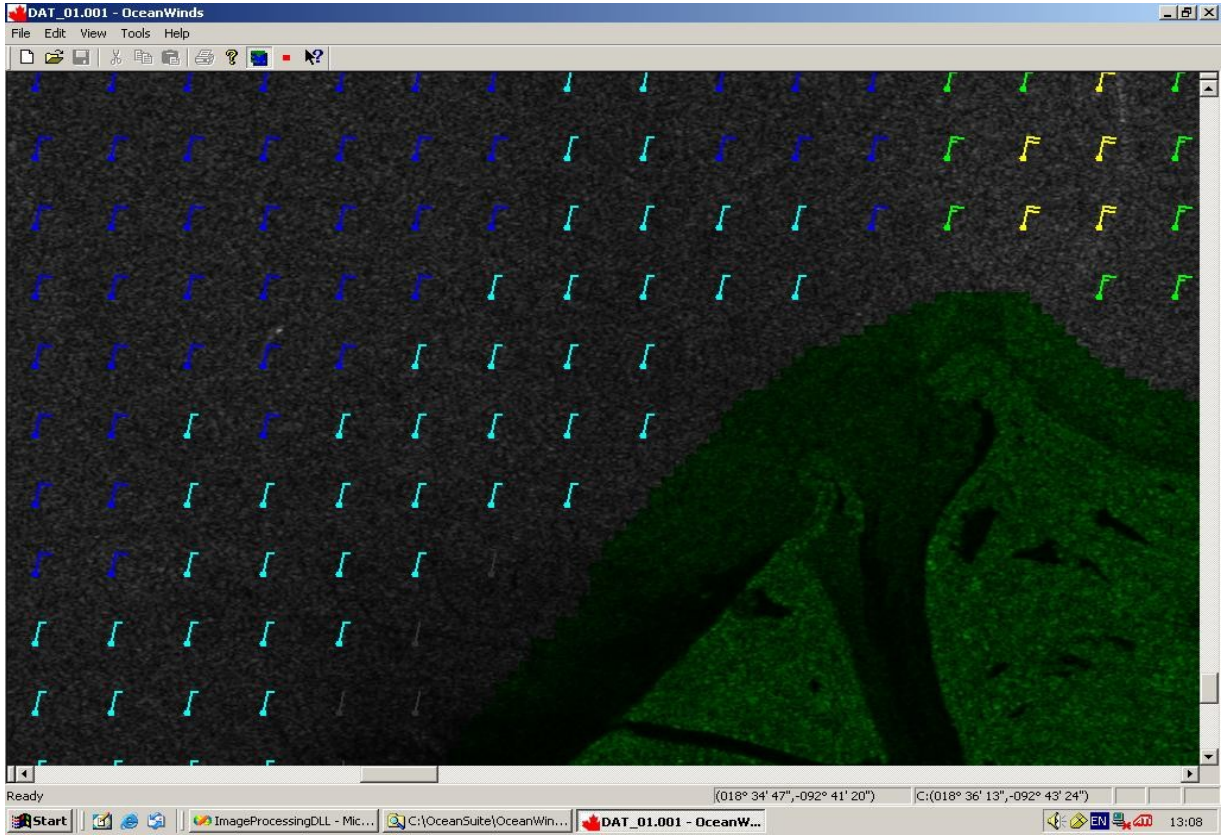
- Coding effort (time, cost)
  - Platforms
  - Existing or open source S/W and re-use
- Test effort including Certification and Accreditation
- Reliability
- Supportability
- IP issues
- Future enhancements

OceanSuite Implementation

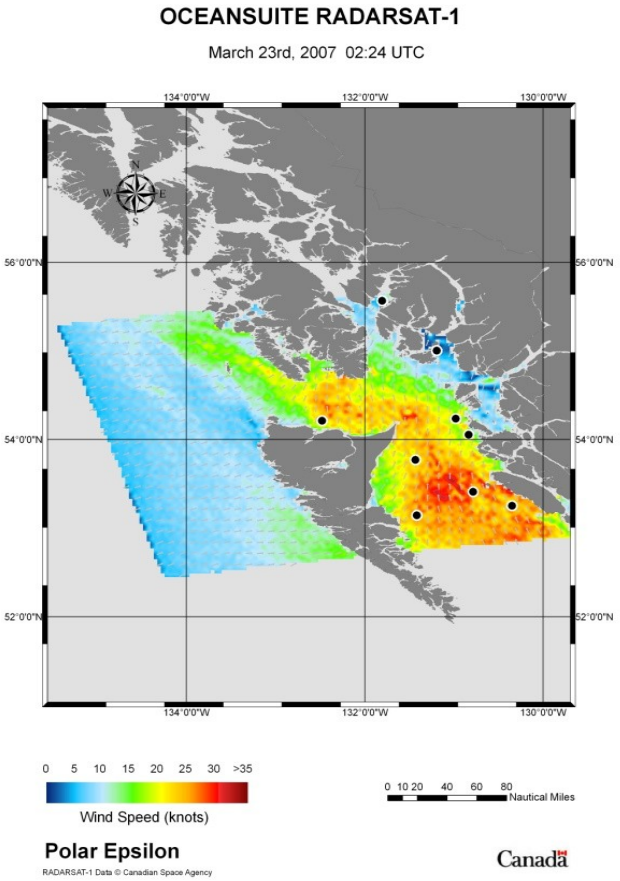
- Minimal support costs
- Minimal testing

- Windows operating system
- Microsoft Visual.NET C++
- Reuse image tools in DLLs

OceanWinds Example



OceanWinds Poster



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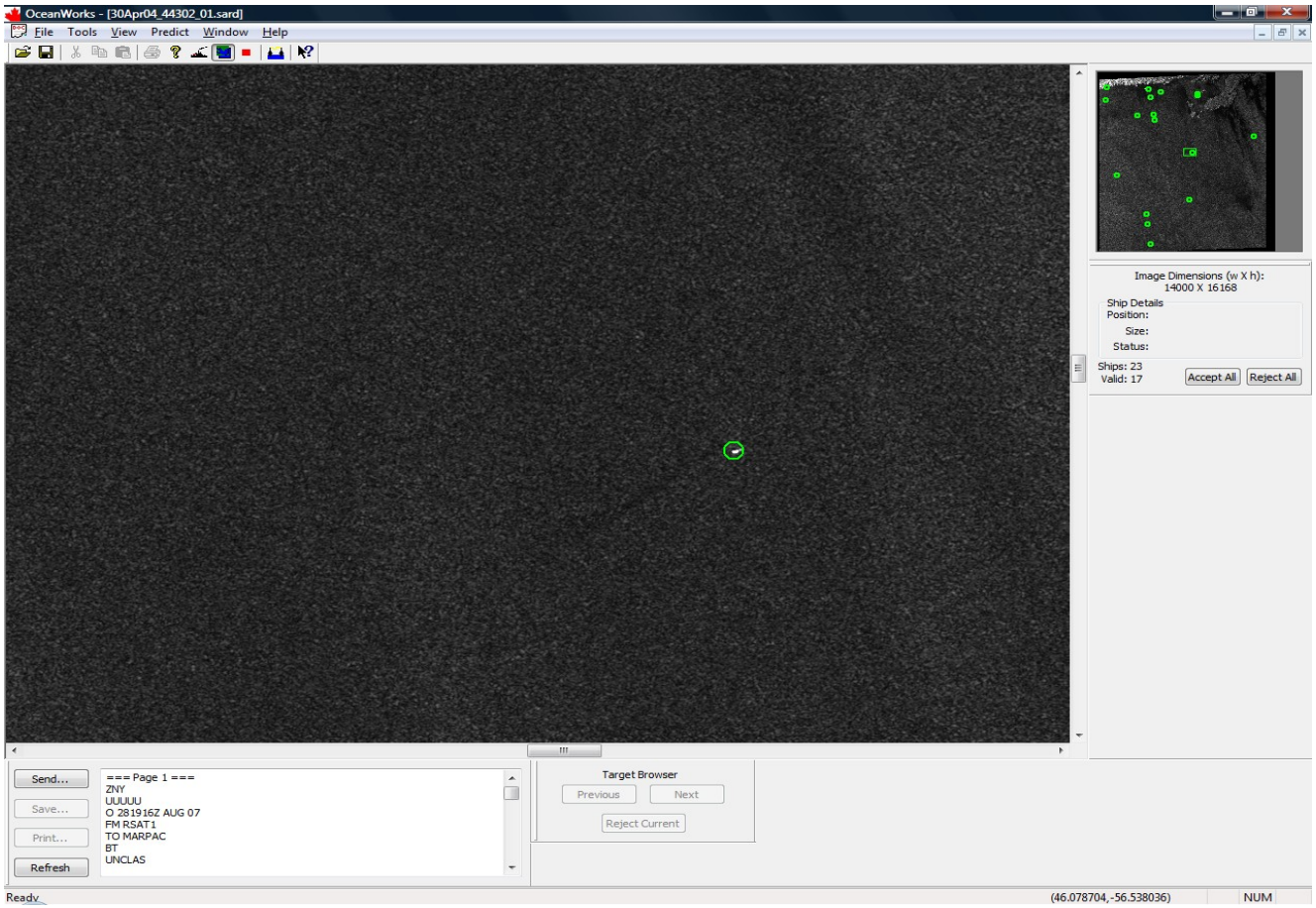
SAR Wind Extraction

1. 180 degree wind direction ambiguity
   - External direction inputs
2. Reliability of wind direction extraction
   - Statistical testing
3. Bright returns from ships
   - Suppressed
4. Land mask

OceanWinds Status

- Aimed at open ocean
- Now operational having been beta tested by MDA (GSI) Gatineau
- Licensing in progress (DRDC)
- Support TBD (currently by Polar Epsilon)

OceanWorks Example



OceanWorks Requirements (Not Necessarily Achievable)

- Detect 25 m ships with Prob. Det. > 90% in sea state 5 or less
- False alarms: a few per pass
- Overall Polar Epsilon time latency 15 minutes
  - Time for OceanWorks < 2 minutes
- Minimal operator assistance
- Implied use of ScanSAR beam to achieve wide swath (e.g. 300 km)

Detection Problems

1. Land mask errors
2. Image artifacts (e.g. nadir ambiguities)
3. Saturation in 8-bit images
4. Range ambiguities
5. Strong sea structure
6. Ice
7. Azimuthal ambiguities

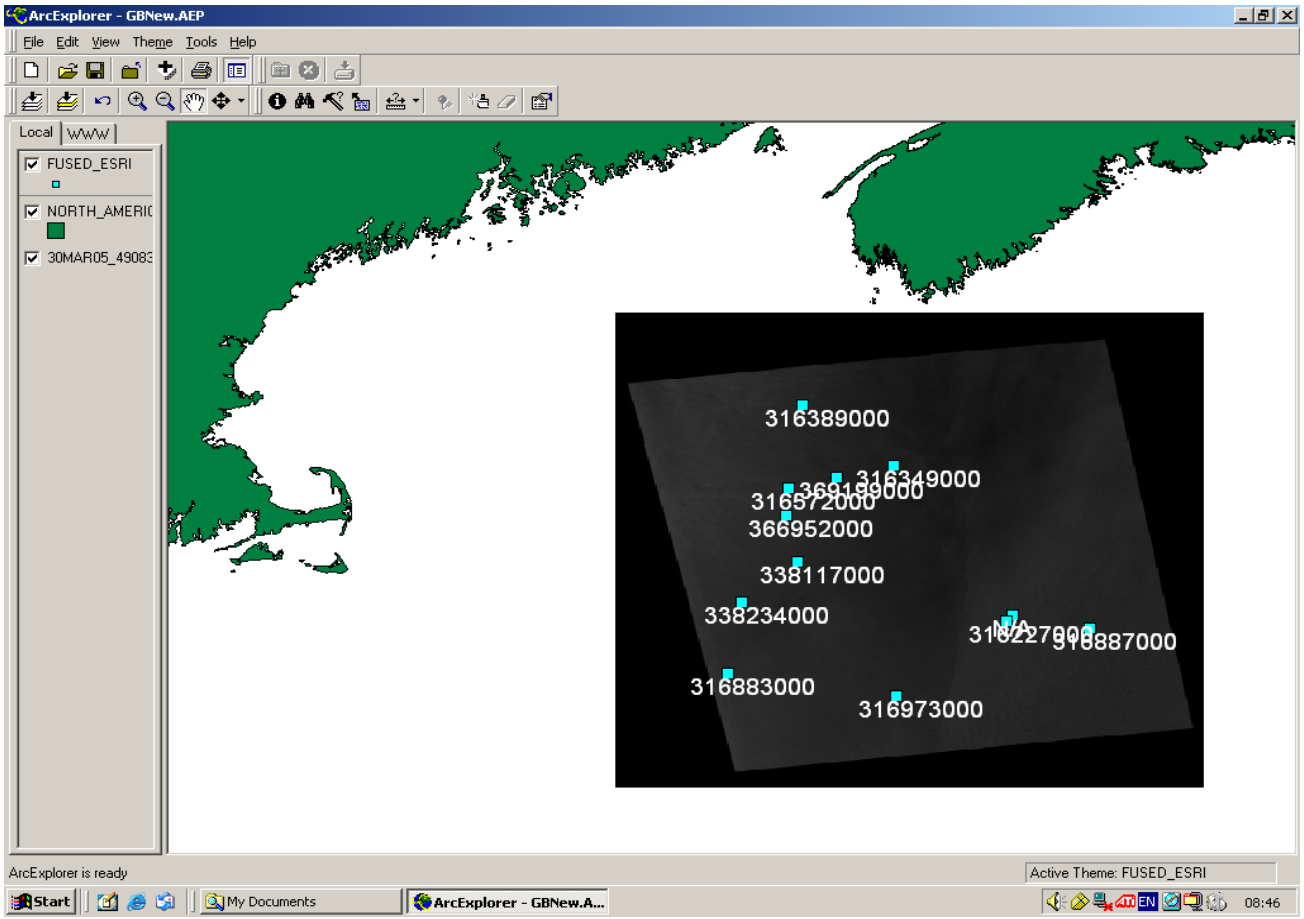
OceanWorks Status

- Aimed at east and west Canadian coasts
- Participated in trials off east coast and west coast (Trident Fury)
- Undergoing fine tuning following some beta testing by MDA (GSI) Gatineau
  - Over 300 RADARSAT-1 and Envisat images in database
- Expect to meet requirement except for ship length (~50 m)

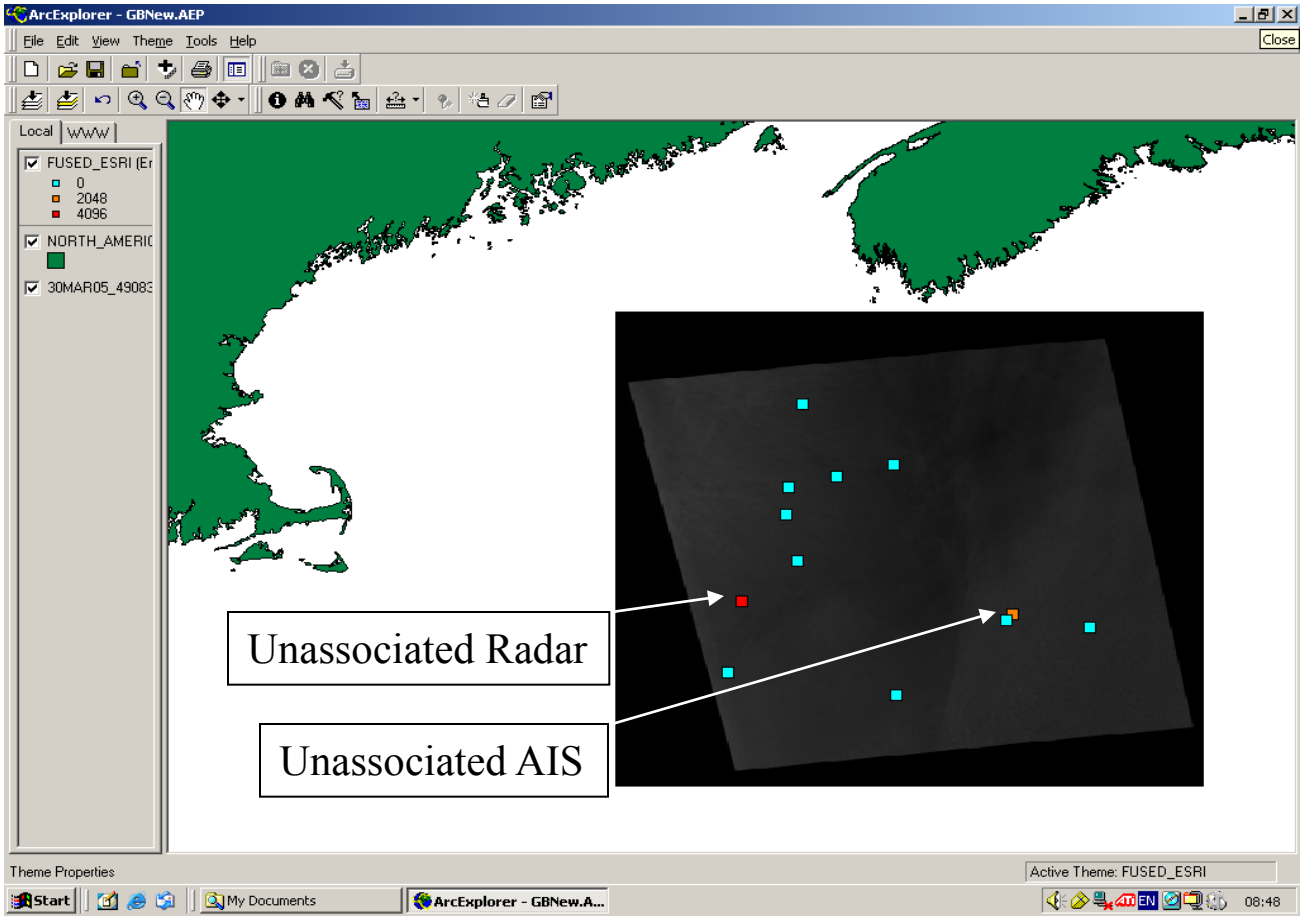
AIS Fusion Enhancement

- Accept NMEA and OTH Gold AIS messages
- Fuse with RADARSAT ship detections
- Send integrated OTH Gold (text) message to Marine Security Operations Centre

AIS Fusion (MMSI)



AIS Fusion (Non-Compliants)



AIS Status

- Prepared for demonstration leading to near real time AIS/RADARSAT-1 fusion
- Partial testing of communications from ORBCOMM to MDA Gatineau completed

OceanOil Example -Terranova Radar Image

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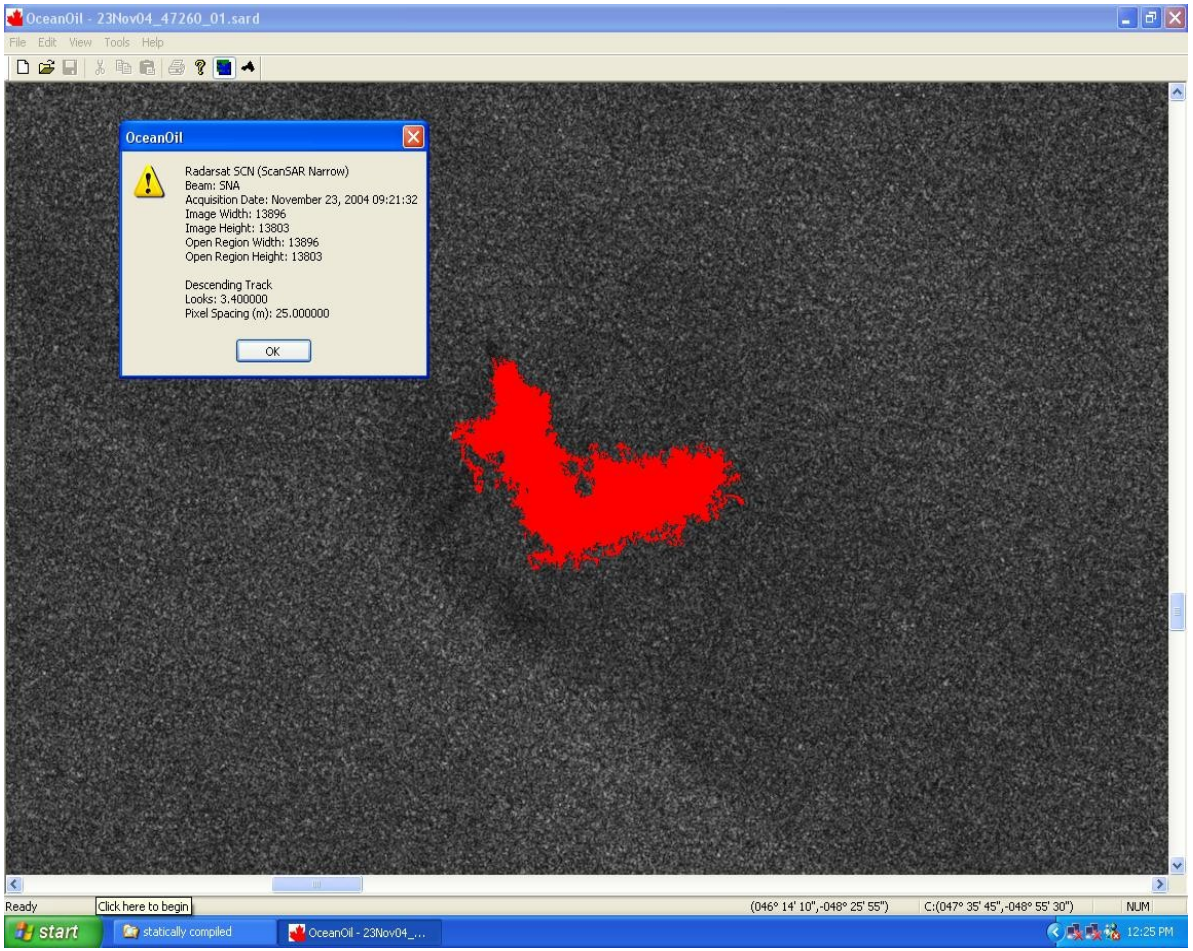
Terranova Spill



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Oil Spill Problems

- Naturally occurring dark areas
- Ship wakes
- Underflow (unsuitable LUT)

OceanOil Status

- Requires more intelligent algorithms
- Will be ready for beta testing spring 2008

Summary

- OceanSuite is close to operational readiness
- Application has commercial value
- Licensing will be used to defray support costs