HF Radar Network (HFRNet) Data Management and Applications

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Scripps Institution of Oceanography and Rutgers University

Agenda

- Overview
- Data Acquisition
- Site Diagnostics
- Data Distribution

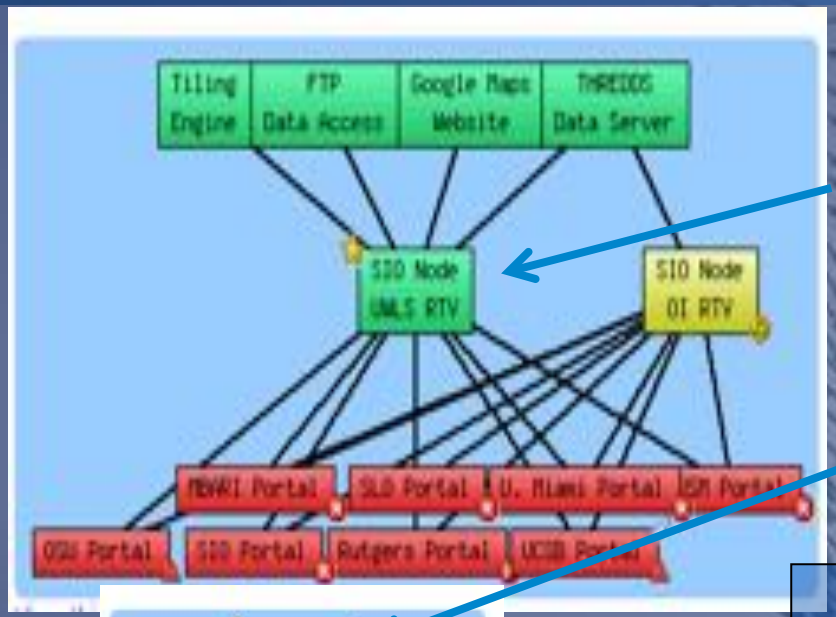
Overview

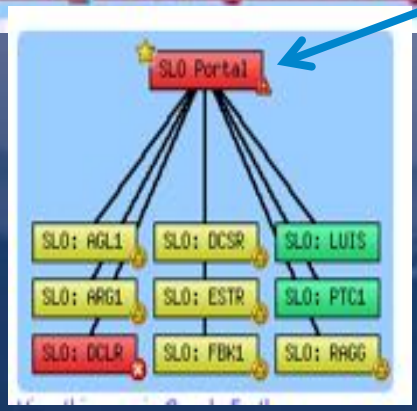
Years of Operation: 9 years
Number of files: >7 million

Participating Organizations: 31
Number of Physical Sites: >130

Network Architecture

Data Acquisition





SIO: SDPL	ACK	10/09 12:53 AM	0.0	100.0	0	SSH	172.23.42.42
SIO: SDCI	ACK	10/09 12:54 AM	0.0	100.0	0	SSH	172.23.42.42
SIO: SDBP	ACK	10/09 12:42 AM	0.0	0.0	0	SSH	166.140.38.139
SIO: SDSL	ACK	10/09 12:56 AM	0.0	100.0	0	SSH	137.110.142.30
SIO: SDSE	UP		99.7	0.1	167	SSH	75.32.81.89
SIO: SDSC	ACK	10/09 12:59 AM	0.0	100.0	0	SSH	172.23.38.40
SIO: SDWW	ACK	10/09 01:00 AM	0.0	100.0	0	SSH	198.180.31.29
UAF: WAIN	UP		99.8	0.0	49	Ante	132.239.92.228
SIO Portal	UP		99.7	0.0	0	Prob	132.239.92.228

Example Node to Site Aggregator communications

Example Site Aggregator to Site communications

Site - the individual field installations of HF radar equipment

Portal or Site Aggregator - a local regional operations center which maintains multiple installations

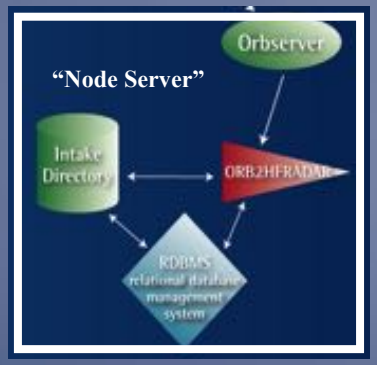
Node - Centralized locations which aggregate data from multiple regions

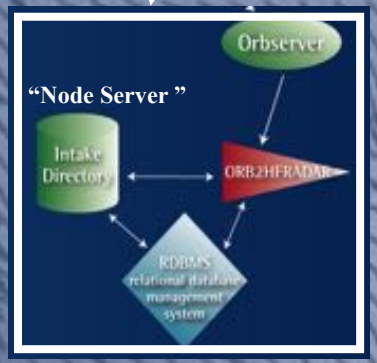
Scripps and NDBC
West Coast Repository & Engine

RUTGERS
East Coast Repository

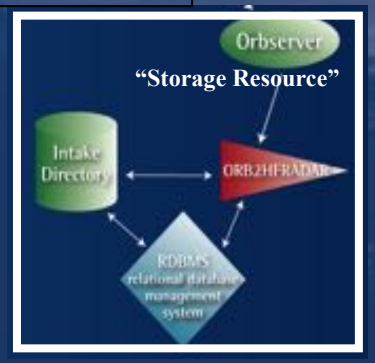
ORB2ORB

ORB2ORB





Radials and metadata,
Real-time vector (RTV),
graphics

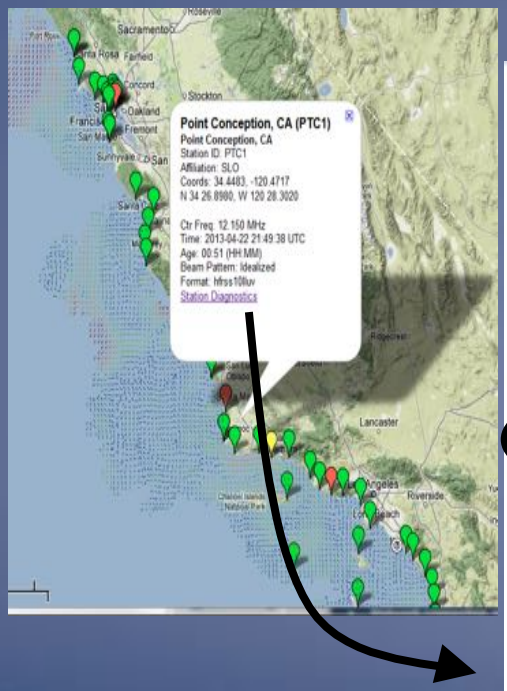


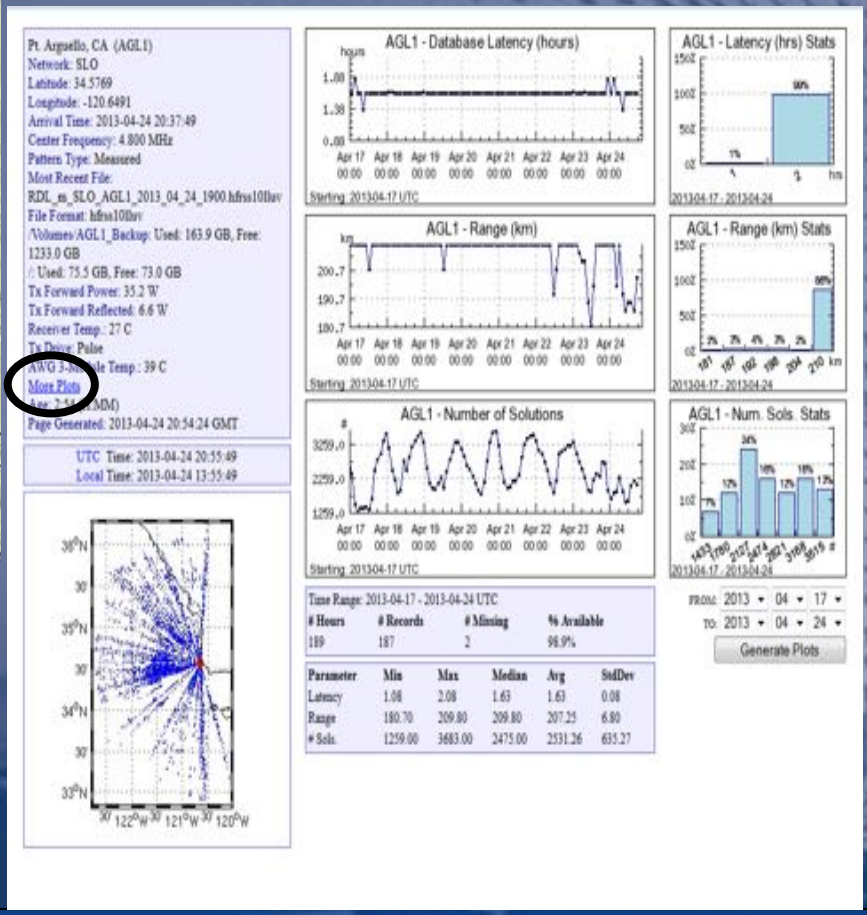
Web Servers

PUBLIC ACCESS

Diagnostics

Radial Diagnostics





Radial diagnostics are summarized in a balloon with a link to the most recent radial image, file information and time histories of latencies and radial solutions

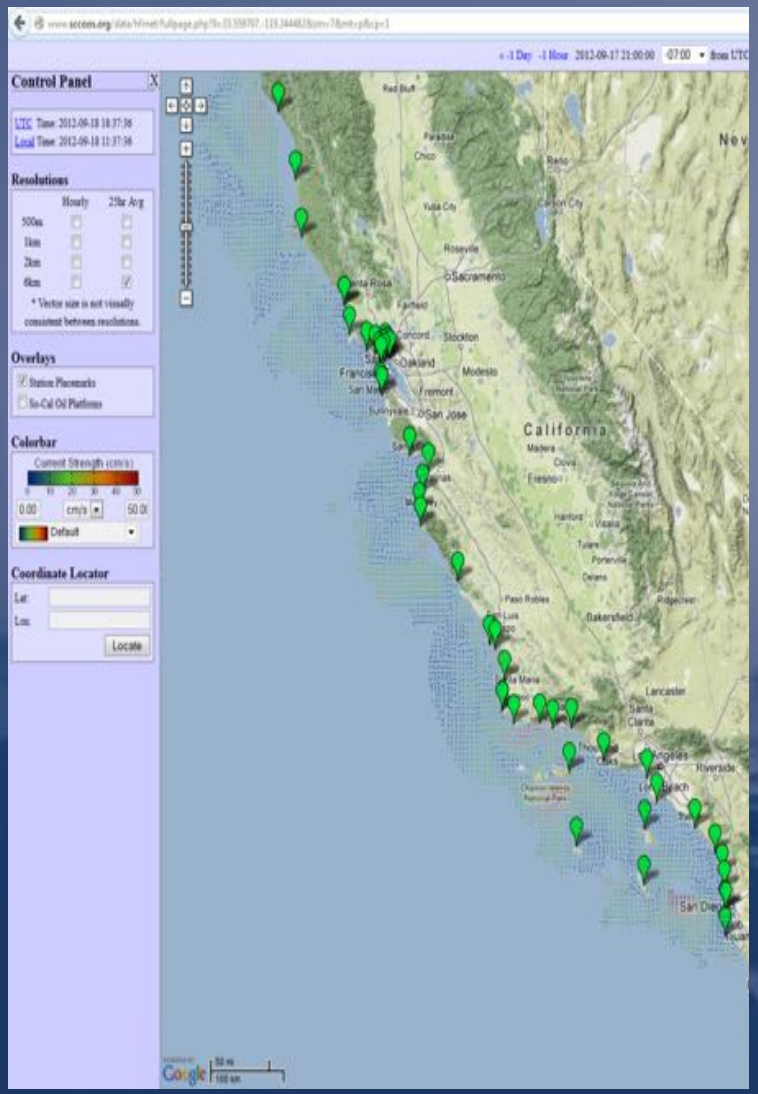
Diagnostics

Network Diagnostics

Network diagnostics are summarized monthly based on file acquisition

Data Distribution

HFRNet Data Availability



1. Online Visualization – http://cordc.ucsd.edu/projects/mapping/maps/fullpage.php
   Online visualization of HF radar surface currents with ability to change date, resolution, colorbar, and station information

2. Web Overlays - http://cordc.ucsd.edu/projects/mapping/api/
   Application programming interface (api) that allows programmers to overlay the currents into any website

3. THREDDS Data Server (TDS) access - http://sdf.ndbc.noaa.gov:8080/thredds/catalog.html http://hfrnet.ucsd.edu/thredds/catalog.html
   TDS service that allows folks to acquire or used the data via thredds for processing and/or visualization.

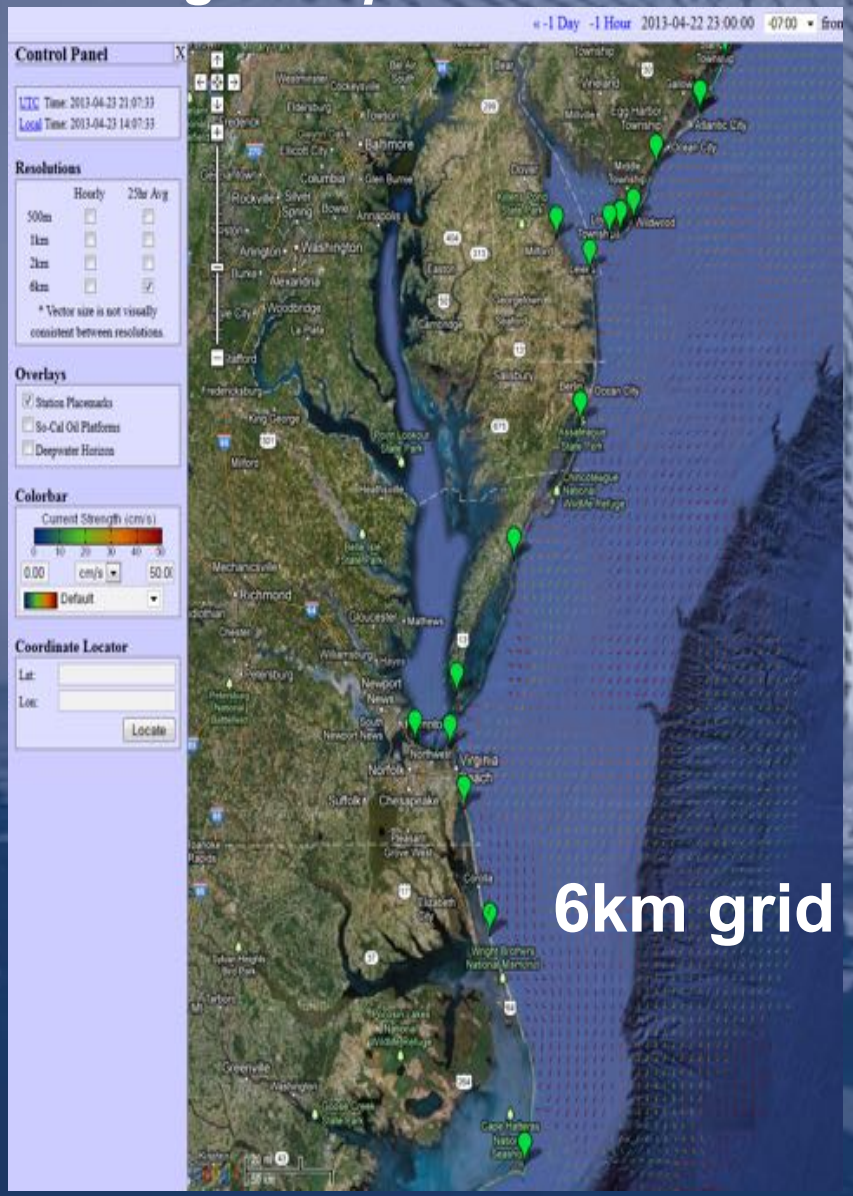
4. Data Archiving – HFRNet (NDBC): Totals and Radials
   - Operators: Range Series and beam pattern
   - Future: All above through

Data Distribution

Google Maps Visualization

Features include:

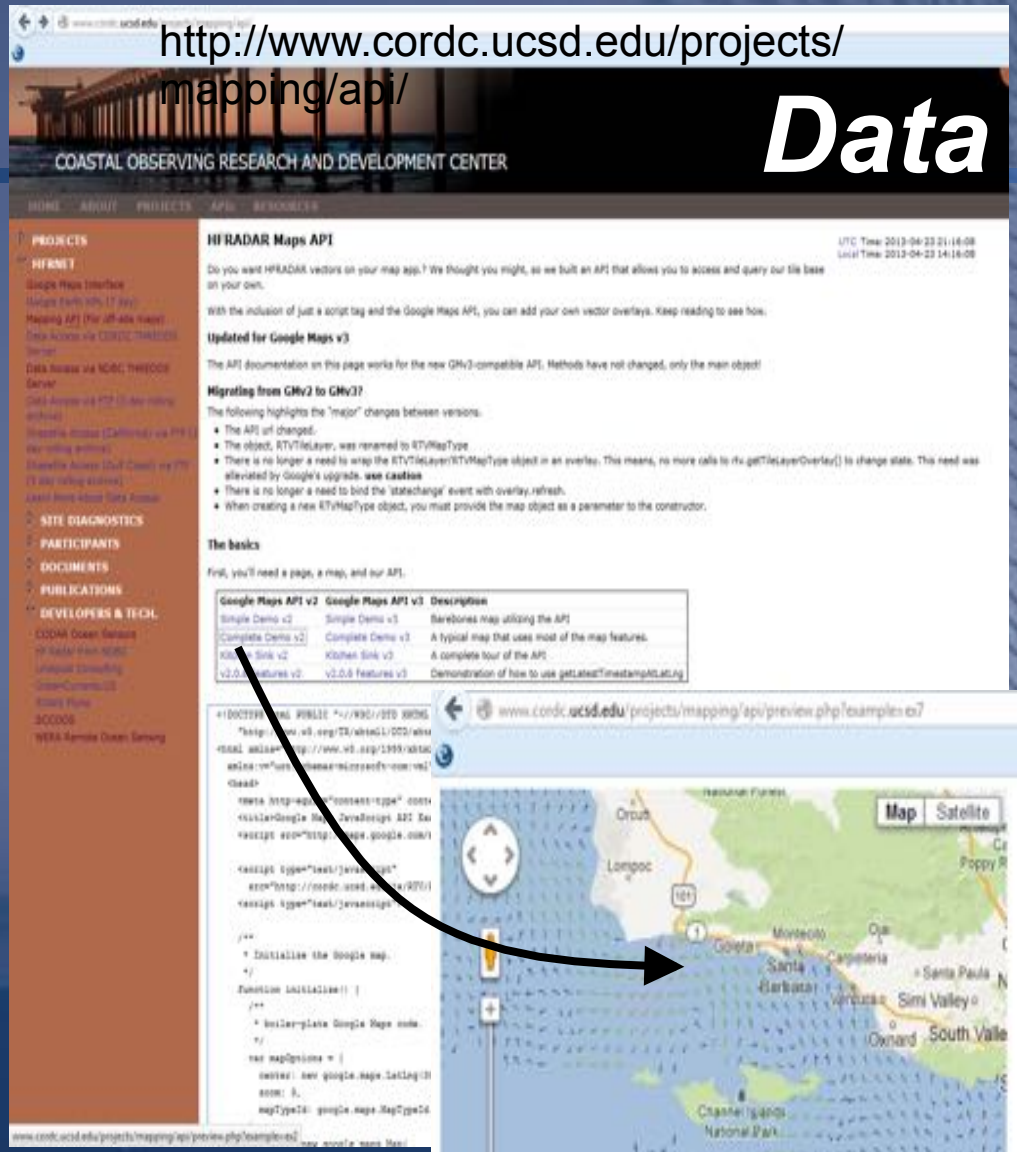
- 12 zoom levels
- Coordinate Locator
- Site Diagnostics
- Total Vectors at 500m, 1km, 2km & 6km
- Hourly and 25 Hour Averaged Data

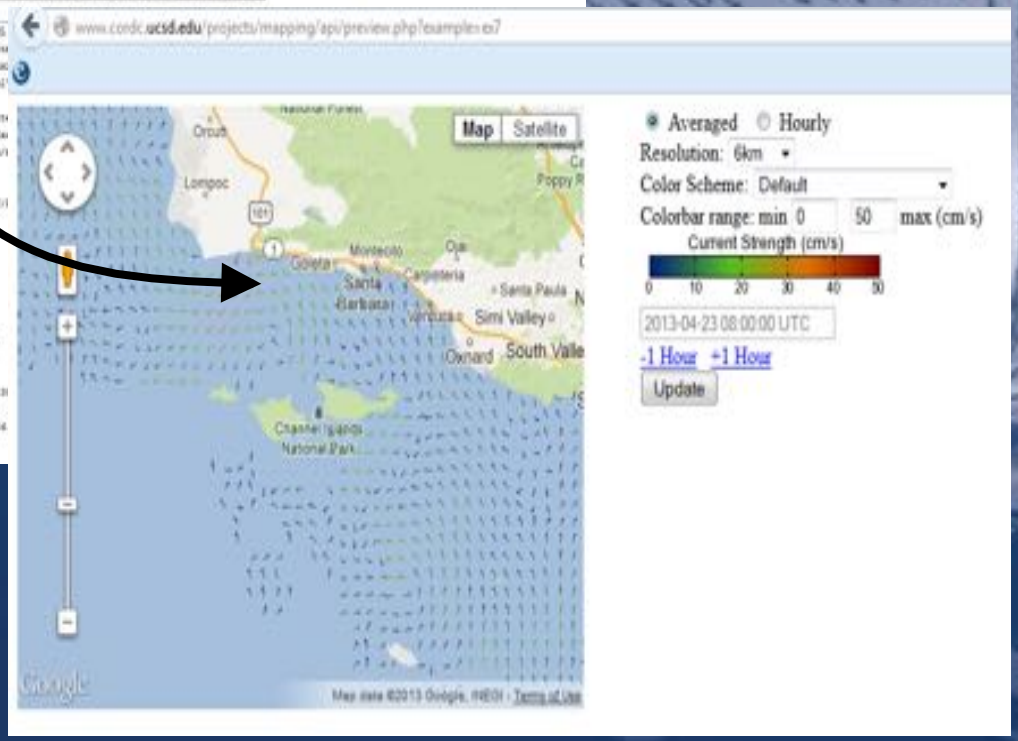


Data Distribution

Google Maps API

http://www.cordc.ucsd.edu/projects/mapping/api/

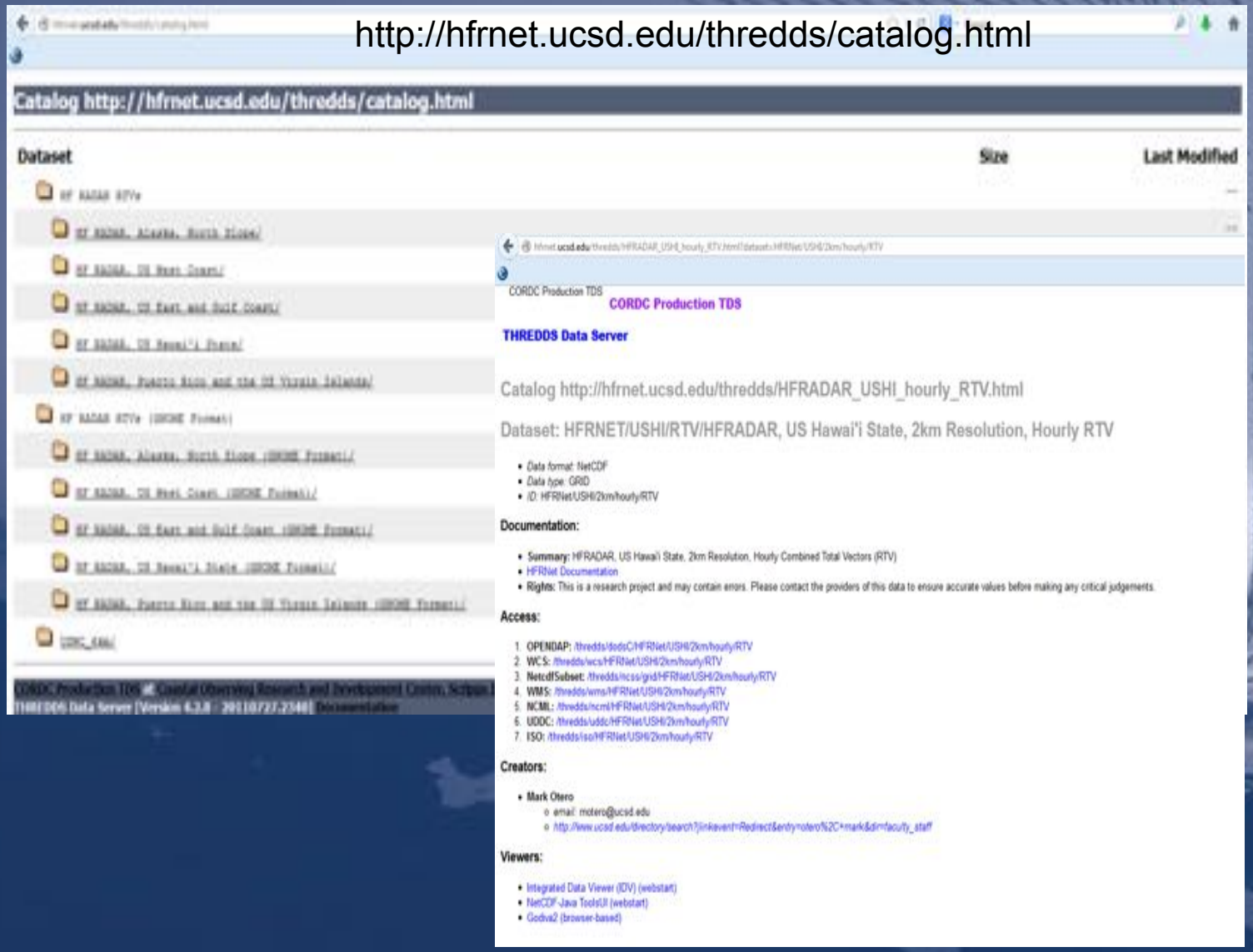




Data Distribution

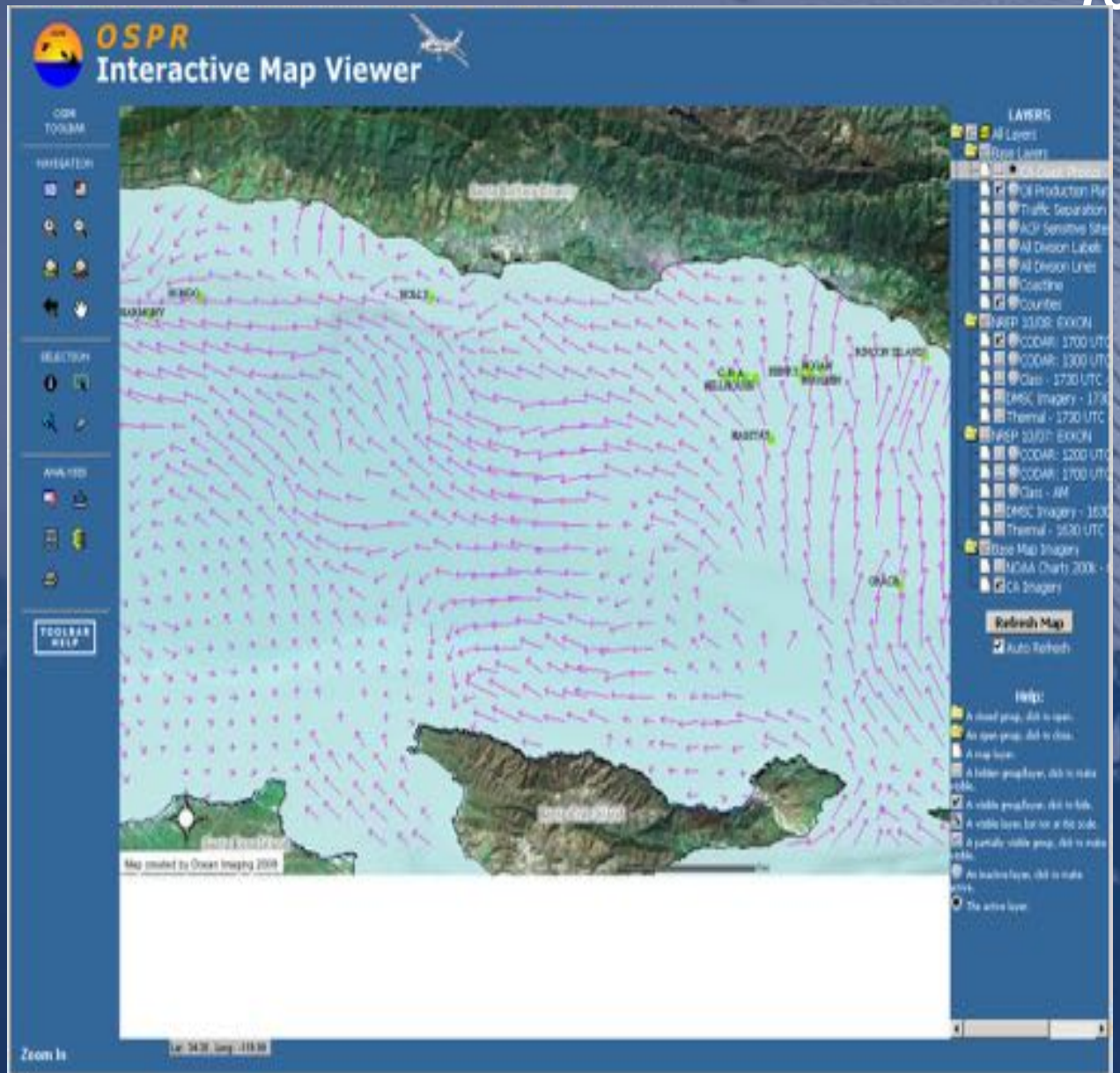
THREDDS

http://hfrnet.ucsd.edu/thredds/catalog.html



Data Distribution

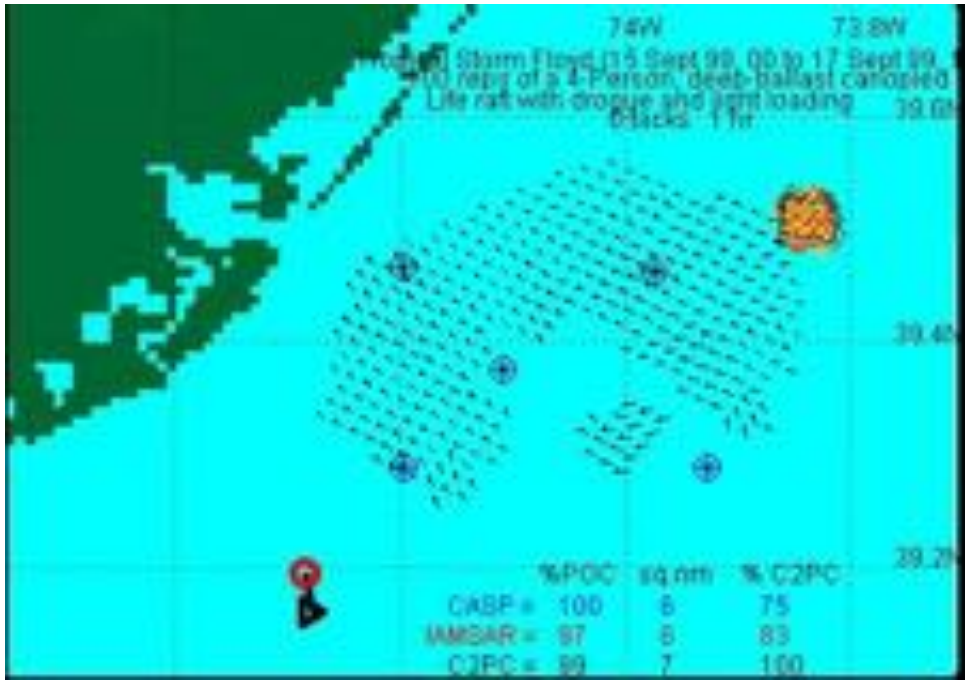
Total Velocities



APPLICATION:
SEARCH AND RESCUE

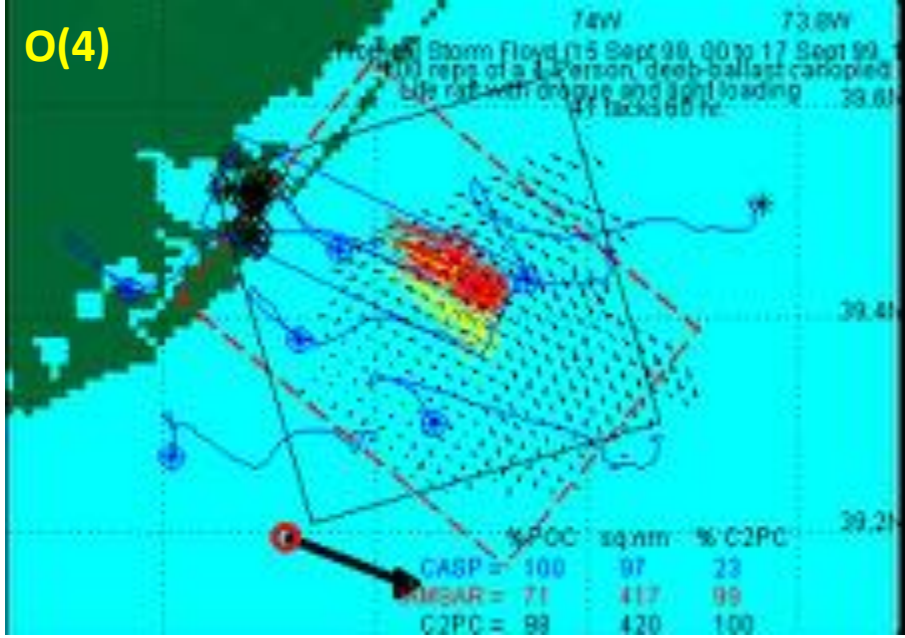
Application to Search and Rescue
United States Coast Guard
Office of Search and Rescue

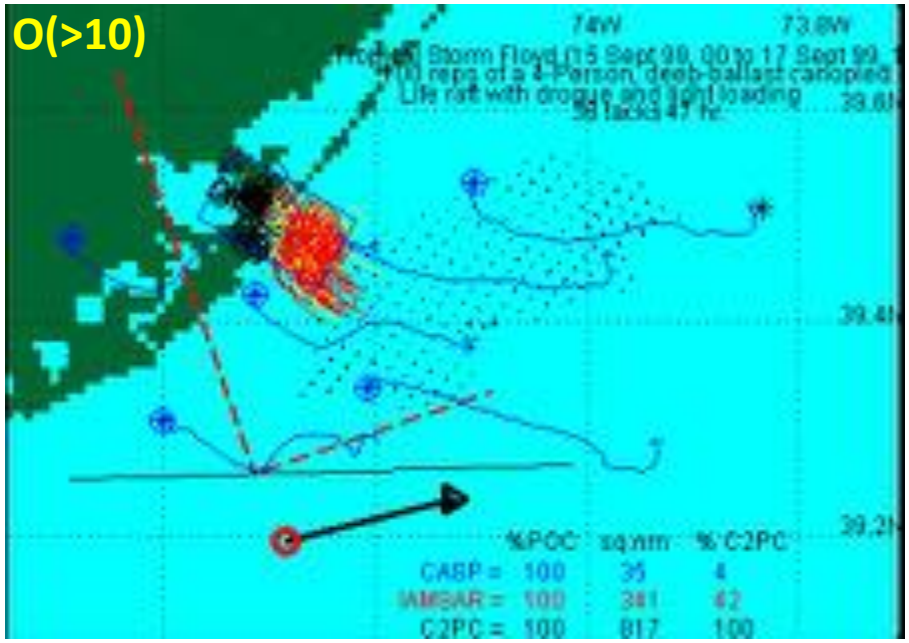
Point measurement vs. Field of measurements:
Hurricane Floyd Simulation



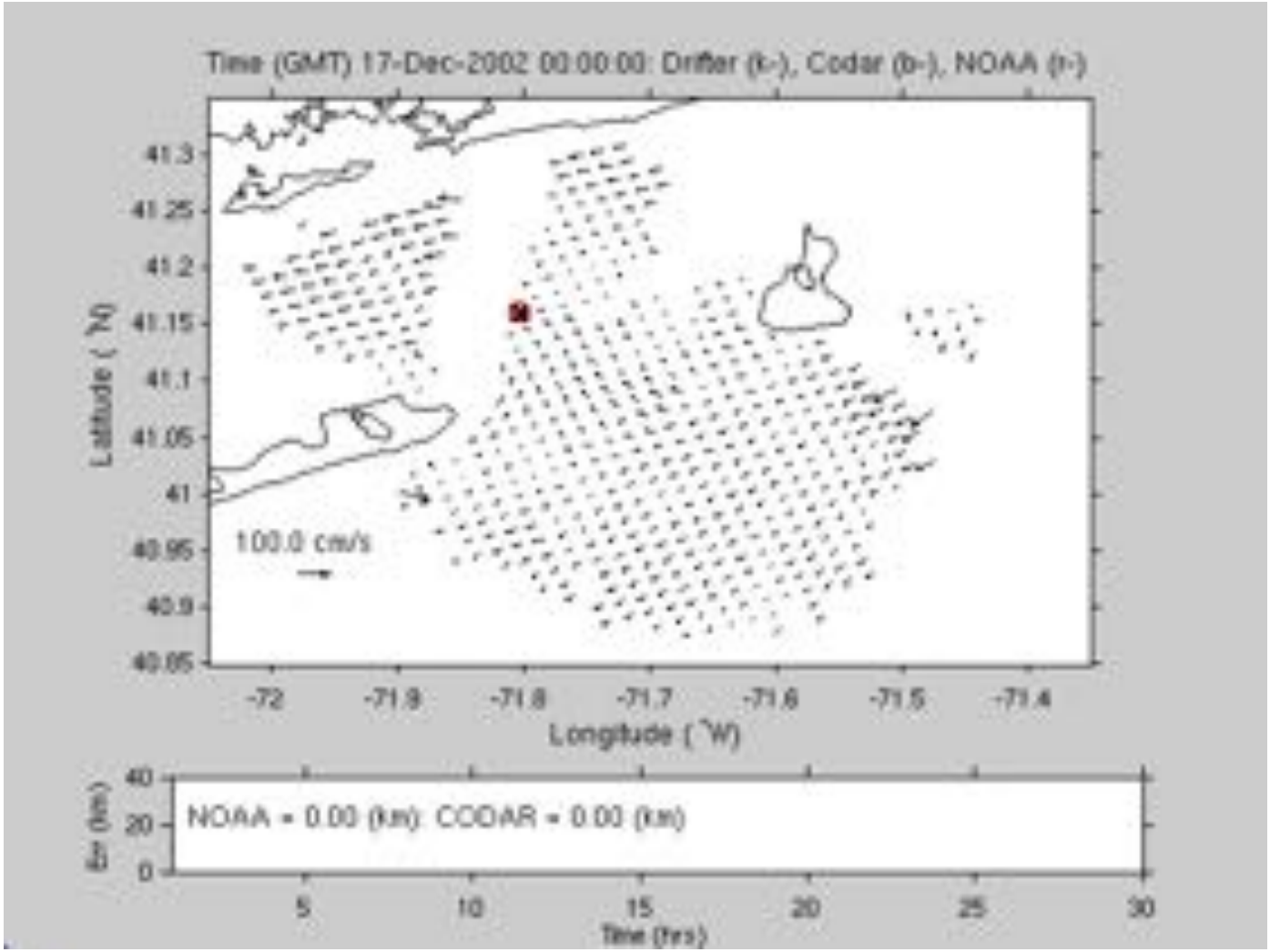
Search area reduced by factor of 4 (>10)

Courtesy Art Allen, USCG Office of SAR

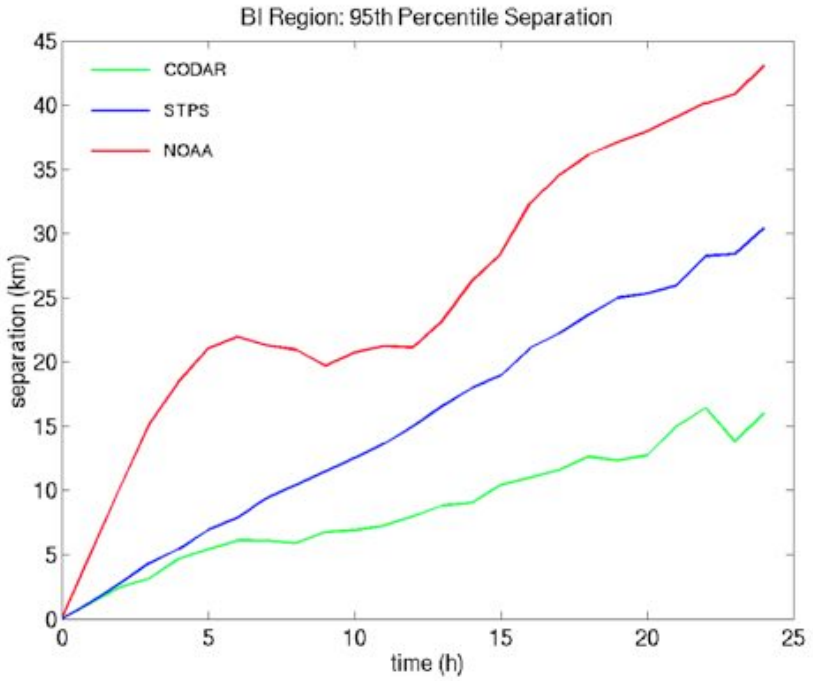




25 MHz Status 2002



25 MHz Status 2002



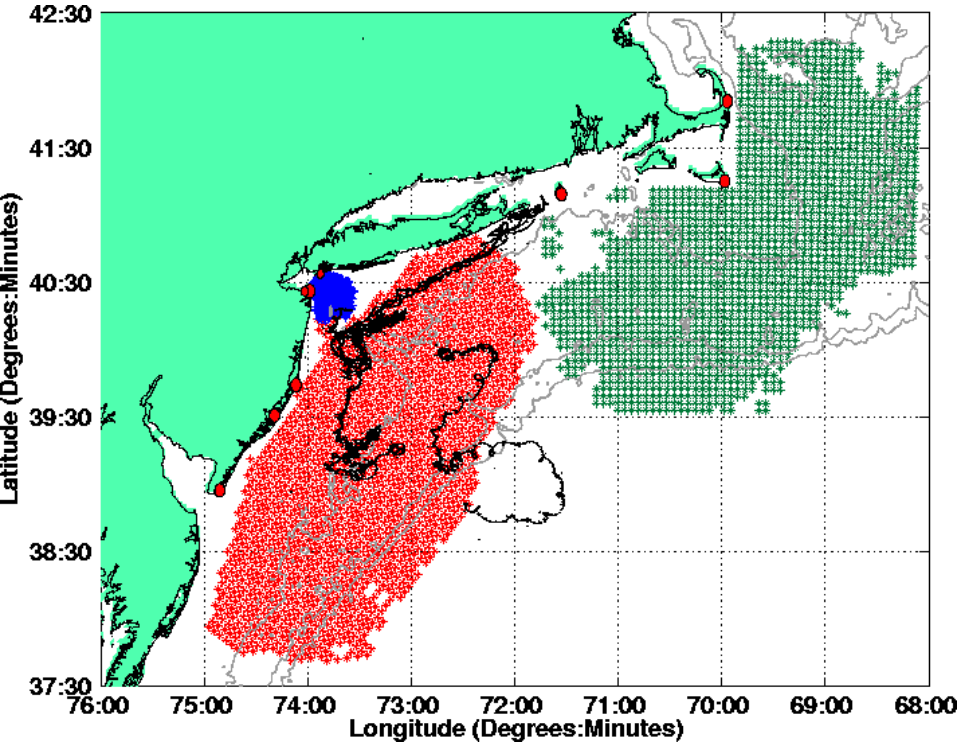
U.S. Coast Guard Research and Development Center
1082 Shennecossett Road, Groton, CT 06340-6048

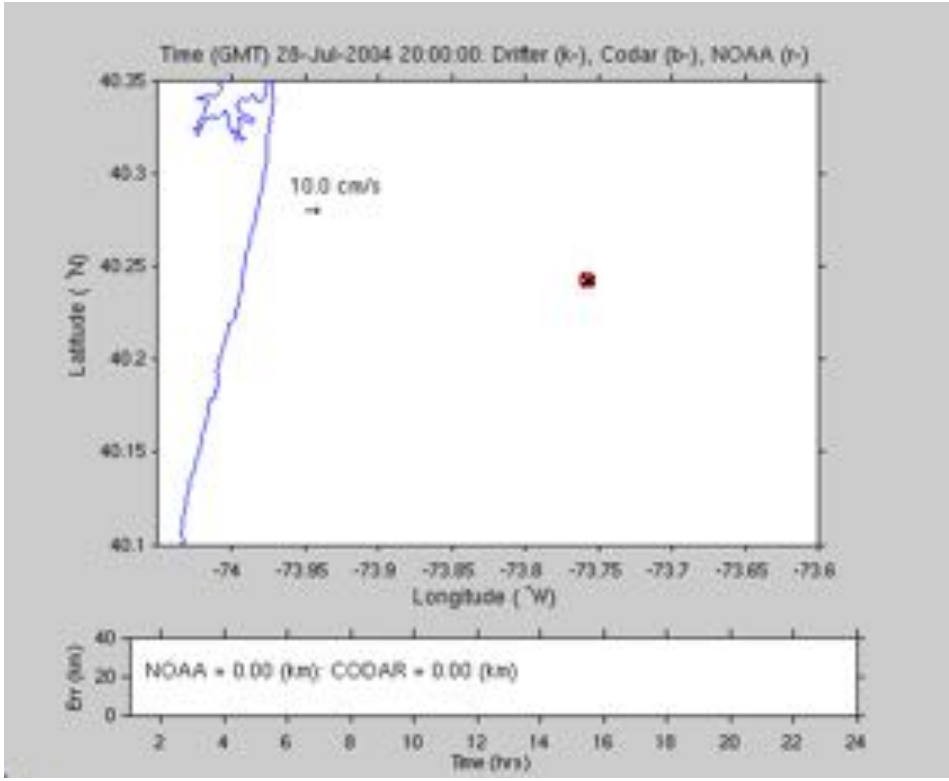
Report No. CG-D-09-03

USE OF COASTAL OCEAN DYNAMICS APPLICATION RADAR (CODAR) TECHNOLOGY IN U.S. COAST GUARD SEARCH AND RESCUE PLANNING

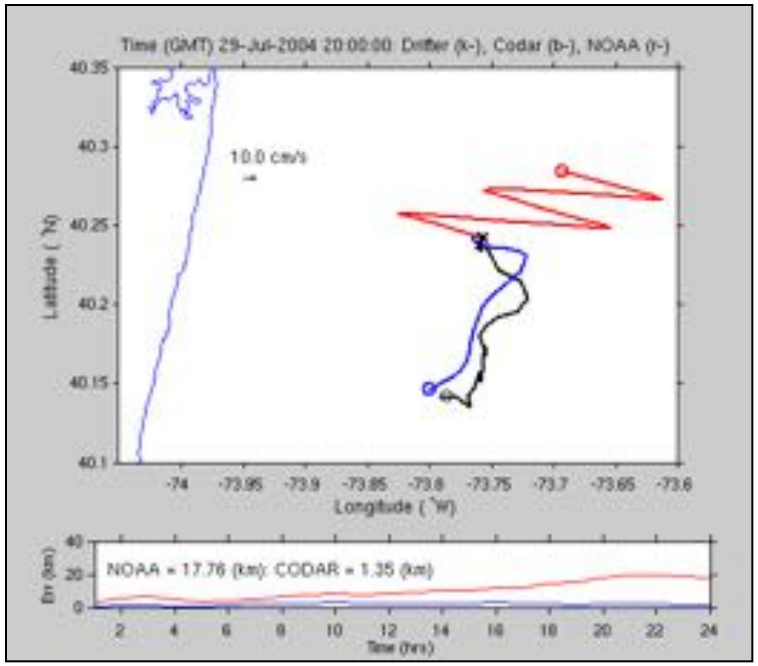
FINAL REPORT
JUNE 2003

5 MHz Status 2004





Status 2004



U.S. Coast Guard Research and Development Center
1082 Shennecossett Road, Groton, CT 06340-6048

Report No.

INTEGRATION OF COASTAL OCEAN DYNAMICS APPLICATION RADAR (CODAR) AND SHORT-TERM PREDICTIVE SYSTEM (STPS) SURFACE CURRENT ESTIMATES INTO THE SEARCH AND RESCUE OPTIMAL PLANNING SYSTEM (SAROPS)

FINAL REPORT
November 2005

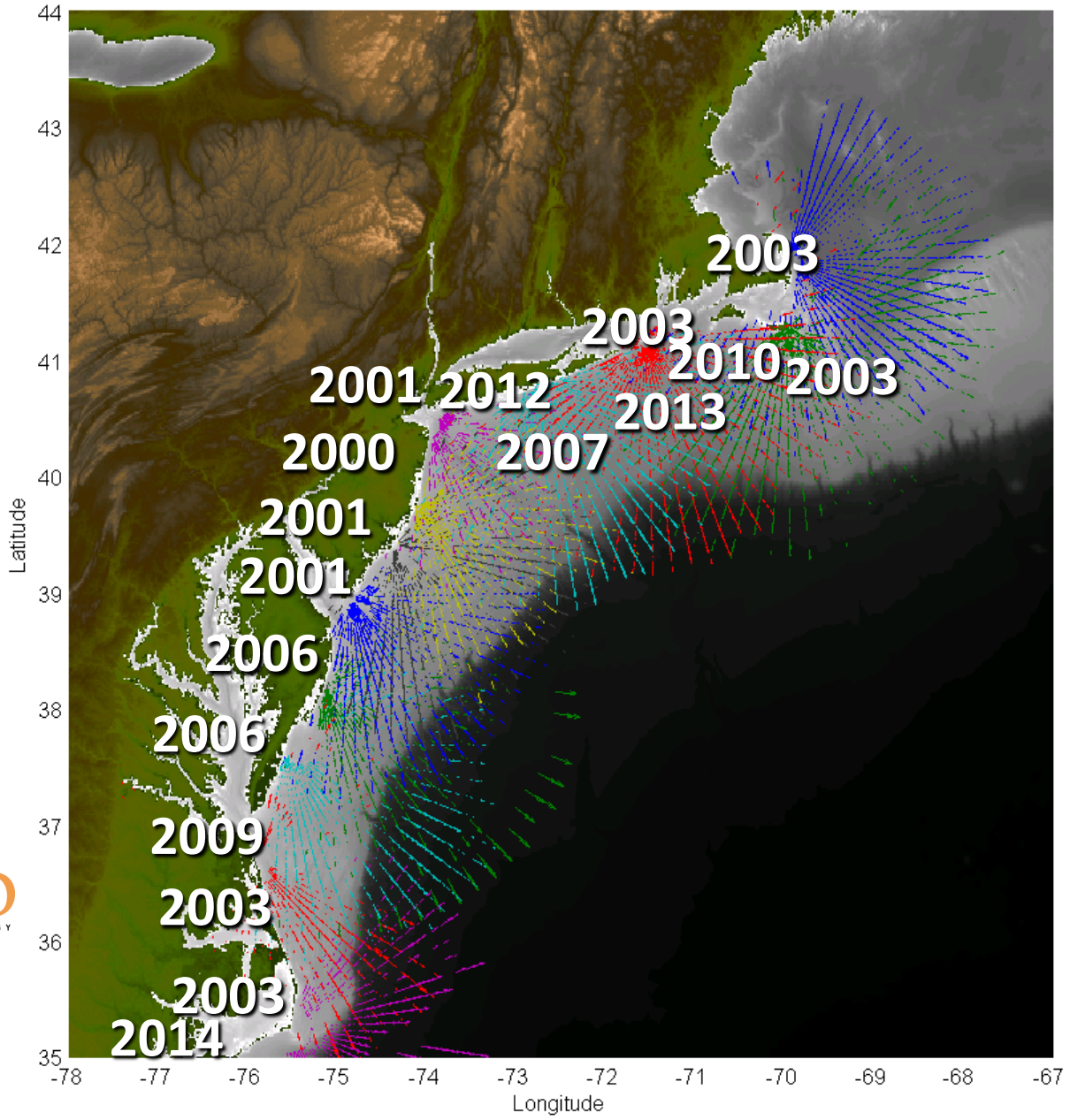
LONG RANGE NETWORK

UMASS DARTMOUTH

RUTGERS
Coastal Ocean Observation Lab

CENTER FOR COASTAL PHYSICAL OCEANOGRAPHY
OLD DOMINION UNIVERSITY

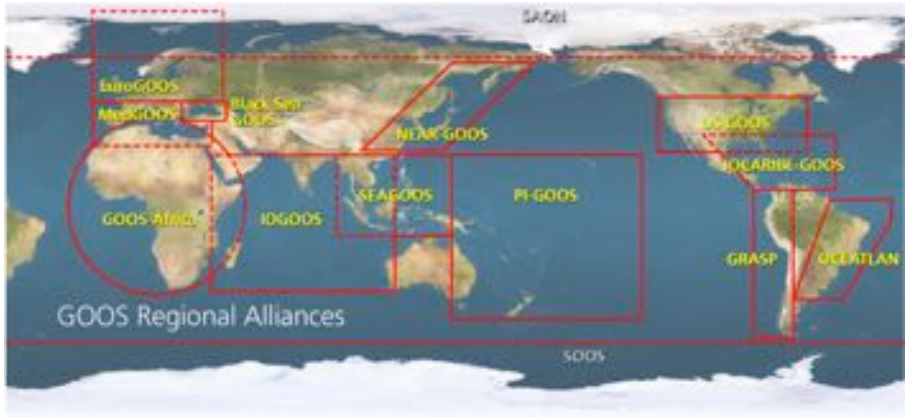
CIT R & D
CENTER FOR INNOVATIVE TECHNOLOGY



U.S. Integrated Ocean Observing System

IOOS
INTEGRATED OCEAN OBSERVING SYSTEM

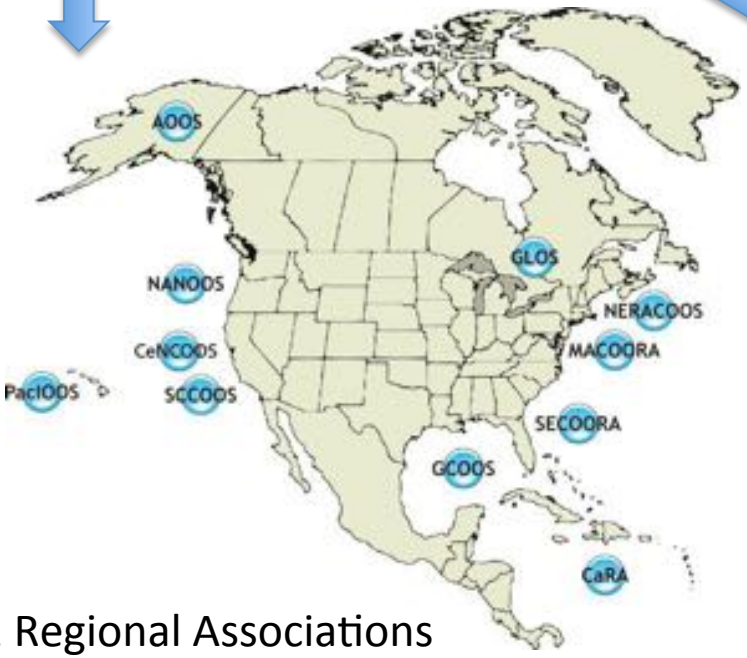
International Component



Global Ocean Observing System

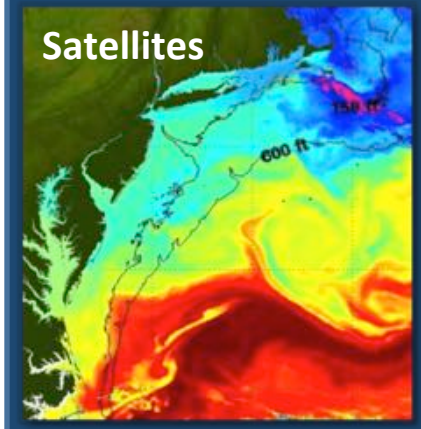
Regional Component

National Component

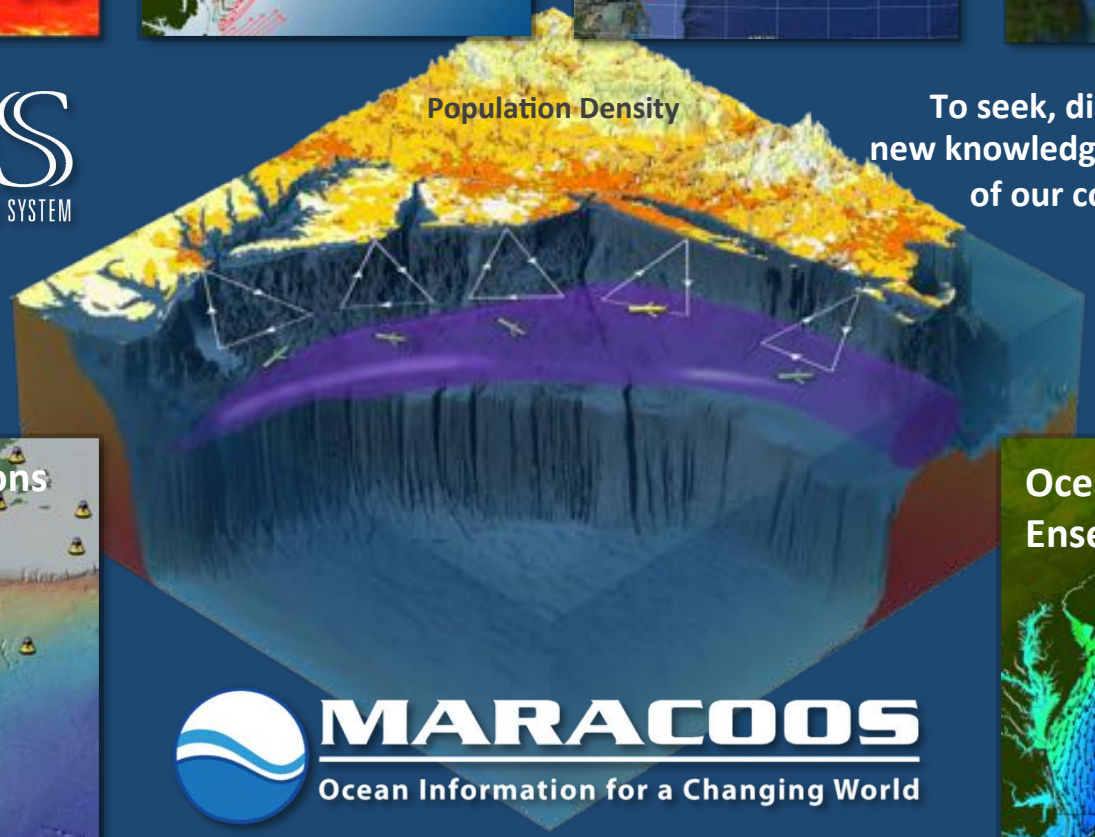


11 Regional Associations

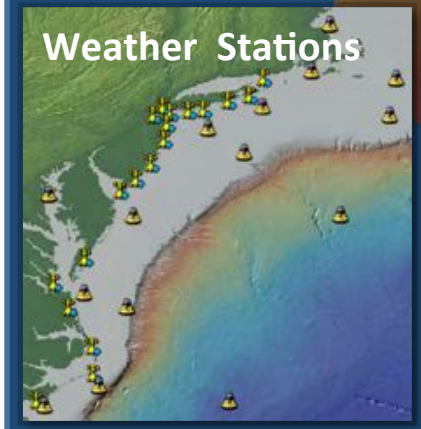
18 U.S. Federal Agencies

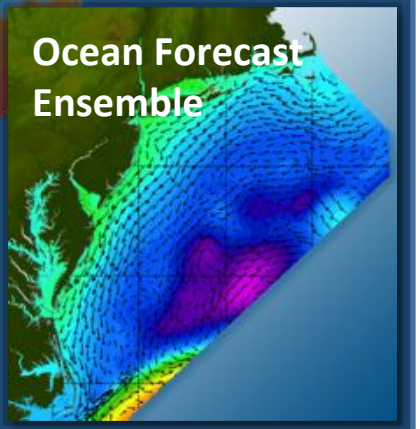


IOOS
INTEGRATED OCEAN OBSERVING SYSTEM



To seek, discover & apply new knowledge & understanding of our coastal ocean

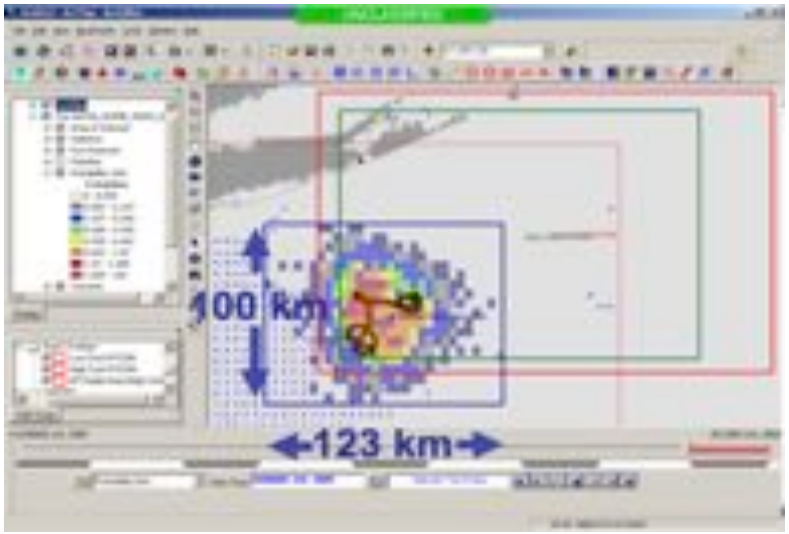




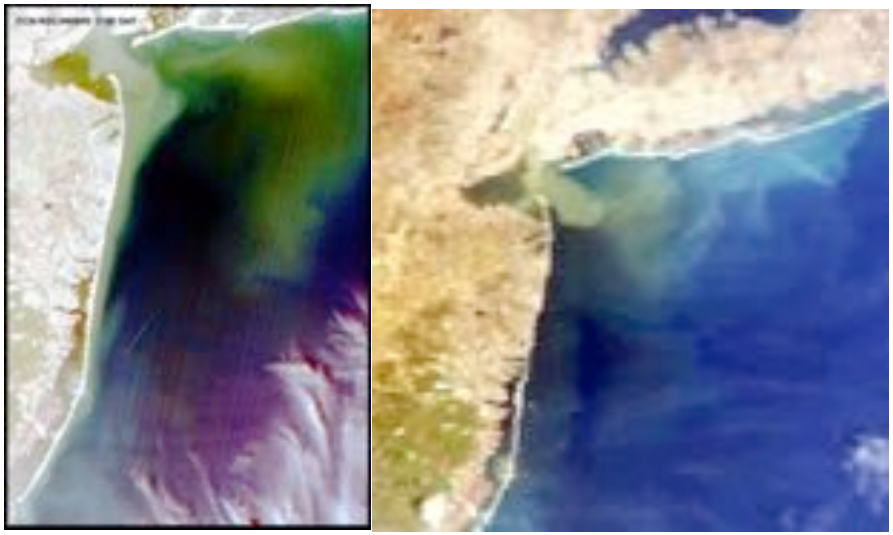
MARACOOS
Ocean Information for a Changing World

MARACOOS REGIONAL THEMES & SUCCESS STORIES

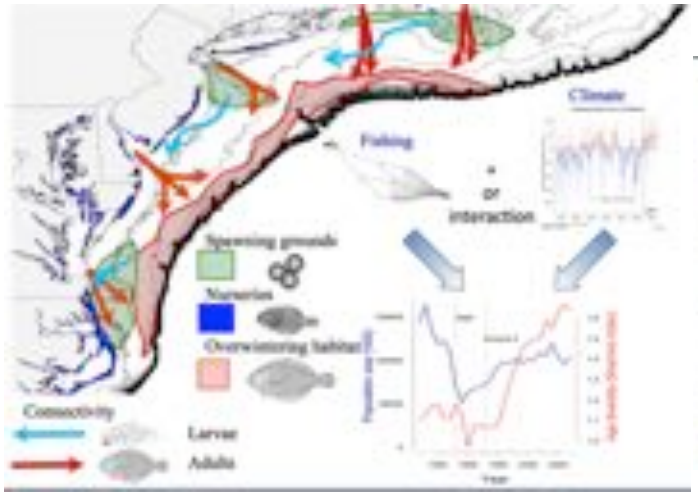
1) Maritime Operations – Safety at Sea



3) Water Quality – a) Floatables, b) Hypoxia, c) Nutrients

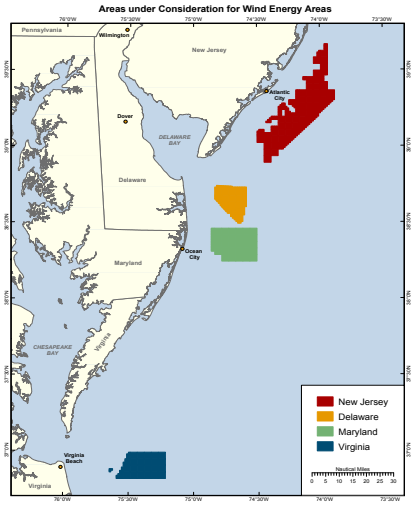


2) Ecosystem Decision Support - Fisheries



4) Coastal Inundation - Flooding

5) Energy – Offshore Wind



Themes and Capabilities

	MARCOOS Capabilities					
MACOORA Themes	**Weather Mesonet**	**HF Radar Network**	**Statistical STPS Forecast**	**Satellite Imagery**	**Glider Surveys**	**Dynamical Ocean Forecasts**
1. Maritime Safety	Operational input to USCG SAROPS	Operational input to USCG SAROPS	Operational input to USCG SAROPS			
2. Ecological Decision Support		Circulation and divergence maps for habitat		SST & Color for habitat	Subsurface T & S for habitat	3-D Fields of T, S, circulation for habitat
3. Water Quality	Winds for transport, river plumes, & upwelling	Surface currents for floatables, bacteria, spill response	Surface currents for floatables, bacteria, spill response	Ocean color for river plumes	Nearshore dissolved oxygen surveys	Surface currents for floatables, bacteria, spill response
4. Coastal Inundation	Weather forecast ensemble validation	Current forecast model validation				Nested forecast ensembles
5. Offshore Energy	Historical analysis & wind model validation	Historical current analysis & wind model validation		Historical analysis surface fronts & plumes for siting	Historical analysis subsurface fronts & plumes	Coupled ocean-atmosphere models for resource estimates

MARACOOS
Ocean Information for a Changing World

Success Stories – Making a Difference

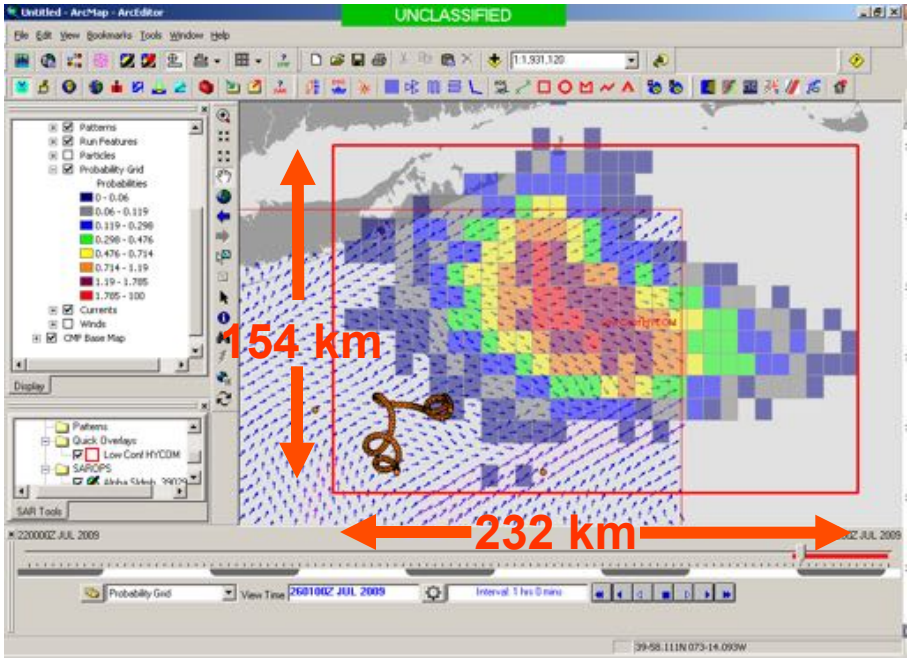
Optimizing HF Radar for SAR using USCG Surface Drifters

Art Allen
U.S. Coast Guard

Scott Glenn
Rutgers University

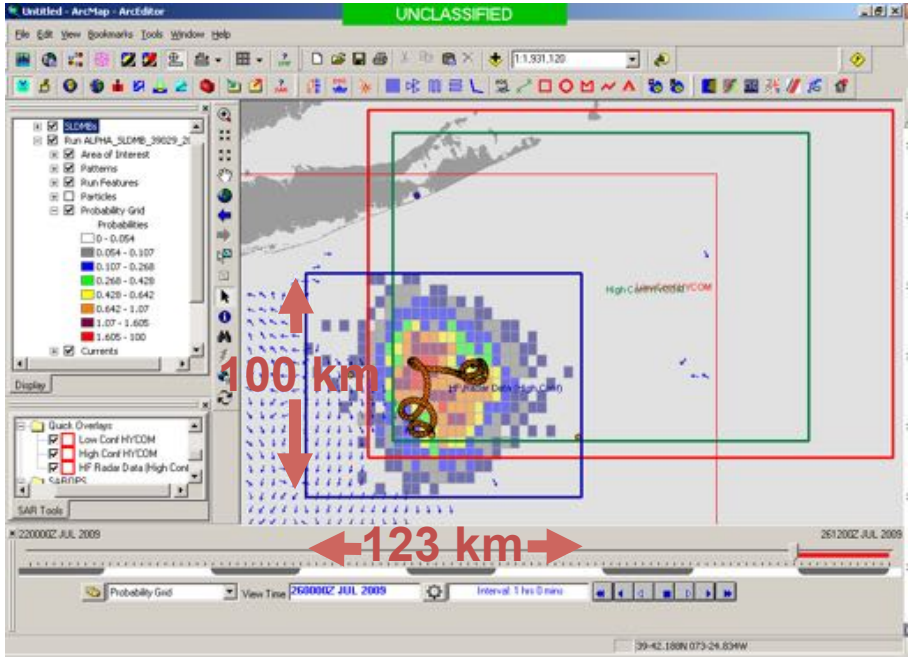
and the Mid-Atlantic Regional Coastal Ocean Observing System

Search Area After 96 Hours



HYCOM

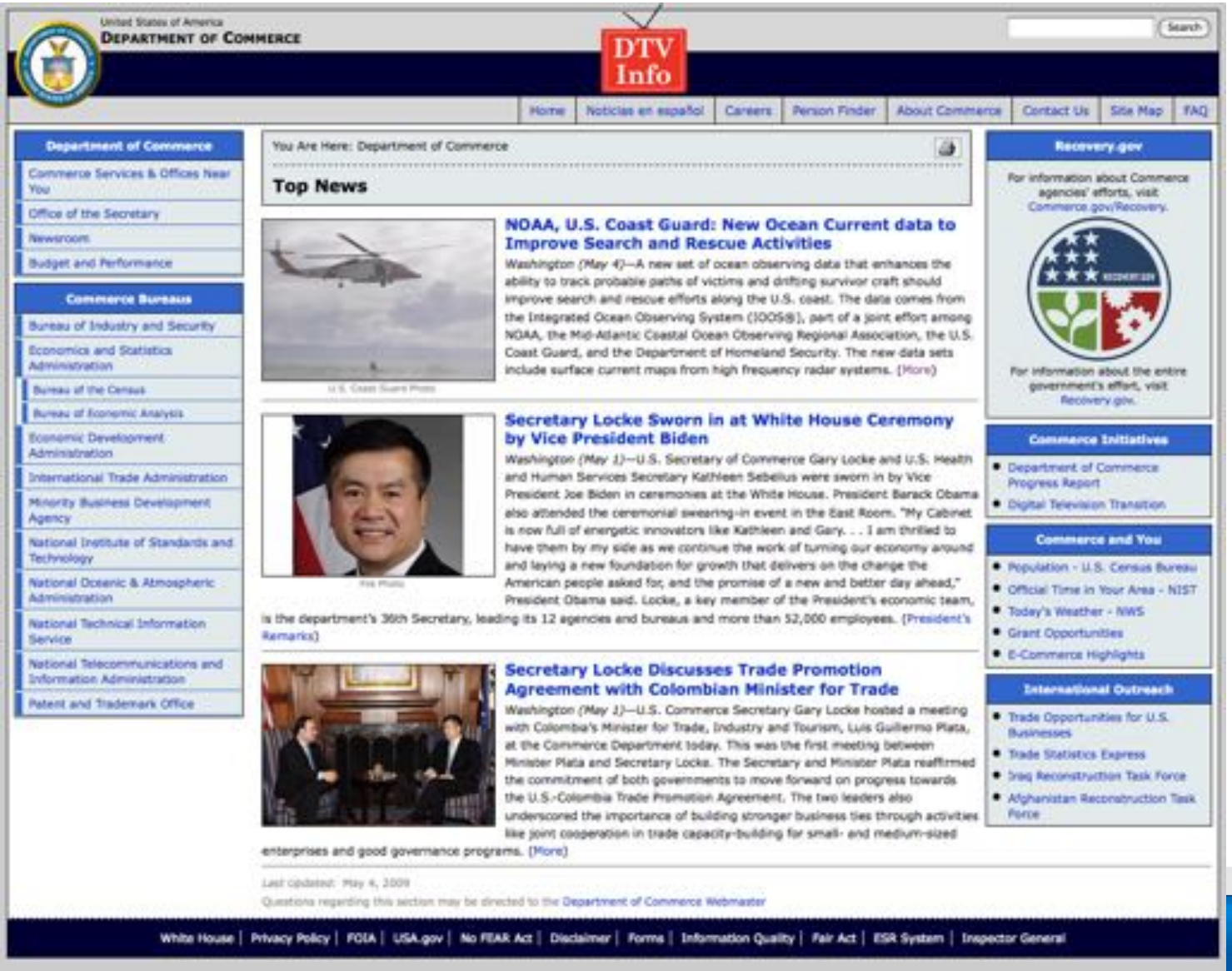
36,000 km^2



CODAR

12,000 km^2

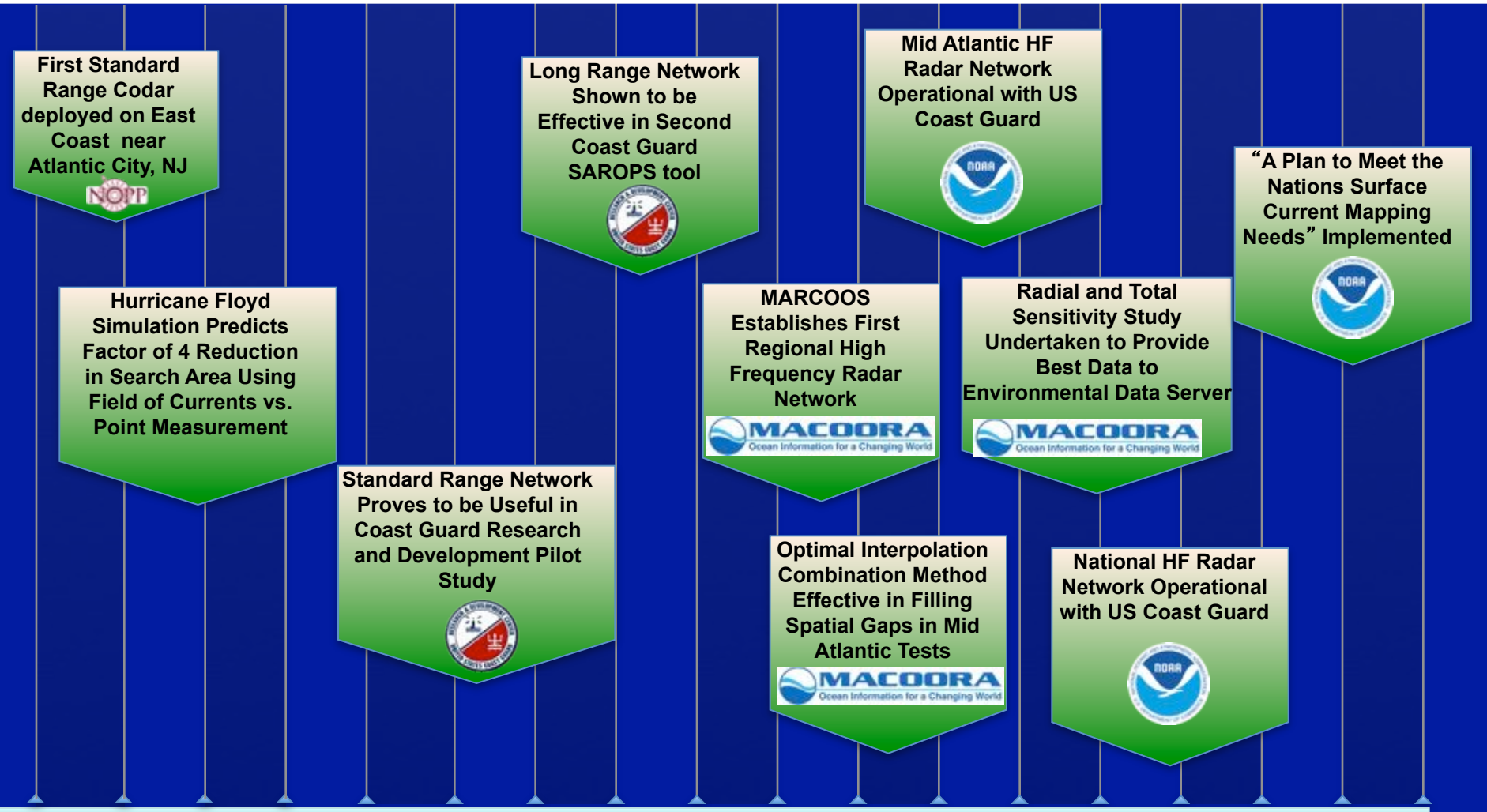
May 4, 2009: After a year of testing, NOAA Announces on U.S. Department of Commerce Website that MARACOOS CODAR is Operational in SAROPS



U.S. IOOS Goal for 2010-2011: Bring all sustained regional-scale HFR networks up to operational status in USCG SAROPS

3 West Coast Regions for California & Oregon

HFR Current Mapping Product Development Road Map for Search and Rescue



Thank You