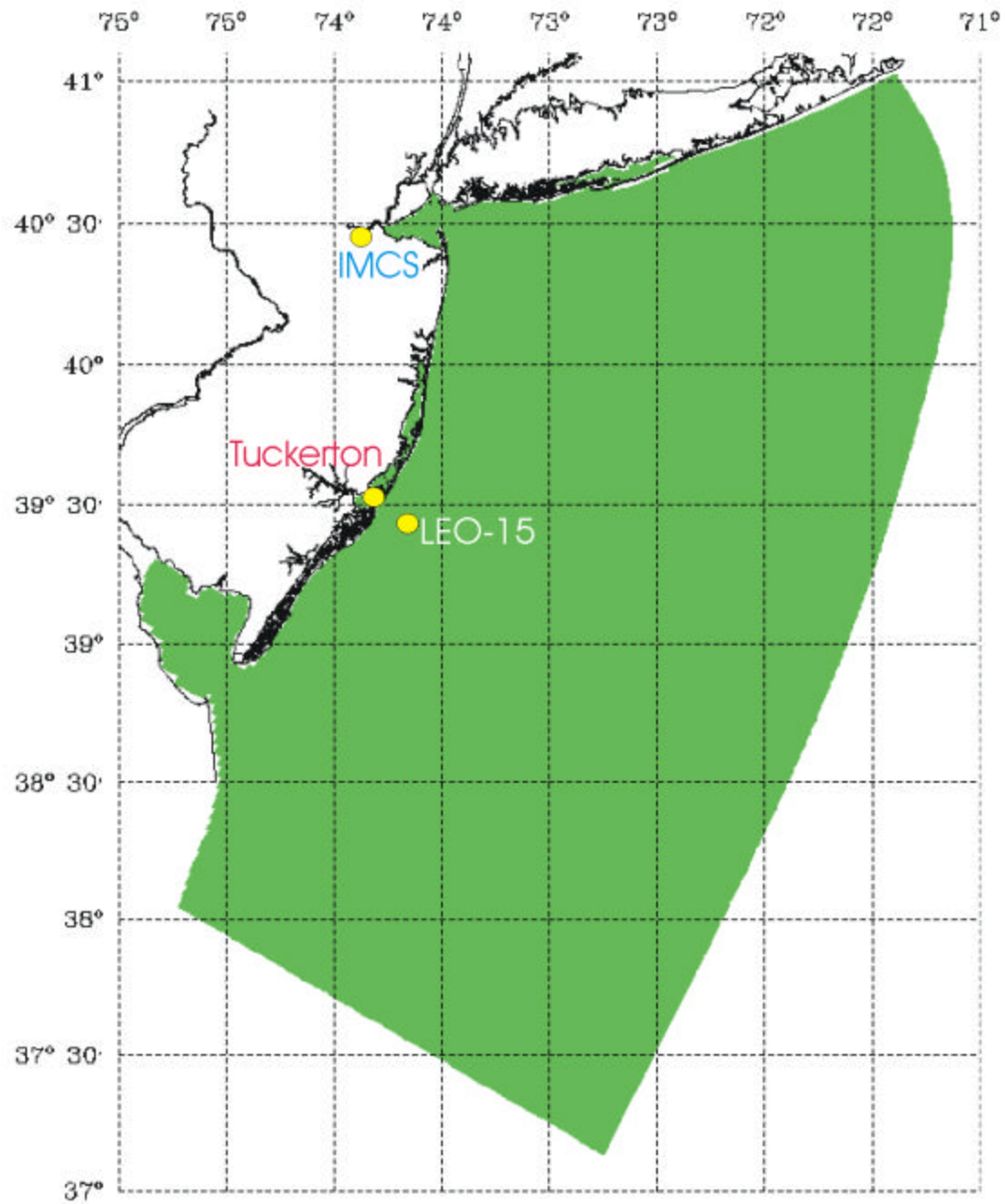
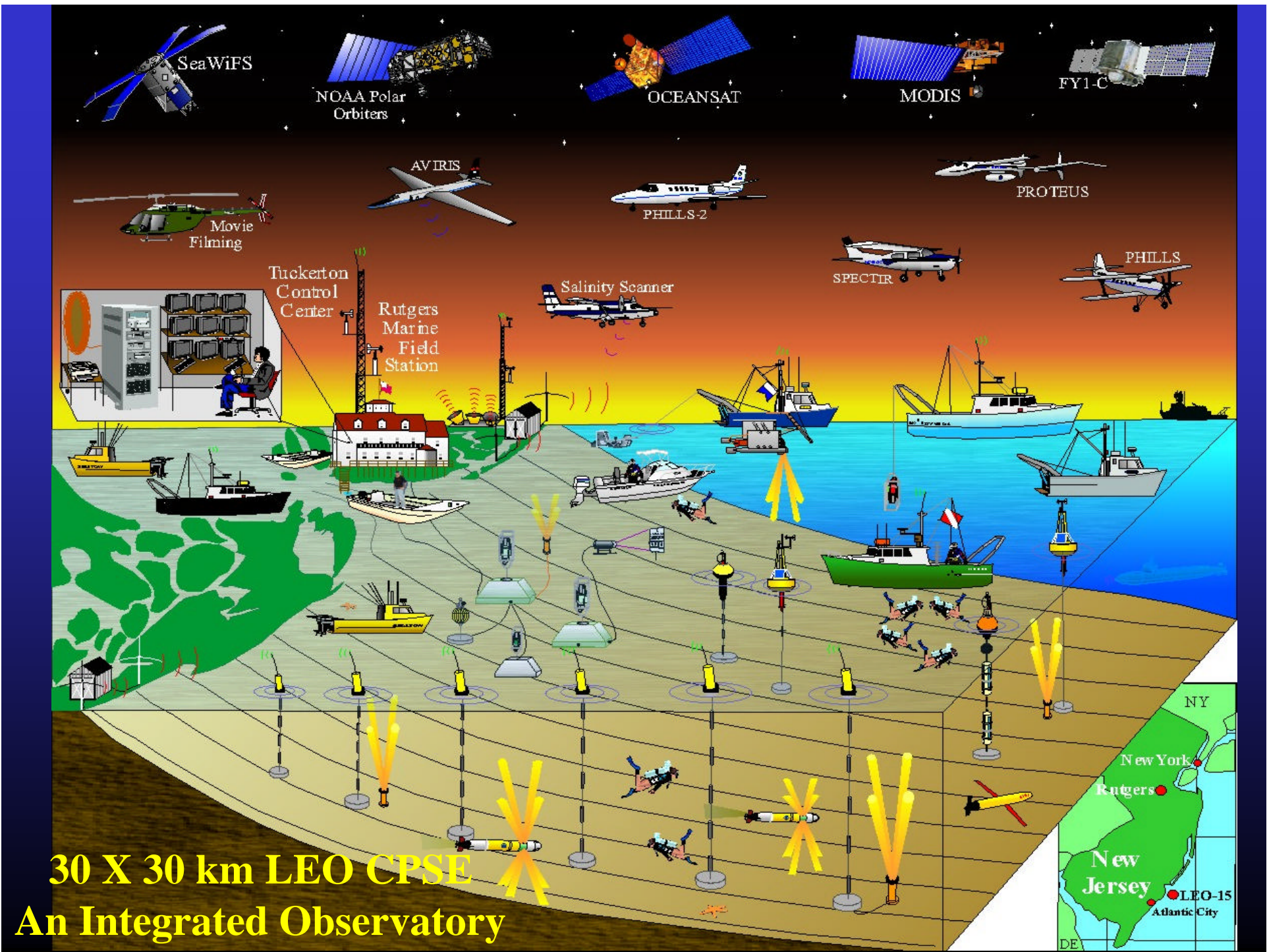




Regional
Ocean
Modeling
System

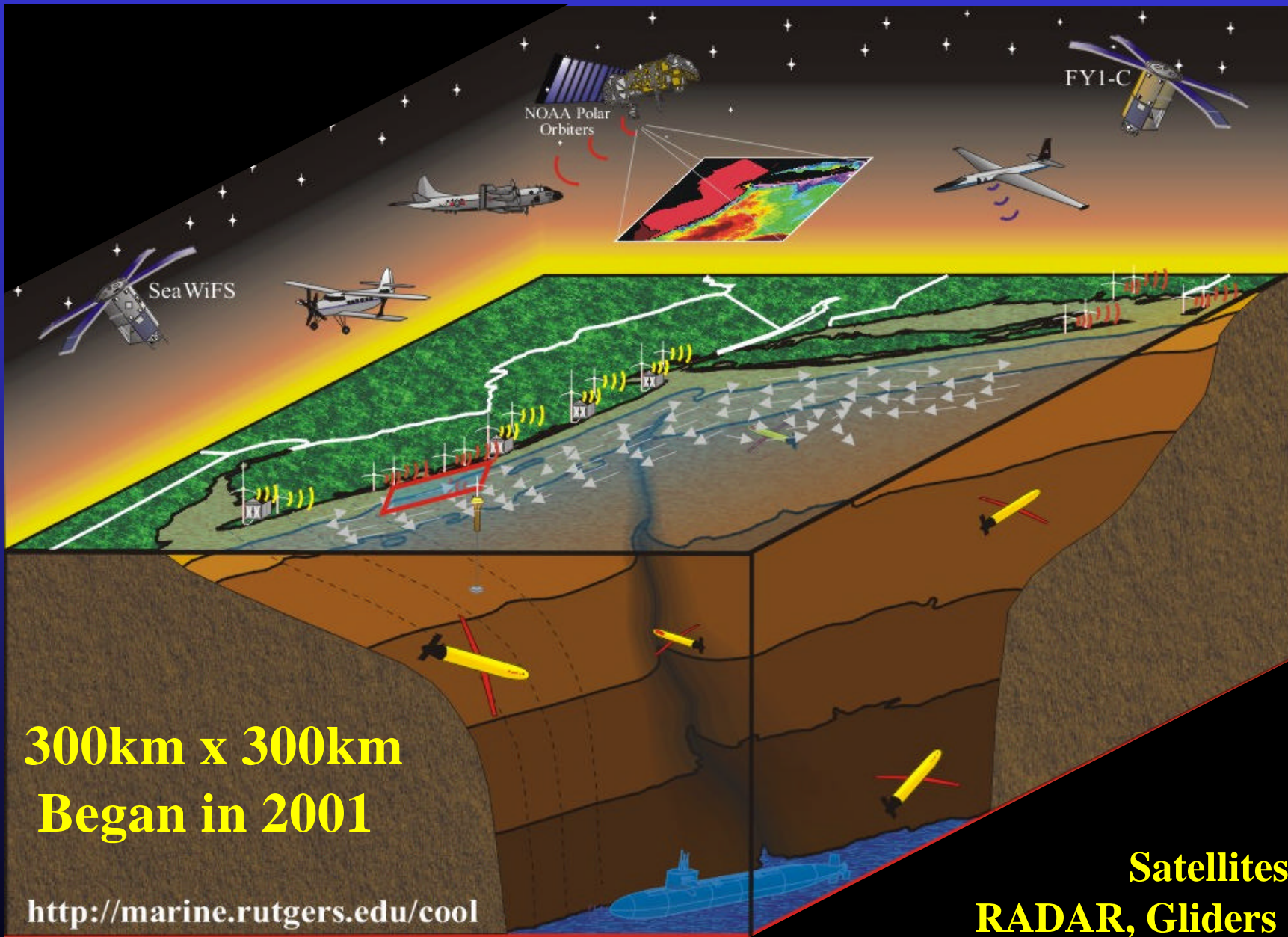
ROMS





30 X 30 km LEO CPSE
An Integrated Observatory

New Jersey Shelf Observing System (NJ-SOS)



Rutgers University Marine Remote Sensing

L-Band

Operational since 1992



L-band currently tracks:

NOAA-12, 16, 17

SeaWiFS

FY1-C, FY1-D

X-Band

To be installed in 2003



X-band will track:

MODIS Aqua/Terra

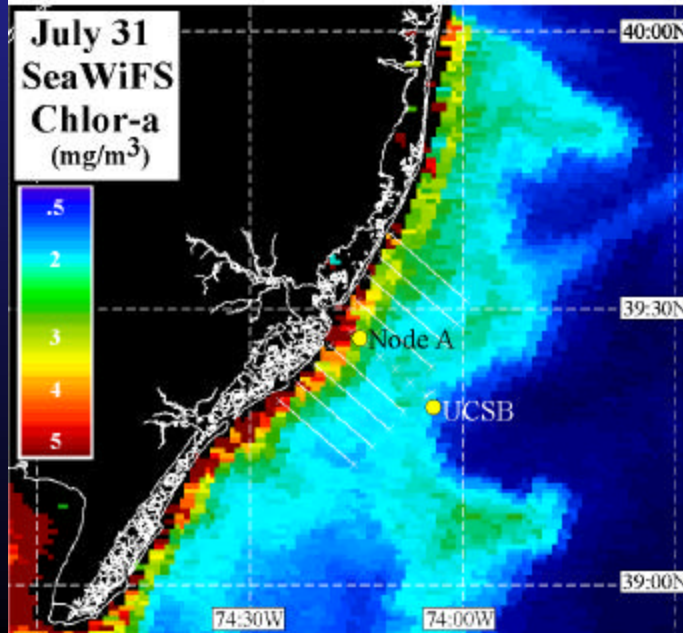
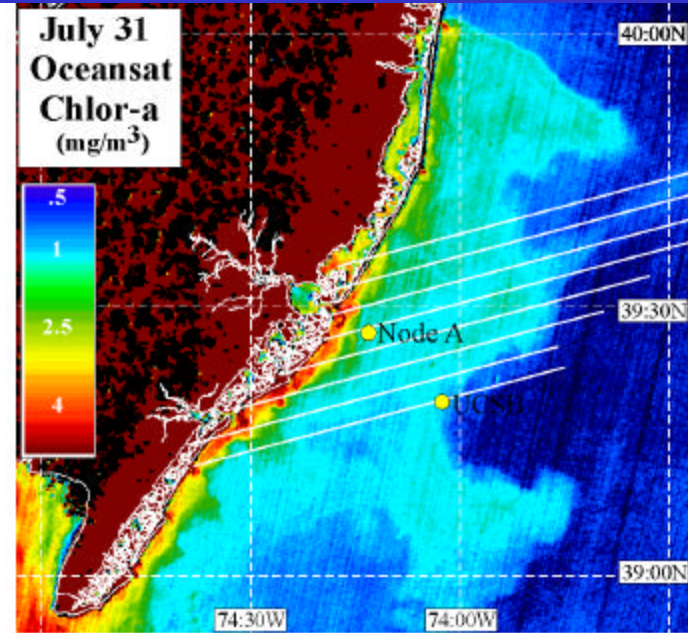
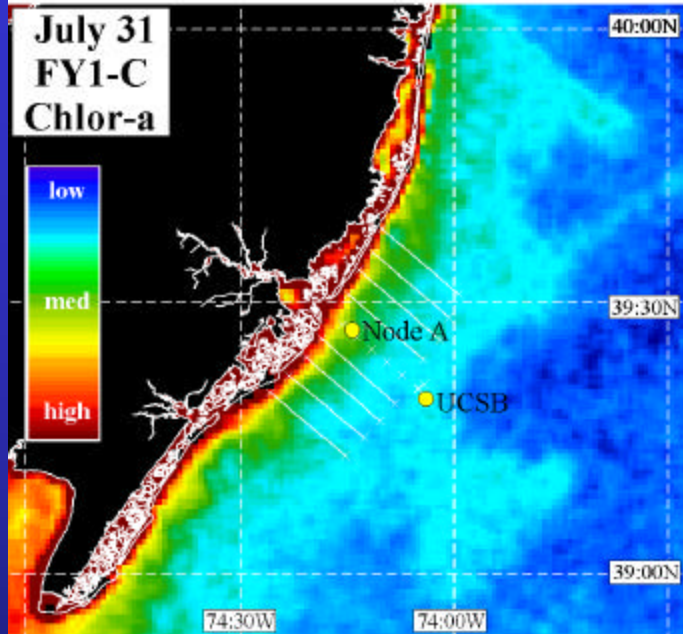
Oceansat

Radarsat

ADEOS 2

HY1

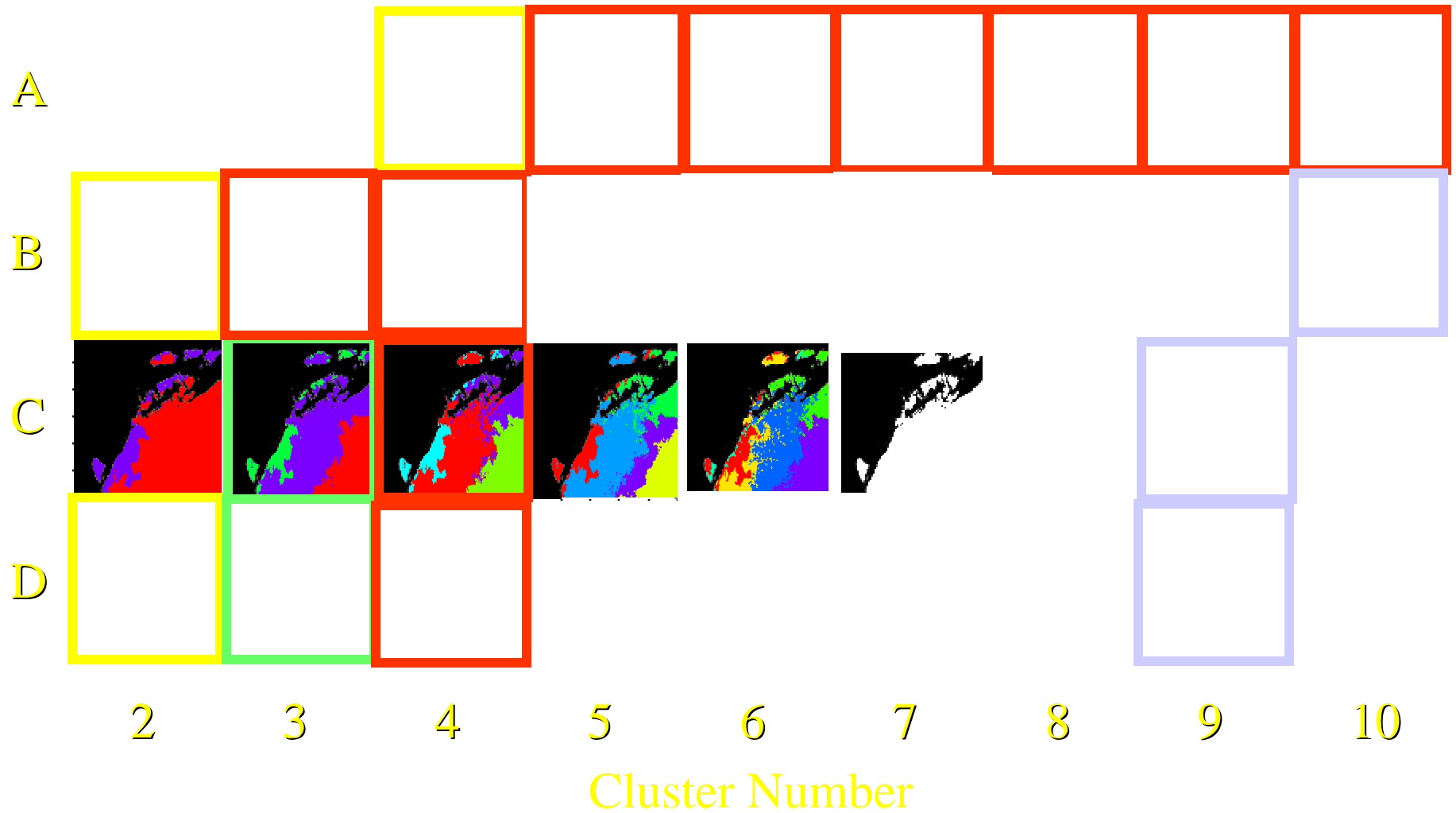
International Constellation of Ocean Color Satellites



X-Band Earth Observing Satellites

EOS (MODIS)	USA	2001
NEMO (COIS)	USA	2004
Orbview-2 (SeaWiFS)	USA	Op.
HY-1 (COCTS/CZI)	China	2002
FY1-C (MVISR)	China	Op.
FY1-D (MVISR)	China	2002
IRS-P3 (MOS)	India	Op.
IRS-P4 (OCM)	India	Op.
ADEOS-2 (GLI/POLDER)	Japan	2002
ENVISAT(MERIS)	Europe	2002

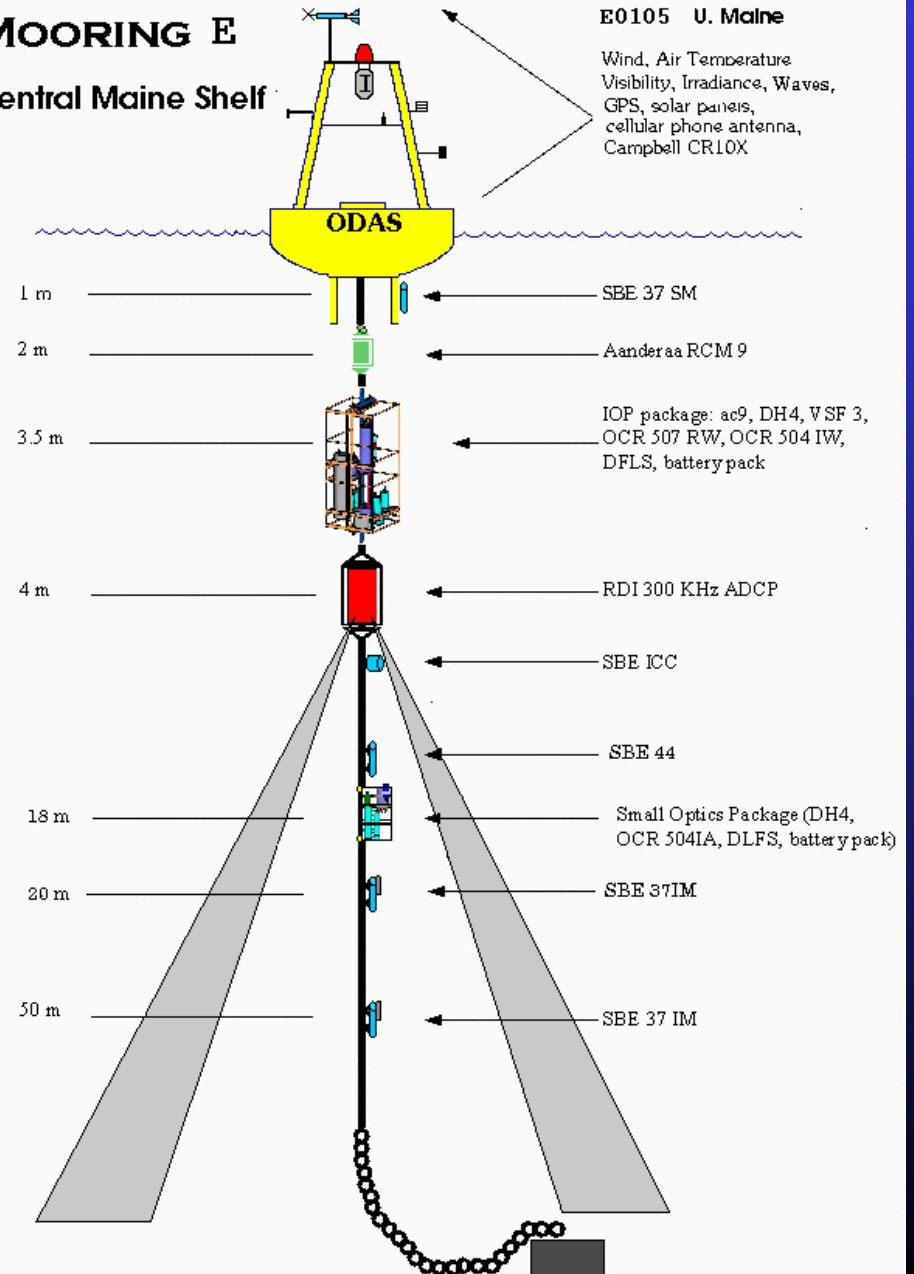
Boundary Analysis



- A) Agglomerative Clustering using complete linkage
- B) Agglomerative Clustering using Ward's Linkage
- C) K-means Clustering with random initialization
- D) C-means fuzzy clustering with random initialization



MOORING E Central Maine Shelf



Nested Multi-Static CODAR Array

Beach



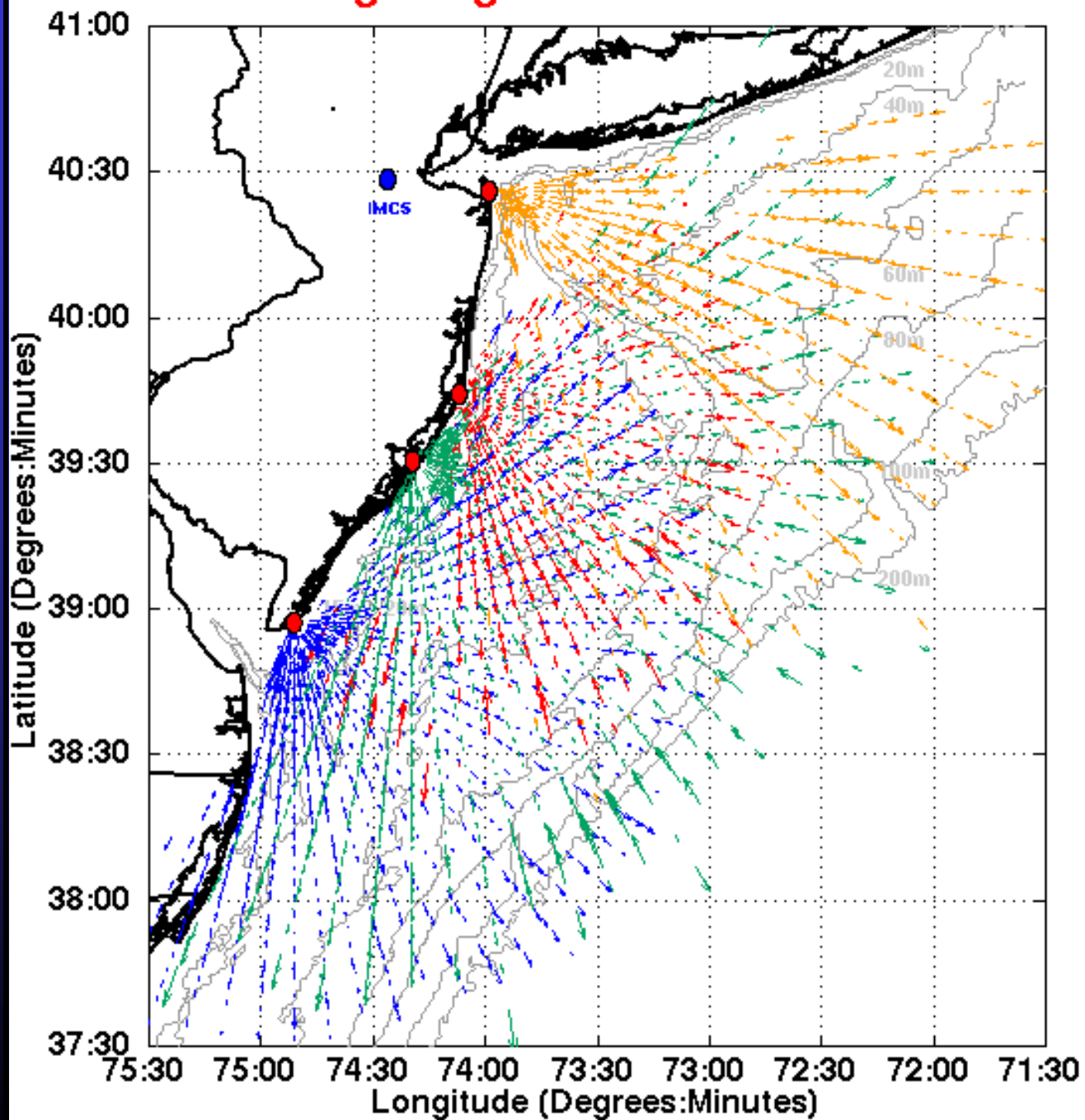
Buoys



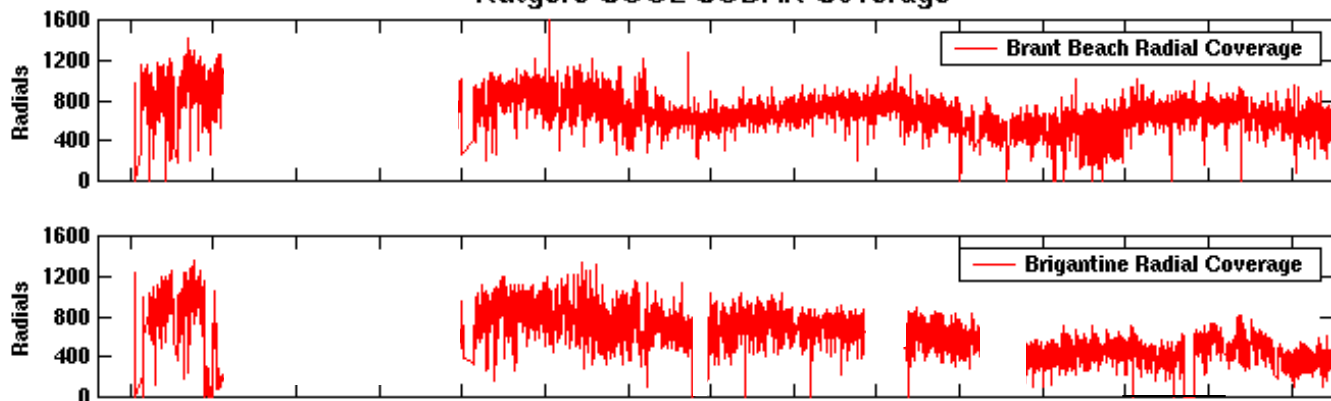
Boats



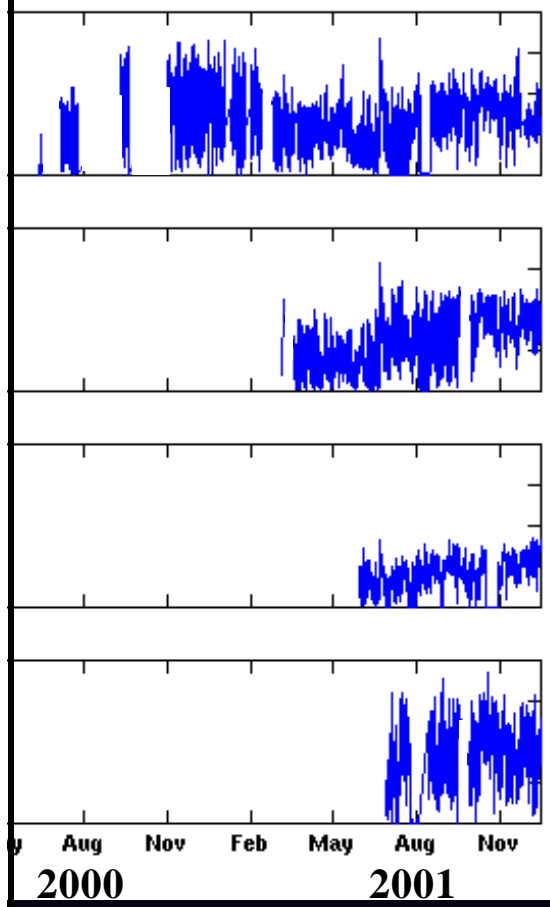
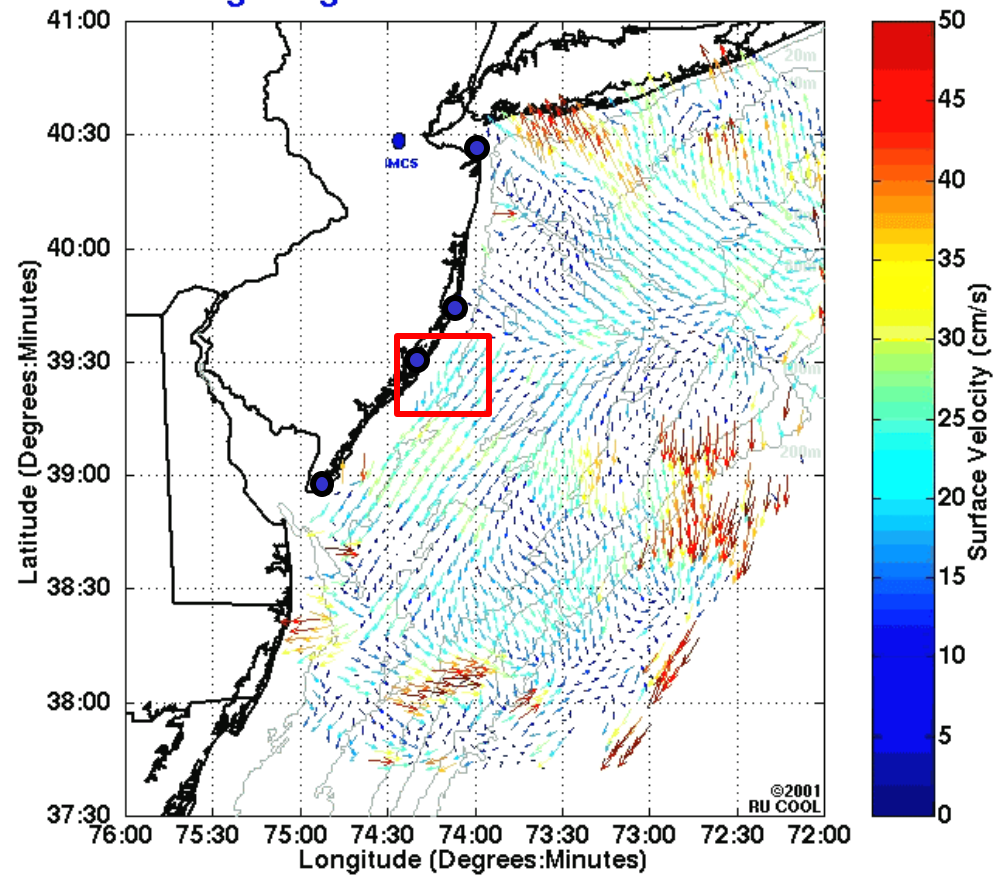
RU COOL Long Range Radials 12/22/2001 1800 GMT



Rutgers COOL CODAR Coverage



RU COOL Long Range Raw Velocities 2001/07/30 2100 GMT



Adaptive Sampling with Aircraft Sensors



**Spectral Technology Innovation & Research
SPECTIR**



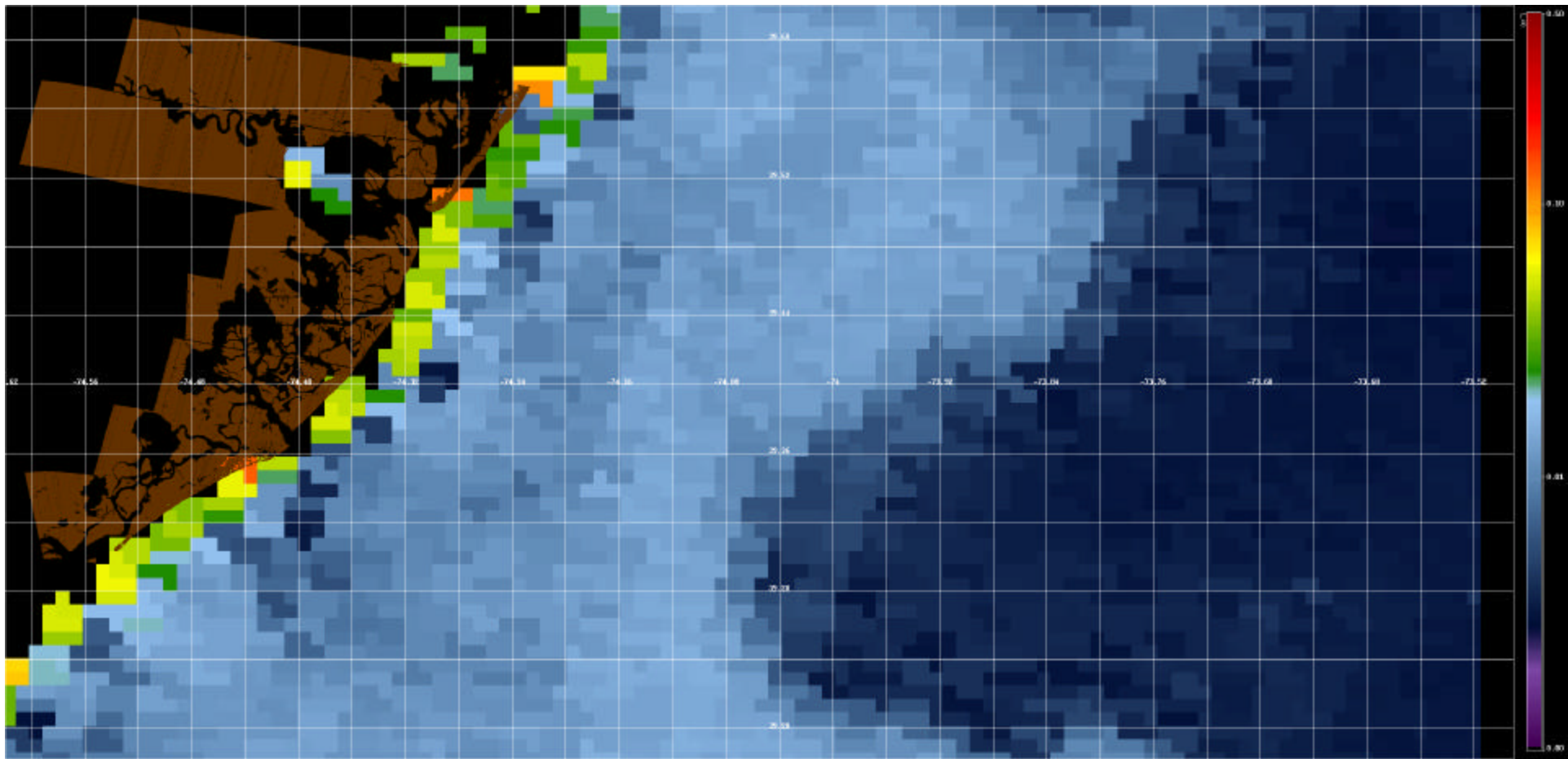
NOAA Citation – PHILLS II



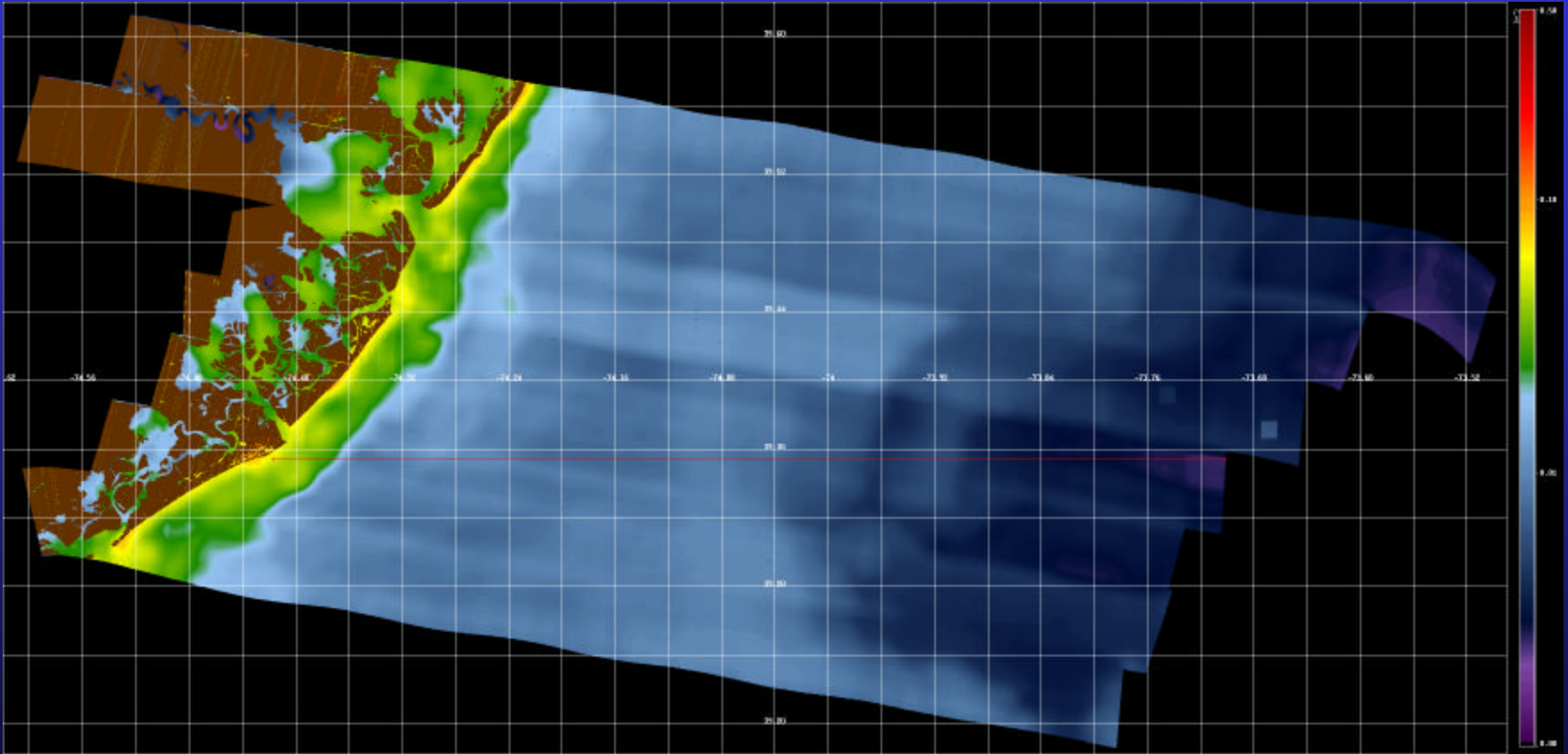
NASA – AVIRIS



Antanov – NRL PHILLS

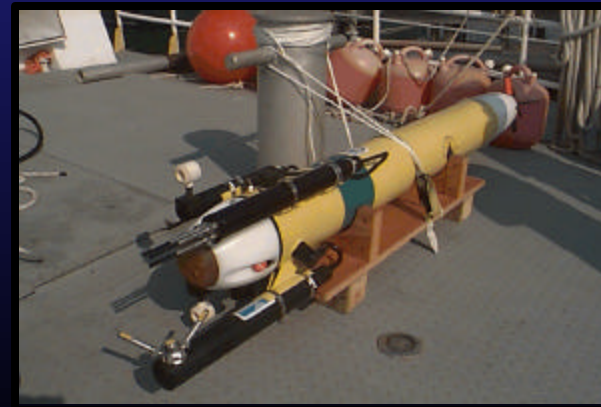
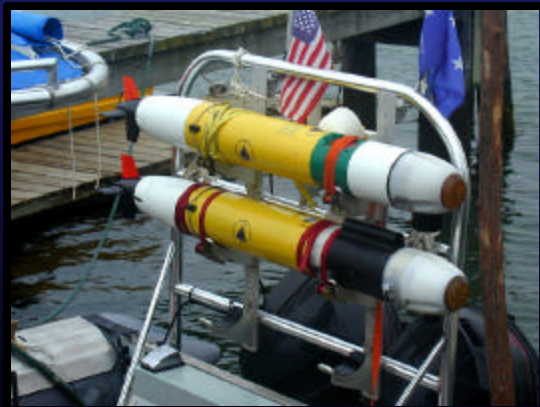
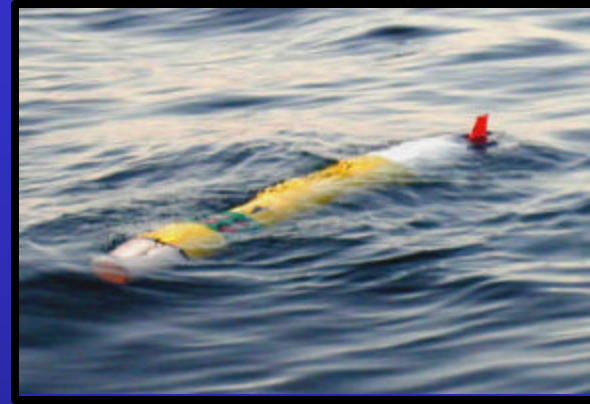
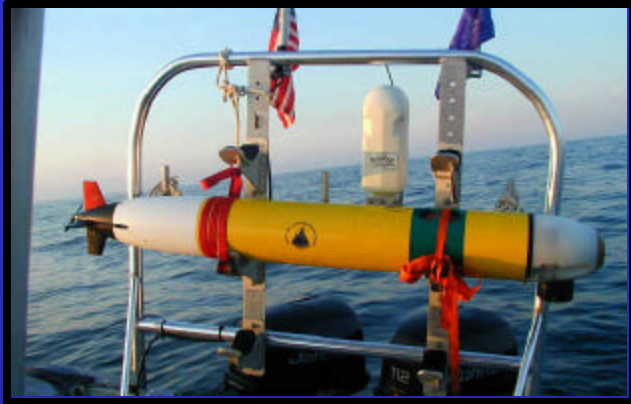


SeaWIFS – bb_arnone



Phills_bbb555_Arnone Smoothed
July 31, 2001

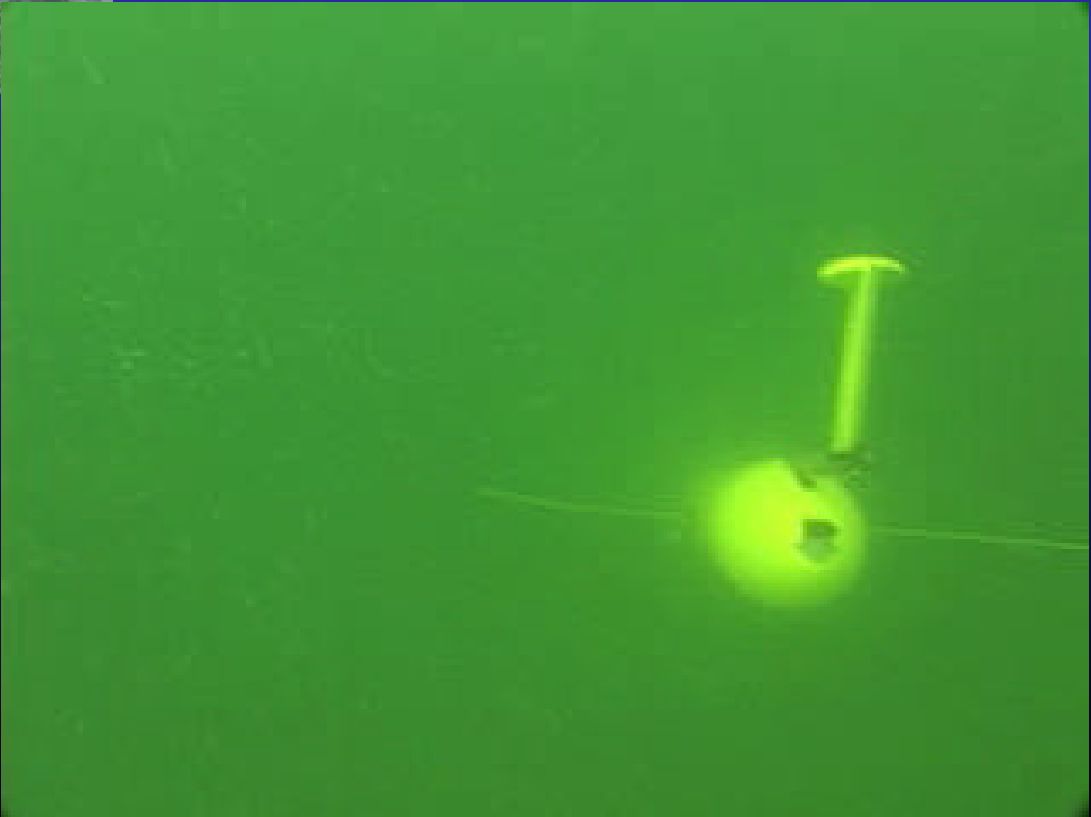
Adaptive Sampling with REMUS AUVs



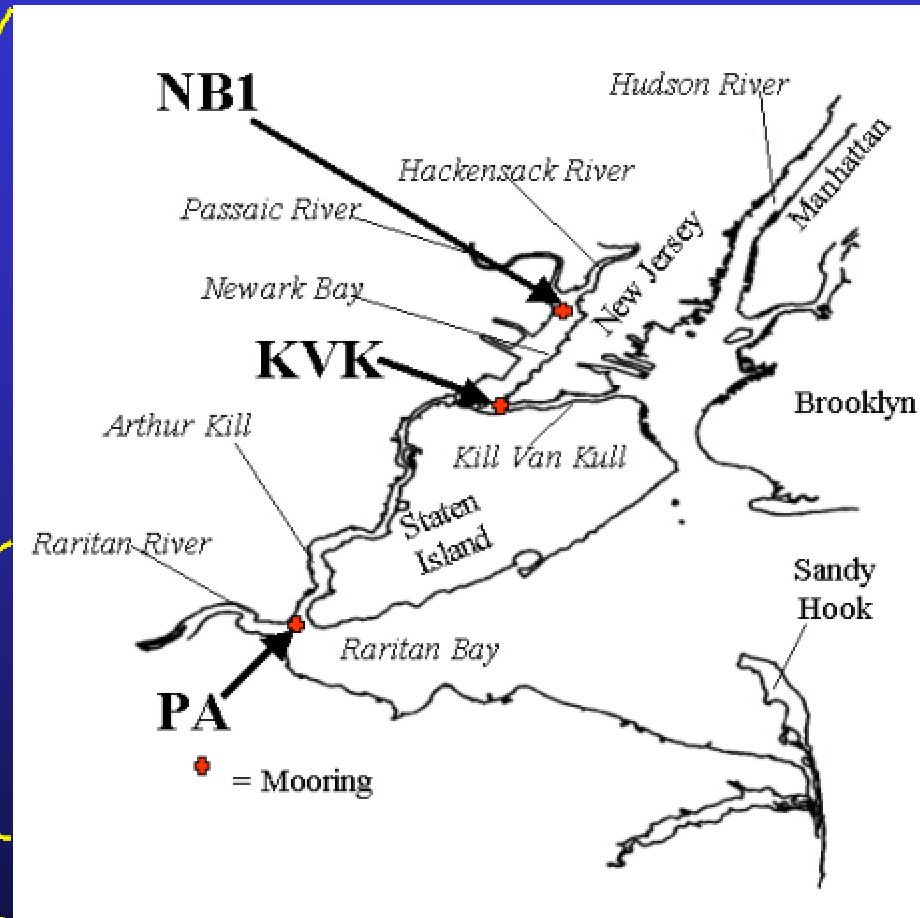
Slocum Autonomous Glider – Webb Research



Jan 14, 2003



New York Harbor



Economic Impact

\$ 30 Billion

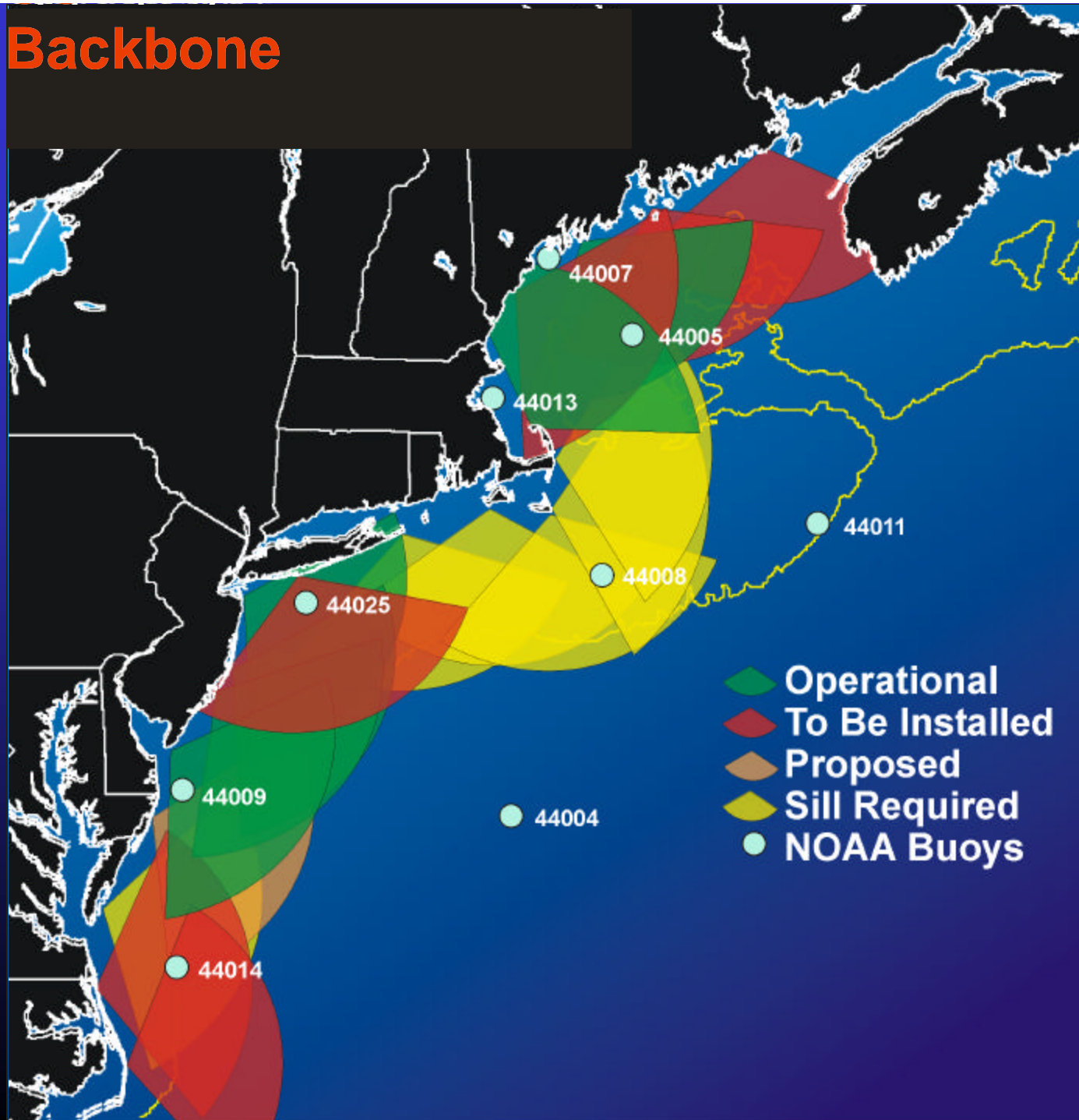
NJDOT Maritime Operations Budget

\$300 Million

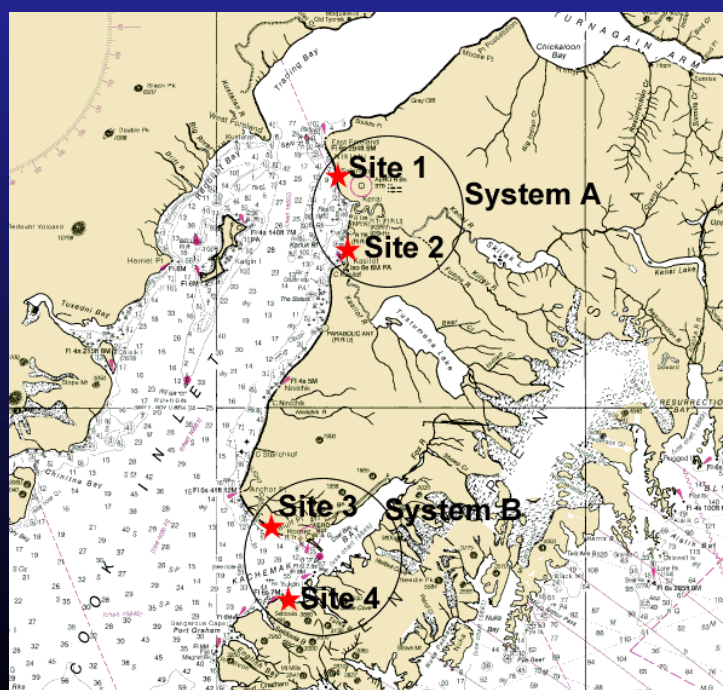
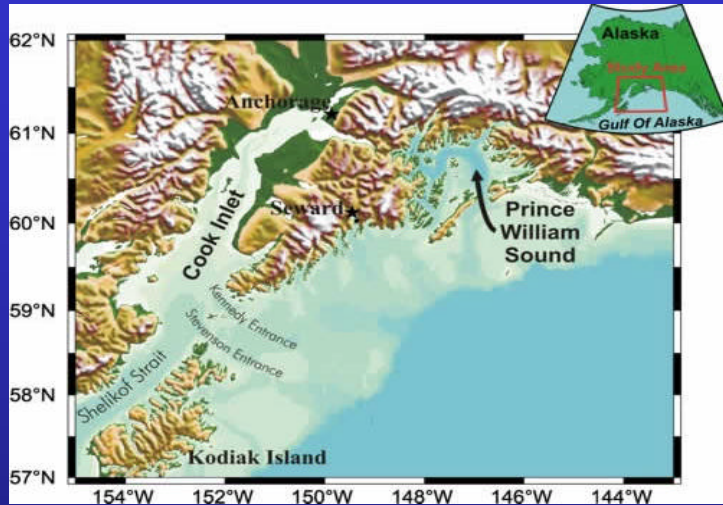
Harbor Science Budgets

\$3 Million

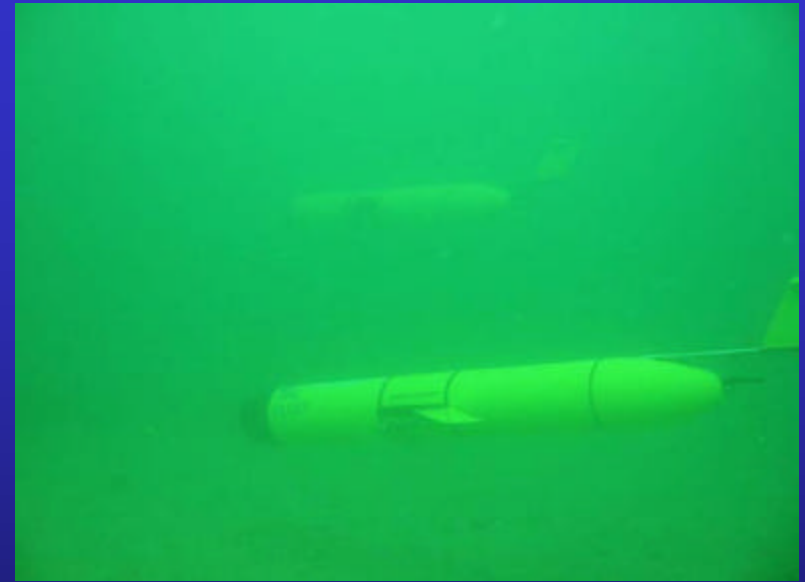
Backbone



Alaska CODAR



Florida Glider Deployment

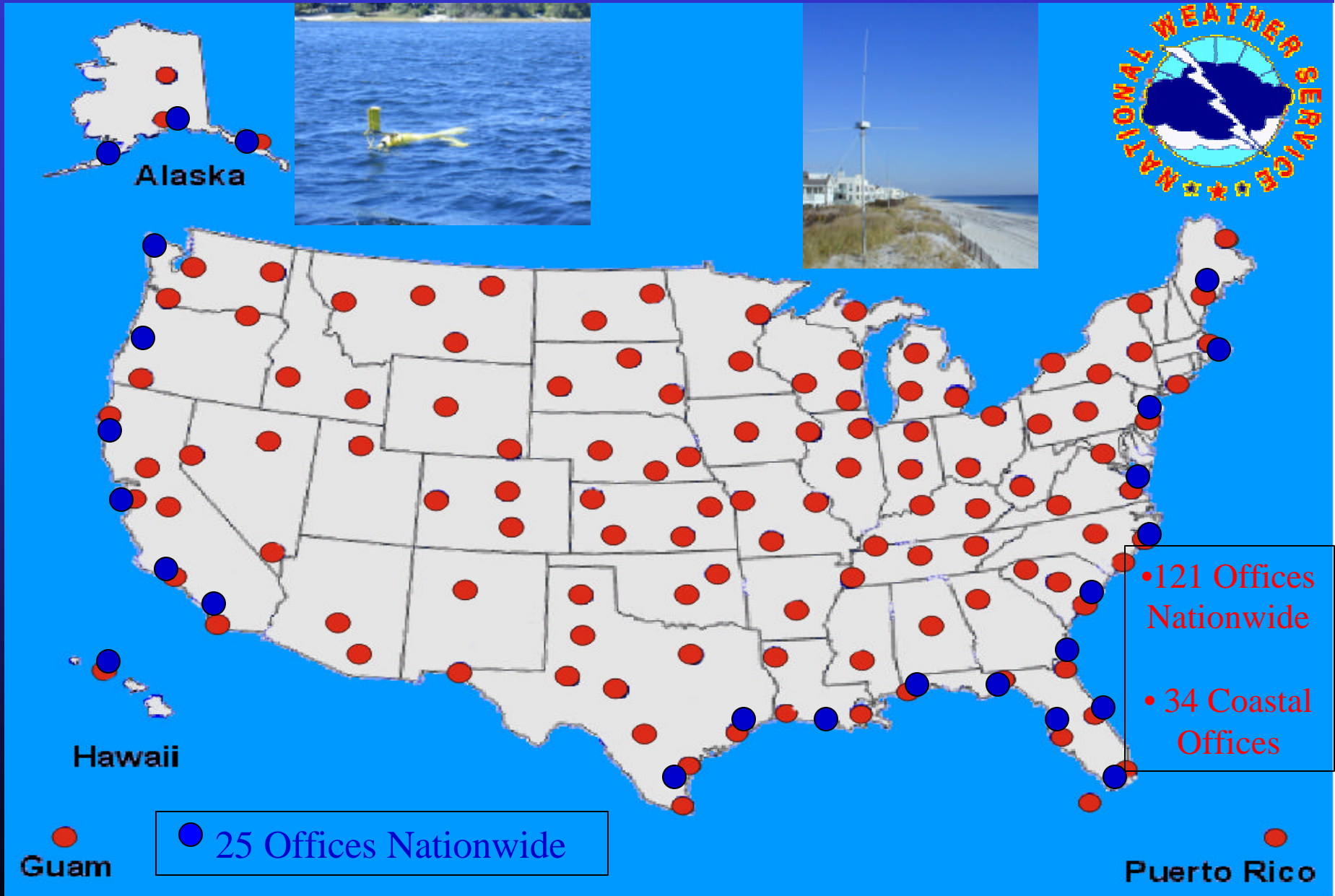


Actively expanded to Bergen, Norway



**Collaborating to expand to Philippines
for study in Luzon Strait**

National Network of Regional Observatories



R/V Endeavor



R/V Endeavor is owned by the National Science Foundation and operated under a Charter Party Agreement by the Graduate School of Oceanography at the University of Rhode Island. Originally built in 1975 she underwent a major mid-life refit in 1993. The vessel is home-ported in Narragansett, RI at the URI Bay Campus and is scheduled by the UNOLS scheduling committee.

R/V Cape Henlopen



R/V Cape Henlopen - University of Delaware



The R/V Cape Henlopen is a general purpose, coastal research vessel operated by the University of Delaware as part of the UNOLS or “academic” fleet. The Cape Henlopen serves researches funded by the National Science Foundation, the Navy, and individual institutions and organizations. The ship’s normal operating area is the Delaware and Chesapeake Bays and the adjacent coastal waters out to 200 nautical miles. However, work is periodically conducted as far north as the Gulf of Maine, as far south as Florida, and as far off shore as Bermuda. The vessel is outfitted with a full range of oceanographic equipment and instrumentation, all of which are available for use when the vessel is chartered.

The ship can accommodate up to 12 scientists on missions lasting up to 10 days, ranging from tracking coastal currents to studying shark behavior. It is equipped with a full range of oceanographic instrumentation including portable chemistry labs; a conductivity, temperature, and depth profiling system; an acoustic doppler current profiler; a meteorological and sea-surface mapping system; and a variety of sediment and water sampling equipment. Navigation is based on the global positioning system (GPS).

R/V Cape Hatteras



The R/V Cape Hatteras is owned by the National Science Foundation and operated under a renewable Charter Party Agreement by the Duke/University of North Carolina Oceanographic Consortium. Her homeport is at Duke University Marine Laboratory in Beaufort, North Carolina and she is scheduled by UNOLS (University-National Oceanographic Laboratory System). Her areas of operation are the North American coast from Nova Scotia to the Caribbean, and beyond Bermuda. She is operated primarily as a Coastal Zone Research Vessel.

R/V Connecticut



The R/V Connecticut is a steel hull, single screw, diesel powered research vessel, outfitted for year-round coastal and near continental shelf service. Built by Washburn and Doughty Associates, Inc., East Boothbay, Maine, the vessel was launched in July 1998 and is homeported at the Marine Sciences & Technology Center in Groton, CT.

The vessel can accommodate up to 30 people for day trips and up to 12 people for overnight and extended science missions. Endurance is 7-10 days. The design favors stability and precise low speed handling and positioning capability which is accomplished with bow and stern pump jet thrusters.

The ship features wet and dry laboratory spaces and a mid-ship mounted, 20" diameter, instrument wet well which allows transducers or sampling gear to be installed through a main deck access hatch. Hardwire connections can be routed to all science spaces. Science vans up to 20' in length can be placed on the large work deck and a full suite of deck machinery is available to perform a wide variety of oceanographic tasks.

R/V Savannah



The R/V *Savannah* represents a state-of-the-art improvement in seagoing opportunities for Skidaway and for the southeastern United States. Acquisition of the R/V *Savannah* began with the search for funds in 1996, and culminated with the arrival of our new ship in September 2001.

The R/V *Savannah* is operated by the Skidaway Institute of Oceanography and is a member of the University National Oceanographic Laboratory System (UNOLS) fleet. The R/V *Savannah* is ideal for biological, chemical, physical, and geological oceanographic studies in estuarine and continental shelf waters throughout the southeastern US Atlantic and Gulf Coasts.

R/V Fay Slover



This all new, 55 foot research platform leads the way in expanded research capability in the Hampton Roads and Chesapeake Bay regions.

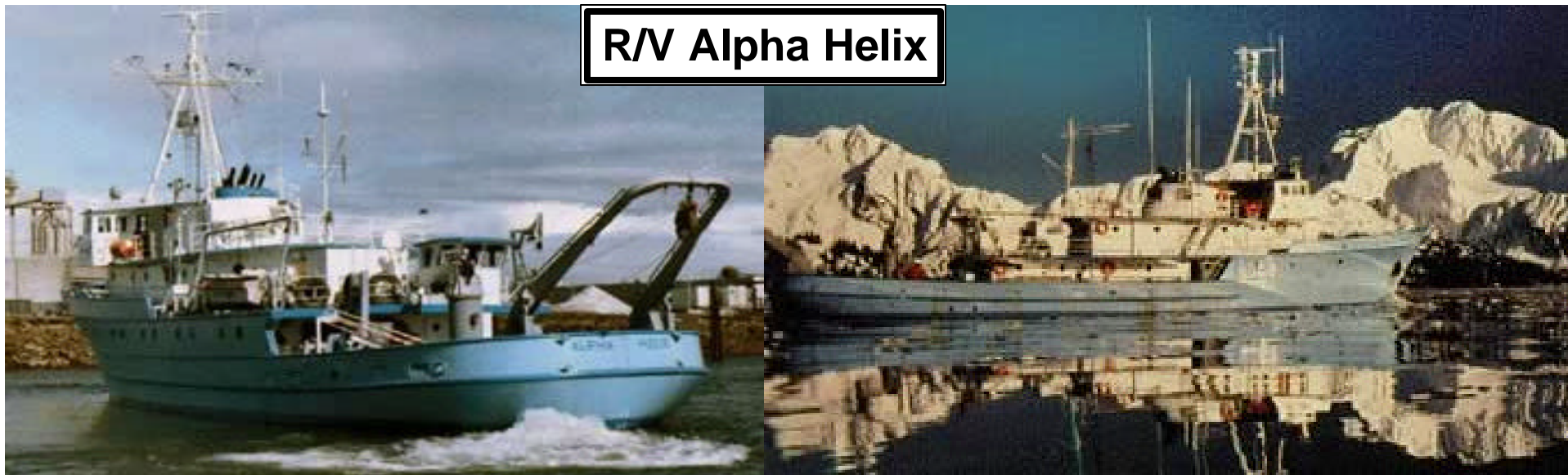
High horsepower diesel engines power R/V Fay Slover to speeds of 20 - 24 knots, thereby expanding the daily range of research operations.

Packed with onboard instrumentation and monitoring equipment, R/V Fay Slover routinely records the most commonly requested oceanographic and meteorological parameters.

R/V Argo Maine



R/V Alpha Helix



The 133-foot research vessel *Alpha Helix* is an oceanographic ship operated by the University of Alaska's Institute of Marine Science for the National Science Foundation. The ship's home port is Seward, Alaska. The *Alpha Helix* was formerly a national oceanographic facility at Scripps Institution of Oceanography in La Jolla, California, and was acquired in 1980 to replace the smaller vessel *Acona*, which had supported University of Alaska marine studies since 1964.

The *Alpha Helix* is maintained and used as a year-round platform supporting oceanographic research on the open ocean and in Alaska's shelf and coastal waters. Its ice-strengthened hull permits surveys in regions covered by seasonal sea ice and in areas adjacent to the numerous tidewater glaciers occurring in Alaska's coastal zone.

The vessel provides living quarters for 15 scientists and a crew of 9. Working spaces include a large general purpose laboratory opening to the working area on the stern, an electronics room, a walk-in freezer, a temperature control room, a machine and wood shop, a library, and a wet laboratory.

The working space aft is served by a hydraulic crane with extendable boom, a stern A-frame, a hydrographic winch and a deep-sea winch, both with conducting cables. A bow thruster is available for station keeping at sea. Modern sampling equipment includes a global position system (GPS) navigation, an acoustic doppler current profiler, a quantitative echo-sounding and integration system, on board computers and satellite voice and data links to the Fairbanks campus and worldwide. Through participation in the University National Oceanographic Laboratory System (UNOLS) the ship is available to the world-wide oceanographic community.

Coastal Science Recommendations

CoOP Report

Pioneer Array --- 30-40 Moorings

Mobile Platforms --- Ships and AUVs

Remote Platforms --- Hyperspectral Satellites
and HF Radars

SCOTS Report

Cross-shelf lines of cabled science nodes with
spidering subnodes deployed in water depths
from shallow diver-serviced depths to deep water.

Coastal cables are a component of a larger network

All

Observations coupled to models.

Midsized Coastal Research Vessel

Shallow water operations O(10m)

24 Hour operations (including Marine Techs)

Sustained operations for several days

Standard sensor suites

Met, ADCP, CTD, Bio-optics, Acoustic Mapping

Broader bandwidth communications with shore

Send data back in real time

Access observatory datasets of websites

Computer Lab

Electronics Shop

Wet Lab

Deck space for a portable Lab van

Towing Capabilities (Outside the wake, both sides)

Undulaters (ex., SeaSoar)

Towbodies (ex., Batfish)

Nets for Fisheries

Midsized Coastal Research Vessel

Autonomous Vehicle Operations

**Short-term propeller-driven AUVs when stationary
(Ultra Short baseline navigation)**

Mission-duration (or longer) Glider AUVs

Autonomous Aircraft

Mooring Servicing

**Atmosphere/Ocean Physical/Bio-optical Moorings
(typically four 2-m diameter moorings per trip)**

HF Radar transmitter moorings

Bottom System servicing

Cabled observatory nodes

Bottom tripods deployment and recovery

ROV capabilities for servicing and sampling

Acoustically quiet

Ice Capable - Alaska

How many Midsize Vessels

Trade off between shorter duration missions and transit time between staging facilities

Typical mission duration – 5-10 days

Total Missions durations > total transit times

Multiple demands during peak periods

Examples – Peak spring discharge from the estuaries

Multiple ships for same experiment

Increased need for servicing missions to maintain long-term continuous

Both scheduled and emergency maintenance

Increased need for rapid response to events

Regional priorities differ

How many Midsize Vessels

First-cut at Locations

Gulf of Maine

Middle Atlantic Bight

South Atlantic Bight

Eastern Gulf of Mexico

Western Gulf of Mexico

Southern California

Northern California

Oregon

Washington

Southern Gulf of Alaska

Northern Gulf of Alaska

Bering Sea

Arctic Seas