Linking IOOS & NWQMN: Applications of New Estuarine & Coastal Observing Technologies

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Research
http://marine.rutgers.edu/cool

Operations Center
http://www.thecoolroom.org

K-12 Education
http://coolclassroom.org
Processes Operate of Time and Space
What is the frequency of events?

- Resuspension events
- Waste discharge, sewage discharge (pipe breakage, treatment plant failure, )
- Spills (oil, chemicals, etc.)
- North Atlantic climate Oscillation (NAO), etc.
- Hurricanes and coastal inundation
- Earthquakes
- Estuary: suspended sediment discharge
Monitoring designs

Benthos
- Gridded
- Remap/emap
- Habitat maps and nested sampling

Water column
- Adaptive sampling
A Global View from Space: Imagers and Altimeters

Passive Imagers for SST & Ocean Color

Active Radars for Altimetry
Rutgers Coastal Observatory

Provide a Long-term Shelf-Wide Context for High Resolution Nested Process Studies
New Enabling Technologies – Coastal Satellites

Water mass classification (Blooms vs Rivers)

Objective Gradient and Frontal Boundaries
New Enabling Technologies – CODAR HF Radar

Each Radar Measures Radial Component of the Surface Current

Hudson Plume – April, 2005
Summer Storm – July, 2005
New Enabling Technologies - Seafloor Cabled Observatories

SEAFLOOR CABLES: LEO-15

SUSTAINED PRESENCE TO CAPTURE “EVENTS’

Hudson River

Depth (m)

2.8  3.4  3.9  4.5

Particle size distribution

Julian Day

202 203 204 205 206 207 208 209 210 211 212 213 214 215

Evolving instrument deployment packages

Evolving profilers (still need work!)

LEO-15 COOL SIIM
New Enabling Technologies: GLIDER IN THE STORM

Depth-Averaged Currents
Surface Currents

Hurricane Ivan

Temperature

$\text{b}_{b532}$

$\text{b}_{b(532)/c(532)}$
A defining characteristic is the remote interactivity

Coastal Ocean Observation Lab
Center for Advanced and Sustained Technologies (CAST)
- **AirNet Communications Wireless Broadband** (~1.5 Mbps, coverage 7 miles offshore from Sandy Hook)

- **Verizon National Access** (~100 kbps, coverage up to 20+ miles off Long Island, less for New Jersey)

- **Freewave Radio Modems** (~80 kbps, coverage for a 18 mile radius centered at Sea Bright Fire Department)

- **Verizon Quick2Net** (14.4 kbps, coverage up to 20+ miles off both New Jersey and Long Island)

- **Iridium Satellite** (2,400 bps, global coverage, data and voice)
Evolving National HF Radar Network

20 Radars Operating, 5 Funded

10 Radars Operating, 20 Funded

As of April 2005

From Eric Terrill, SIO
Hypoxia/Anoxia & Bottom Bathymetry

Historical Recurrent Hypoxia Centers

Depth
- 12 m
- 15 m
- 20 m
- 25 m
- 30 m
- 35 m
- 40 m
- 50 m
- 100 m
- 500 m
- 1000 m
- 2500 m

Long Island
New Jersey
Cape May
Barnegat
LEO
Warsh – NOAA 1989

Summer late fall upwelling
TSS Transport ~ \[ Q \times TSS = 100 \text{ kg/s} \sim 10,000 \text{ MT/day} \]
\[ Q=400 \text{ m}^3/\text{s} \quad TSS\sim 250 \text{ gm/m}^3 \]

Q & TSS ~ 10 times above "normal"

- Transport 100 times above normal
- Export even relatively higher

If TCDD concentration .5 ppb event would transport 5 gms/day into Newark Bay
Suspended Sediment Flux MT/DAY

~30,000 MT/YEAR
..but underestimates big events.
The buoyant pulse front looks like a tidal bore as it flows past the R/V Cape Hatteras (2005)
Wind data from NOAA NDBC station at Ambrose Light
RU COOL Raw Velocities (HFR) 2005/04/11 0500 GMT

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The Nearshore Recirculation: A Potential Incubator (known to locals as the Frazer eddy)

A Biological Incubator
Abundant Nutrients
Large Phytoplankton
Plunging DO
Freshwater Plume Moves Out Across the Shelf:
Hudson Shelf Valley
The Nearshore Recirculation: A Potential Incubator (known to locals as the Frazer eddy)

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Freshwater Plume Moves Out Across the Shelf: Hudson Shelf Valley
Freshwater Plume Moves Out Across the Shelf: Water Mass Boundaries (Oliver et al., 2004)

April 13, 2005

-NJ highway transports carbon, fish larvae, etc.
International Programs

- Global Ocean Observing System
- Census of Marine Life
- Ocean Biogeographic Information System
Search criteria included:
"latitude 40.0 N - 40.5 N, longitude 74.0 W - 73.5 W"

Results 1 - 10 (of 218)

**Balaenoptera (unspecified)**  
a whale, 1101 global records

**Balaenoptera acutorostrata** "Minke whale"  
a whale, name verified, 6771 global records

**Balaenoptera physalus** "fin whale"  
a whale, name verified, 51054 global records

**Tursiops truncatus** "bottle-nosed dolphin"  
a dolphin/small toothed whale, name verified, 12702 global records

**Phoca vitulina** "harbor seal"  
a seal/sea lion/walrus, name verified, 1319 global records

**Calanectris diomedea** "cory's shearwater"  
a bird, name verified, 2218 global records

**Larus (unspecified)**  
a bird, 6302 global records

**Larus argentatus** "herring gull"  
a bird, name verified, 27698 global records

**Larus atricilla** "laughing gull"  
a bird, name verified, 2340 global records

**Larus delawarensis** "ring-billed gull"  
a bird, name verified, 372 global records
Would you like to give us any feedback on OBIS? Click here to take our survey.

**RESULTS**

Search criteria included:
"latitude 40.0 N - 40.5 N, longitude 74.0 W - 73.5 W"

**Caretta caretta** "loggerhead"
a turtle, name verified, 18313 global records

**Chelonia mydas** "common green sea turtle"
a turtle, name verified, 859 global records

**Dermochelys coriacea** "leatherback"
a turtle, name verified, 524 global records

**Alosa aestivalis** "Blueback shad"
a fish, name verified, 1009 global records

**Alosa mediocris** "Hickory shad"
a fish, name verified, 19 global records

**Alosa pseudoharengus** "Alewife"
a fish, name verified, 5903 global records

**Alosa sapidissima** "American shad"
a fish, name verified, 1438 global records

**Ammodytes dubius** "Northern sand lance"
a fish, name verified, 3535 global records

**Brevortia (unspecified)**
a fish, 755 global records

**Caranx hippos** "Crevale jack"
a fish, name verified, 1021 global records

Results 31 - 40 (of 218)

Result page: Previous 4 5 6 7 8 9 10 Next
Results

Search criteria included:
"latitude 40.0 N - 40.5 N, longitude 74.0 W - 73.5 W"

**Prionotus carolinus** "Northern searobin"
a fish, name verified, 3545 global records

**Prionotus evolans** "Striped searobin"
a fish, name verified, 320 global records

**Scomber scombrus** "Atlantic mackerel"
a fish, name verified, 5119 global records

**Scophthalmus aquosus** "Windowpane"
a fish, name verified, 5413 global records

**Sphoeroides maculatus** "Northern puffer"
a fish, name verified, 177 global records

**Squalus acanthias** "Blue dog"
a fish, name verified, 22033 global records

**Stenotomus chrysops** "Scup"
a fish, name verified, 1087 global records

**Tautogolabrus adspersus** "Blue perch"
a fish, name verified, 2241 global records

**Urophycis chuss** "Ling"
a fish, name verified, 10956 global records

**Urophycis regia** "Spotted codling"
a fish, name verified, 2450 global records

Results 71 - 80 (of 218)
RESULTS

Search criteria included:
“latitude 40.0 N - 40.5 N, longitude 74.0 W - 73.5 W”

Results 91 - 100 (of 218)

**Homarus americanus** “American lobster”
a decapod, name verified, 5745 global records

**Ampelisca (unspecified)**
an amphipod, 690 global records

**Ampelisca abdita**
an amphipod, name verified, 561 global records

**Ampelisca vadorum**
an amphipod, name verified, 270 global records

**Ampelisca verrilli**
an amphipod, name verified, 190 global records

**Corophium tuberculatum**
an amphipod, name verified, 115 global records

**Gammarus mucronatus**
an amphipod, name verified, 24 global records

**Cubaris plasticus**
an isopod, name verified, 2047 global records

**Cyathura polita**
an isopod, name verified, 482 global records

**Acartia spp.**
a copepod, 49993 global records

Result page: Previous 10 11 12 13 14 15 16 Next
Would you like to give us any feedback on OBIS? Click here to take our survey.

Results

Sort by:  ● Scientific name  ● Common name  ● Higher taxon  ● Number of global records

Search criteria included:

"latitude 40.0 N - 40.5 N, longitude 74.0 W - 73.5 W"

Results 111 - 120 (of 218)

Pseudocalanus elongatus
a copepod, name verified, 32014 global records

Rhincalanus nasutus
a copepod, name verified, 1634 global records

Temora longicornis
a copepod, name verified, 40438 global records

Temora turbinata
a copepod, name verified, 926 global records

Evedne spp.
a branchiopod, 15235 global records

Podon spp.
a branchiopod, 9832 global records

Brania (unspecified)
a polychaete, 32 global records

Brania (unspecified)
a polychaete, 32 global records

Eteone heteropoda
a polychaete, name verified, 172 global records

Glycera americana
a polychaete, name verified, 547 global records

Result page: Previous 12 13 14 15 16 17 18 Next
Search criteria included:
“latitude 40.5 N - 41.0 N, longitude 74.5 W - 74.0 W”

**Larus argentatus** “herring gull”
a bird, name verified, 27698 global records

**Larus delawarensis** “ring-billed gull”
a bird, name verified, 372 global records

**Larus marinus** “great black-backed gull”
a bird, name verified, 19536 global records

**Larus philadelphia** “bonaparte's gull”
a bird, name verified, 7372 global records

**Phalacrocorax auritus** “double-crested cormorant”
a bird, name verified, 8174 global records

**Phalacrocorax phalacrocorax auritus**
a bird, 8153 global records

**Aluterus schoepfii** “Orange filefish”
a fish, name verified, 834 global records

**Menidia menidia** “Atlantic silverside”
a fish, name verified, 415 global records

**Menidia menidia menidia**
a fish, 3 global records

**Peprilus paru** “American harvestfish”
a fish, name verified, 64 global records