Ocean Observing Infrastructure for the New England Shelf

June 14, 2011
Mid-Atlantic Fishery Management Council
Port Jefferson, NY
Presentation Outline

• Introduction
• OOI Pioneer Array Timeline
• Pioneer Array
  – Scientific motivation
  – Description of array
  – Micro-siting revisions and rationale
• Report on written comments
• Update on Pioneer Array schedule & activities
• Opportunity for questions and answers

June 14, 2011
TIMELINE

- Programmatic EA
  - June 2008
- FONSI PEA
  - February 2009
- Draft Site Specific EA
  - August 2010
- Final EA & FONSI
  - January 2011
- Micro-siting Public Meetings
  - October 2010
  - November 2010
  - June 2011
- Test Deployment
  - September 2011 – April 2012 (pending)
- USACE & USCG Permits
  - Winter/Spring 2012
- Deployments
  - 2012, 2013, 2014
The OOI Pioneer Array

Scientific Motivation and Description of Equipment
OOI Network Design

Regional Cabled Nodes

Global Arrays

Coastal Arrays

Cyber-infrastructure

Education and Public Engagement
Middle Atlantic Bight

- Persistent advection of cold, fresh water from the north
- Influence of Gulf Stream rings and meanders from the south
- Complex frontal zone at the shelf-break

Plueddemann, WHOI; Illustration by Jack Cook
Ecosystem Dynamics

- The shelfbreak front is a biological as well as a physical property boundary
Marine Habitats

- The shelfbreak and coastal zone are the most important marine habitats in the MAB.
- The shelfbreak has highest diversity of marine mammals in the U.S. Mid-Atlantic EEZ.

Natural Resources Defense Council (2001)
Climate Connections

• High-latitude regime shifts influence mid-latitude ecosystems

Greene and Pershing (2007)
Frontal Dynamics

- The front is distinguished by the transition from cold, fresh shelf water to warmer, saltier slope water.
- Surface-intensified jet, near the 150 m isobath.
- Mechanisms of cross-front exchange are largely unknown.

Linder and Gawarkiewicz (1998)
Shelfbreak processes

Weather & climate forcing

Mesoscale & submesoscale physical response

Ecosystem response
Pioneer Array Design

Figure courtesy of WHOI
Surface Mooring

- **Instrumented buoy**
  - Surface meteorology, waves
  - Carbon dioxide (air and sea)
- **Subsurface instrument frame**
  - Temperature and salinity
  - Dissolved oxygen, pH
  - Currents
  - Optical properties
  - Chlorophyll, organic matter, Nitrate
- **Multi-Function Node**
  - Temperature and salinity
  - Dissolved oxygen
  - Currents
  - Optical properties
  - Acoustic zooplankton sensor
  - Connection for additional sensors
- **AUV dock**
  - Inshore and Offshore sites only
  - Offload data and recharge AUV
Moored (wire-following) Profiler

- Telemetry buoy
  - Satellite telemetry to shore
- Subsurface sphere
  - Maintains taut wire
- Subsurface profiling body
  - Temperature and salinity
  - Dissolved oxygen
  - Currents
  - Optical properties
  - Chlorophyll, organic matter
- Subsurface instrument frame
  - Water-column currents
Winched (surface-piercing) Profiler

- Profiling Body
  - Telemetry to shore
  - Temperature and salinity
  - Dissolved oxygen
  - Dissolved carbon dioxide
  - Currents
  - Optical properties
  - Chlorophyll, organic matter
  - Nitrate

- Bottom frame
  - Water column currents
Representative Buoys

Instrumented Buoy

Winched Profiler
Representative Buoys

Telemetry Buoy
Gliders and AUVs

- Gliders and AUVs
  - Temperature, salinity and pressure
  - Dissolved oxygen
  - Currents
  - Optical properties
  - Chlorophyll, organic matter
  - Nutrients (AUVs only)
# PIONEER ARRAY
## INSTALLATION SCHEDULE

<table>
<thead>
<tr>
<th>OOI Installation Schedule</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
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</thead>
<tbody>
<tr>
<td>Coastal Array</td>
<td>Pioneer</td>
<td></td>
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</tr>
</tbody>
</table>

**Legend**

- **Installation**
- **Data Flow**
- **Commissioning**
- **Giders Deployed**
- **AUVs Deployed**

June 7, 2011
The OOI Pioneer Array

Micro-siting Revisions and Rationale
Pioneer Array (Nov 2010)

Moored Array
15 nm x 5 nm

AUV Operations
43 nm x 59 nm

Glider Operations
70 nm x 81 nm
Revised Pioneer Array (April 2011)

Moored Array
25 nm x 5 nm

AUV Operations
43 nm x 59 nm

Glider Operations
70 nm x 100 nm
North/South extent 15 nm
East/West extent 5 nm

Distance between moorings 3.5 nm to 6 nm

Buffer Zone Radius 0.5 nm

Distance between Buffer Zones 2.5 nm to 5 nm (see chart)
Revised Moored Array (April 2011)

North/South extent 25 nm
East/West extent 5 nm

Distance between moorings 4.5 nm to 8 nm

Buffer Zone Radius 0.5nm

Distance between Buffer Zones 3.5 nm to 7 nm (see chart)

* Crosses indicate representative locations only; precise locations are not yet determined
Navigation Safety

Pioneer Array buoys will follow U.S. Coast Guard Private Aids to Navigation (PATON) regulations:

- Reflective panel and designation letter on hull
- USCG approved lighting (strobed marine lantern)
- Passive Radar reflector (on all buoys)
- Contact information on buoy hull
- Inclusion on the Notice to Mariners, Local Notice to Mariners, and Light List,
- Location marked on NOAA digital charts
In addition, OOI will also provide:
• Active radar pinger (on some buoys)
• Recommended Area to be Avoided (voluntary buffer zone of 0.5 nm radius around each mooring site)
• Proposed guard buoys to delineate Area to be Avoided for sites shallower than 250 fm.
• Boat Trax (broadcasts buoy positions to nearby, receiver-equipped boats)
Guard Buoys in the Revised Array

Plueddemann (WHOI)
Revised Moored Array Description

<table>
<thead>
<tr>
<th>Site</th>
<th>Name</th>
<th>Location of Site Center</th>
<th>Depth fm (meters)</th>
<th>Surface Mooring</th>
<th>Moored Profiler</th>
<th>Winched Profiler</th>
<th>Guard Buoy</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Upstream Inshore</td>
<td>40°20.7’N, 70°41.0’W</td>
<td>52 (95)</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
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<tr>
<td>2</td>
<td>Inshore</td>
<td>40°21.0’N, 70°47.5’W</td>
<td>52 (95)</td>
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<td>0</td>
<td>1</td>
<td>1</td>
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<td>3</td>
<td>Central Inshore</td>
<td>40°13.0’N, 70°47.5’W</td>
<td>68 (125)</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
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<tr>
<td>4</td>
<td>Central</td>
<td>40°08.5’N, 70°47.5’W</td>
<td>74 (135)</td>
<td>1</td>
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<tr>
<td>5</td>
<td>Central Offshore</td>
<td>40°04.0’N, 70°47.5’W</td>
<td>82 (150)</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
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<tr>
<td>6</td>
<td>Offshore</td>
<td>39°56.0’N, 70°47.5’W</td>
<td>252 (480)</td>
<td>1</td>
<td>1</td>
<td>0</td>
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<tr>
<td>7</td>
<td>Upstream Offshore</td>
<td>39°55.1’N, 70°41.0’W</td>
<td>252 (480)</td>
<td>0</td>
<td>1</td>
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<td>Science Moorings (10)</td>
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<td>3</td>
<td>5</td>
<td>2</td>
<td>--</td>
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<tr>
<td></td>
<td>Guard Buoys (8)</td>
<td></td>
<td></td>
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<td>8</td>
</tr>
</tbody>
</table>
Ocean Observatories Initiative

Test Deployments

What, When, Where
OOI Test Deployments: 2011-2012

• Shelfbreak site, 39° 55.0’ N, 70° 47.5’ W
  – two moorings at 285 fm (520 m)
  – Surface mooring
  – Moored profiler

• Deep Ocean site, 39° 30.0’ N, 70° 47.5’ W
  – one mooring at 1356 fm (2480 m)
  – Moored profiler (hybrid type)

• Time frame
  – Deploy September 2011
  – Recover April 2012
PIioneer Array Comments

- Presentation of summarized comments
- Comment and responses to be posted on the OOI/NSF Environmental Compliance and Micro-siting webpage at:

  http://www.oceanobservatories.org/about/environmental-compliance/
PIONEER ARRAY Schedule and Activities

• Science Outreach Day at Whaling Museum
  – September 17th – 10am to 2pm
  – Specific Session for Test Update and Q&A

• Test Moorings Deployed – September 22, 2011
• Apply for permit – Winter/Spring 2012
• Meeting in June 2012 to update everyone on test lessons learned and any modifications
• Deploy Gliders – June 2012
• Pioneer Moorings Deployed – 2013, 2014
PIioneer Array Q&A

• Questions & Answers

• Info
  – http://www.oceanobservatories.org/about/environmental-compliance/
  – Monthly emails
  – Meetings
  – We respond to phone calls and emails
    • Jm cgover@nsf.gov  703-292-7591