Ocean Observatories Initiative

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

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

Ocean Observatories Initiative

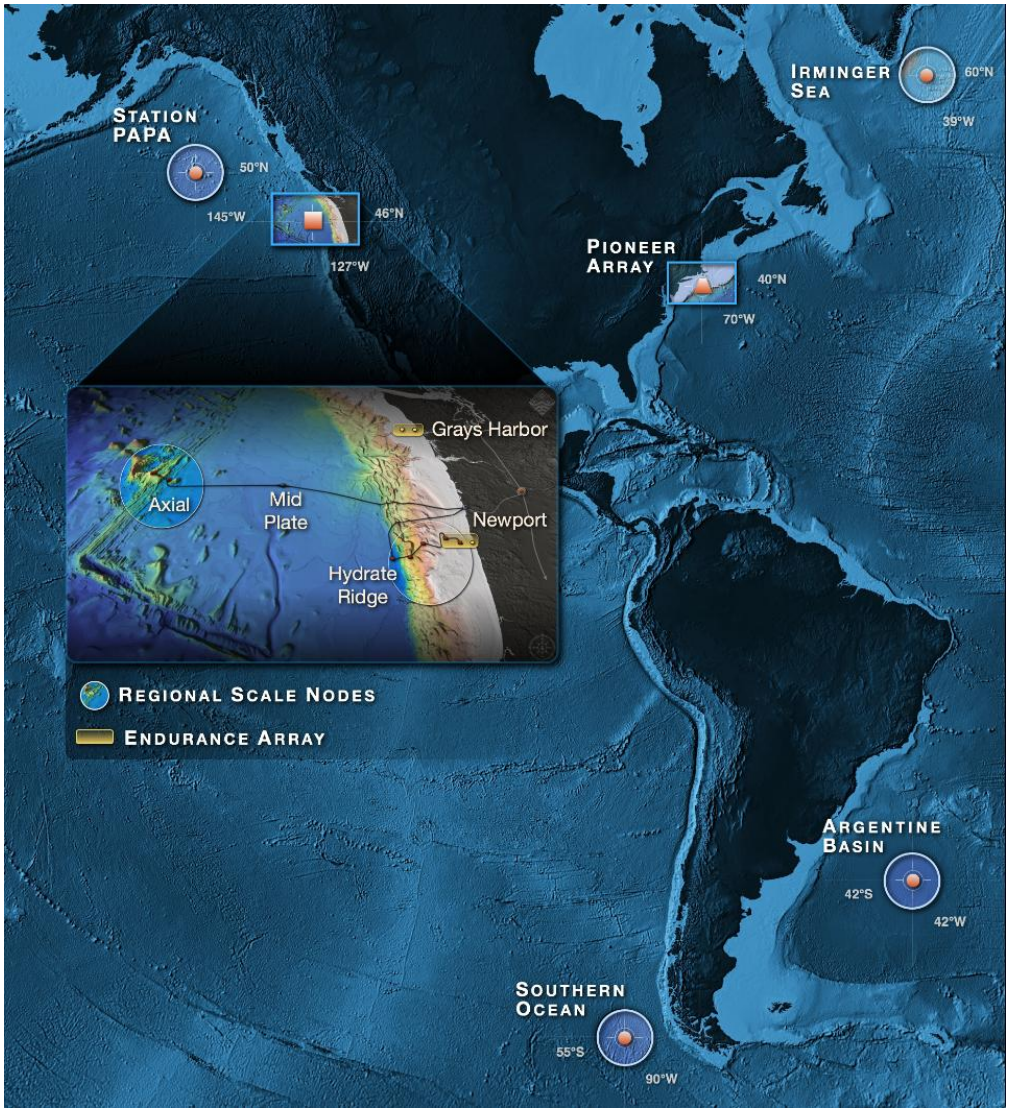
The OOI Pioneer Array

Scientific Motivation and Description of Equipment

June 14, 2011

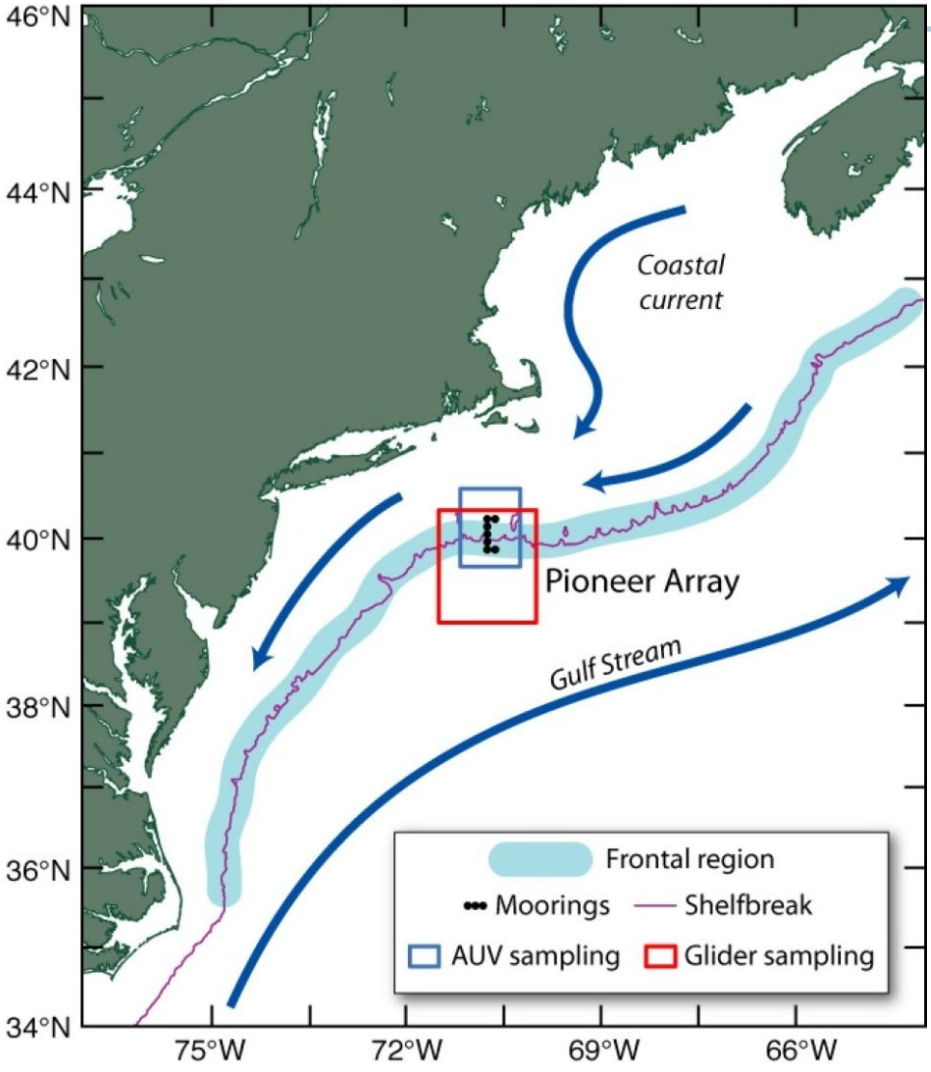
OOI Network Design

- Regional Cabled Nodes
- Global Arrays
- Coastal Arrays
- Cyber-infrastructure
- Education and Public Engagement



Middle Atlantic Bight

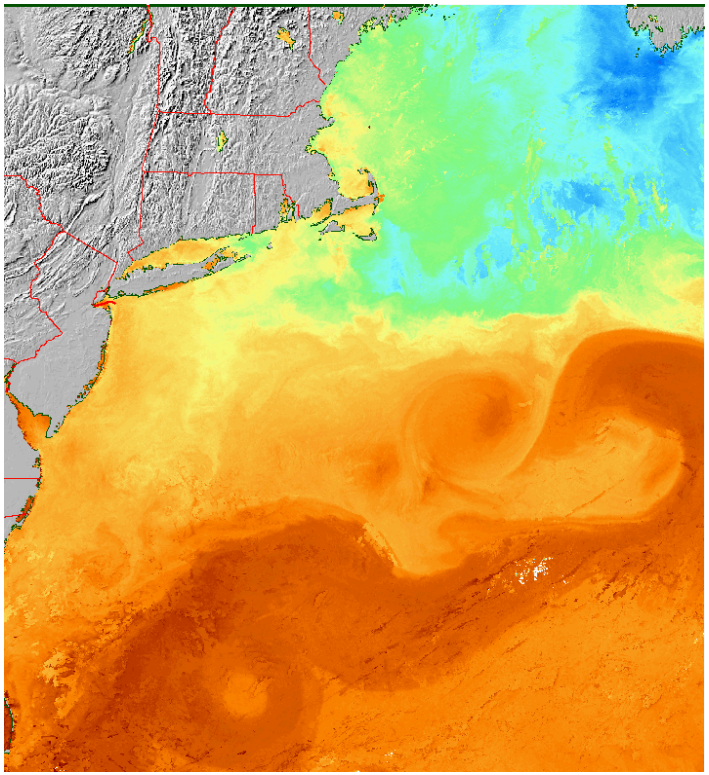
- Persistent advection of cold, fresh water from the north
- Influence of Gulf Stream rings and meanders from the south
- Complex frontal zone at the shelf-break



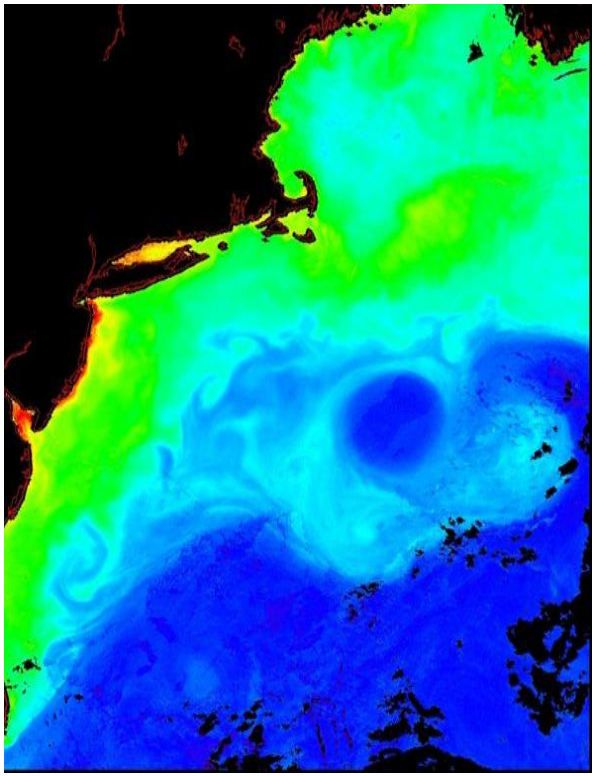
Plueddemann, WHOI; Illustration by Jack Cook

Ecosystem Dynamics

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



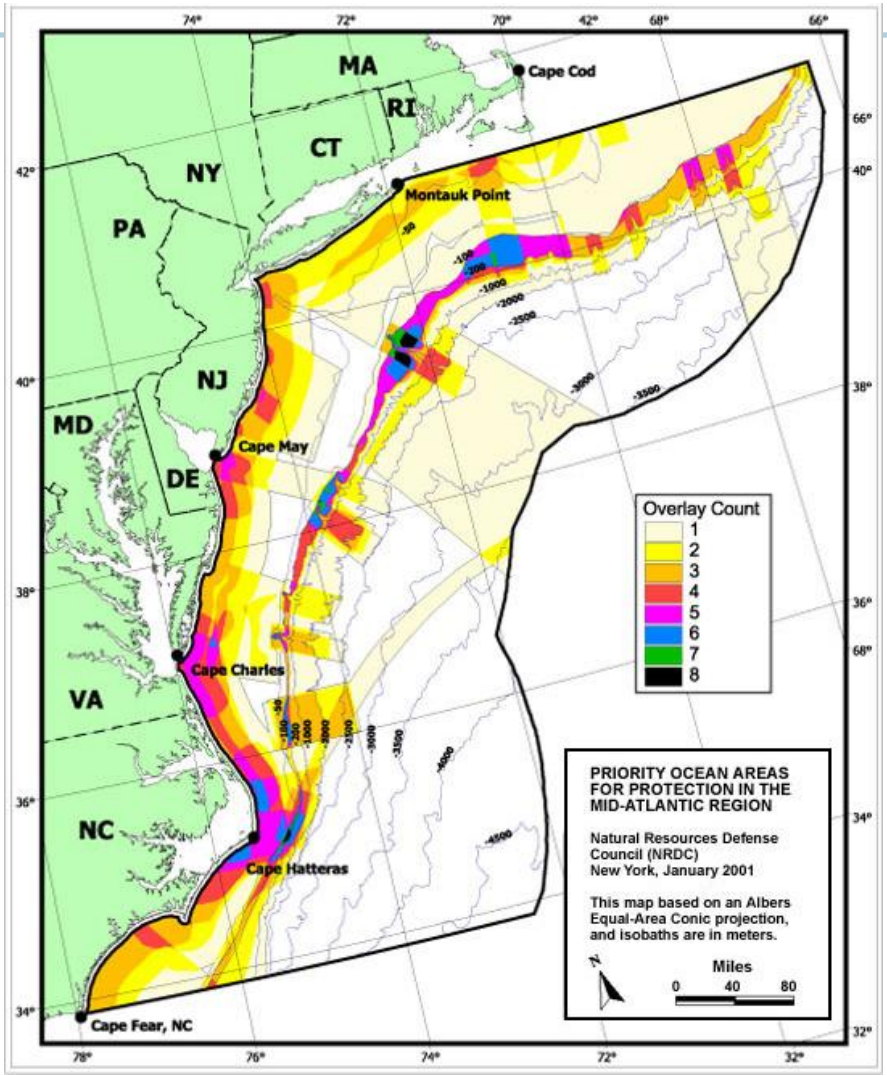
SST (APL/Johns Hopkins)



Chlorophyll (H. Sosik)

Marine Habitats

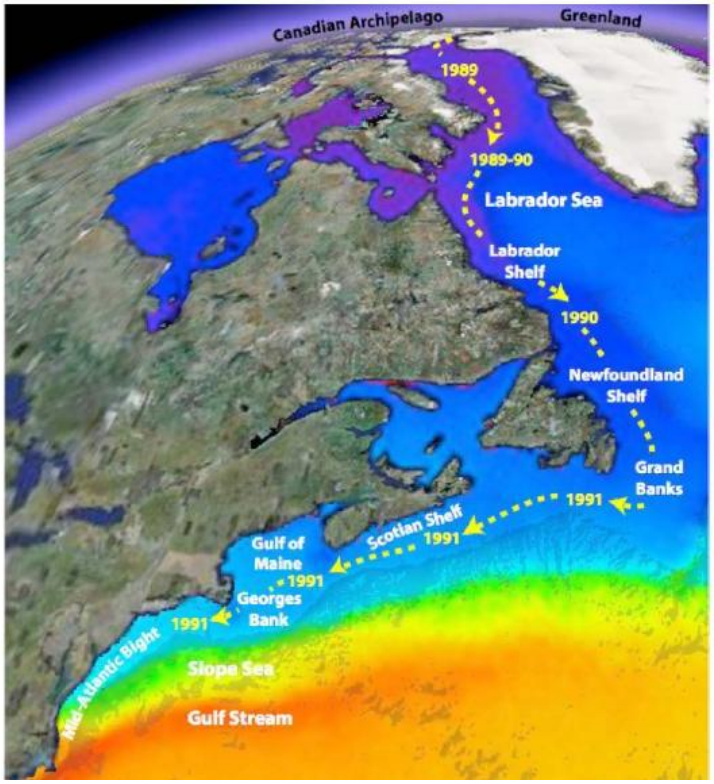
- The shelfbreak and coastal zone are the most important marine habitats in the MAB
- The shelfbreak has highest diversity of marine mammals in the U.S. Mid-Atlantic EEZ



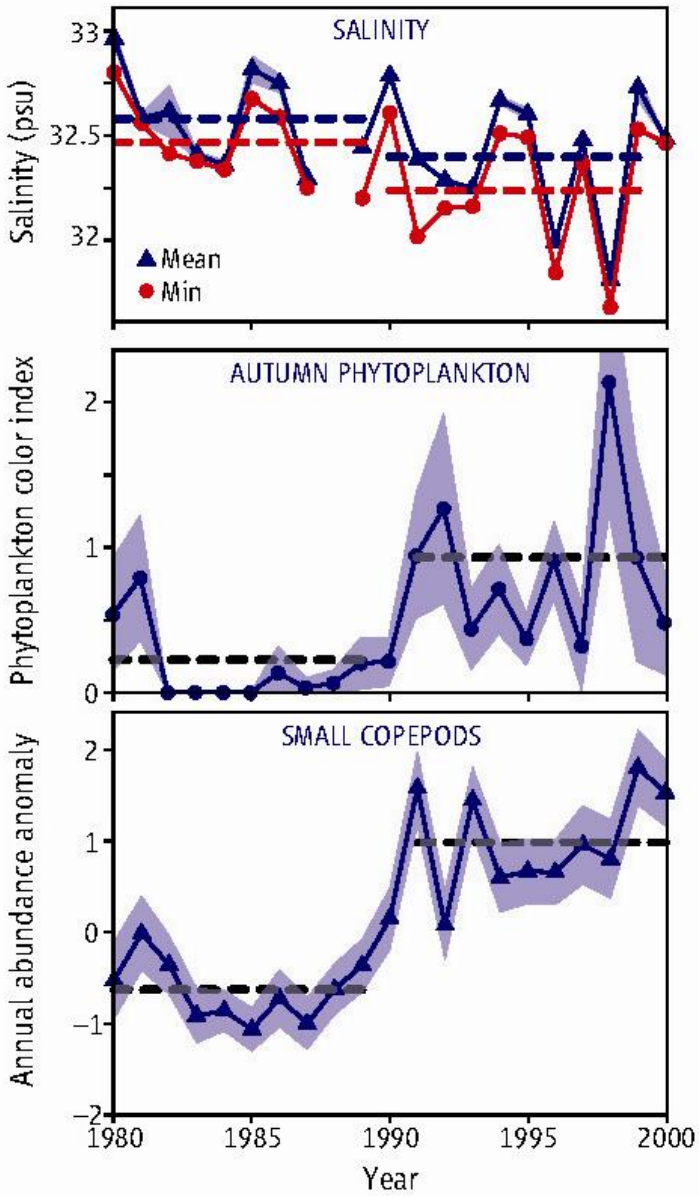
Natural Resources Defense Council (2001)

Climate Connections

- High-latitude regime shifts influence mid-latitude ecosystems



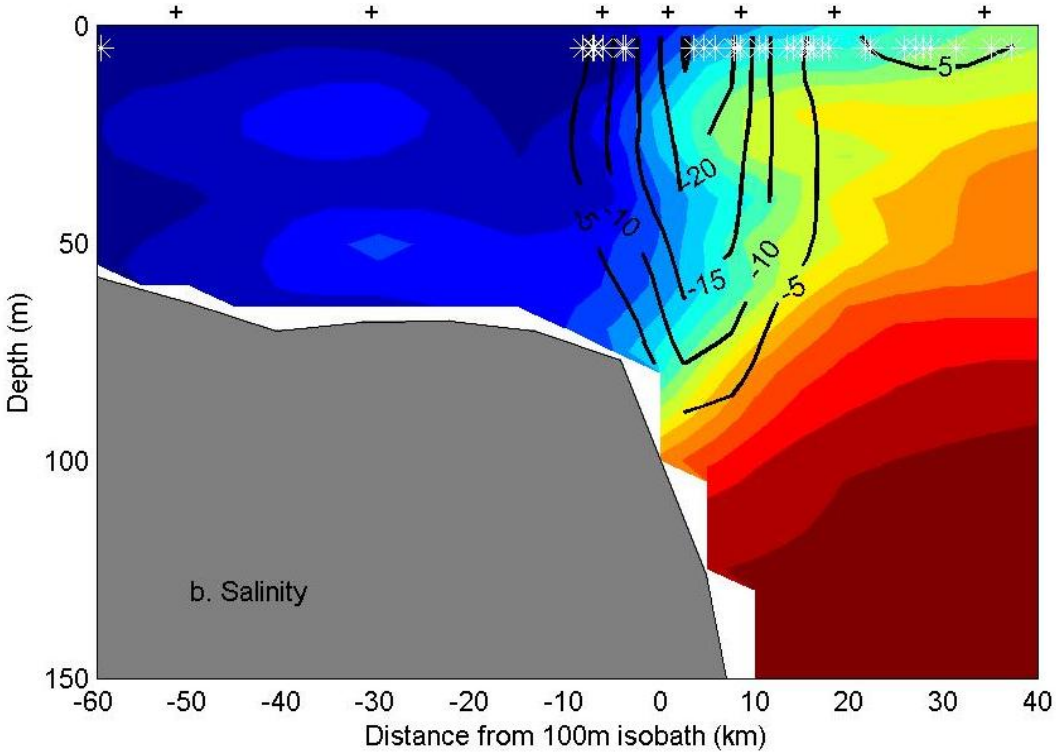
Greene and Pershing (2007)



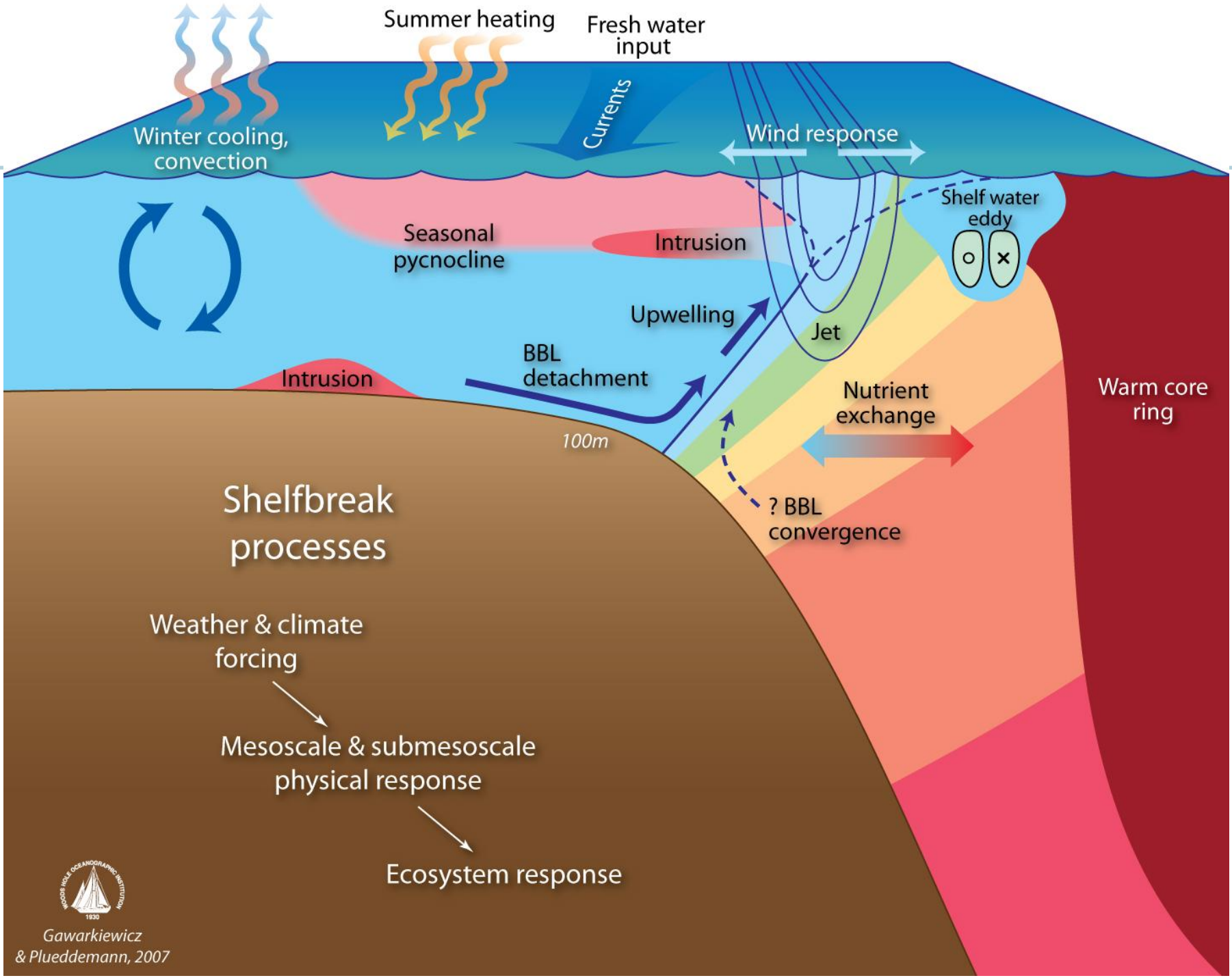
Frontal Dynamics

- 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)


Summer heating
Fresh water input
Currents
Winter cooling, convection
Wind response
Shelf water eddy
Seasonal pycnocline
Intrusion
Upwelling
Jet
BBL detachment
Intrusion
Nutrient exchange
Warm core ring
100m
Shelfbreak processes
? BBL convergence
Weather & climate forcing
Mesoscale & submesoscale physical response
Ecosystem response
Gawarkiewicz & Plueddemann, 2007

Pioneer Array Design

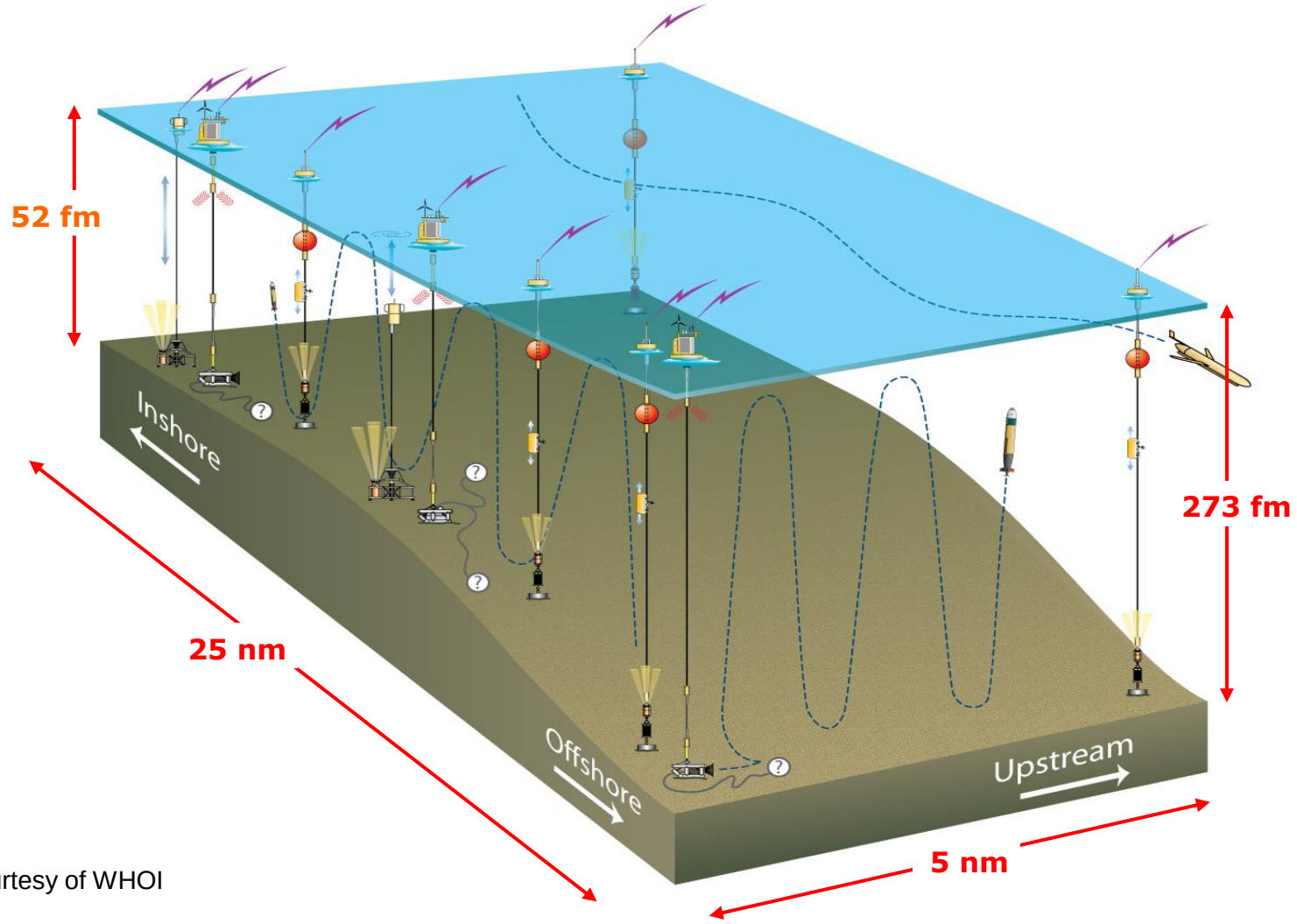
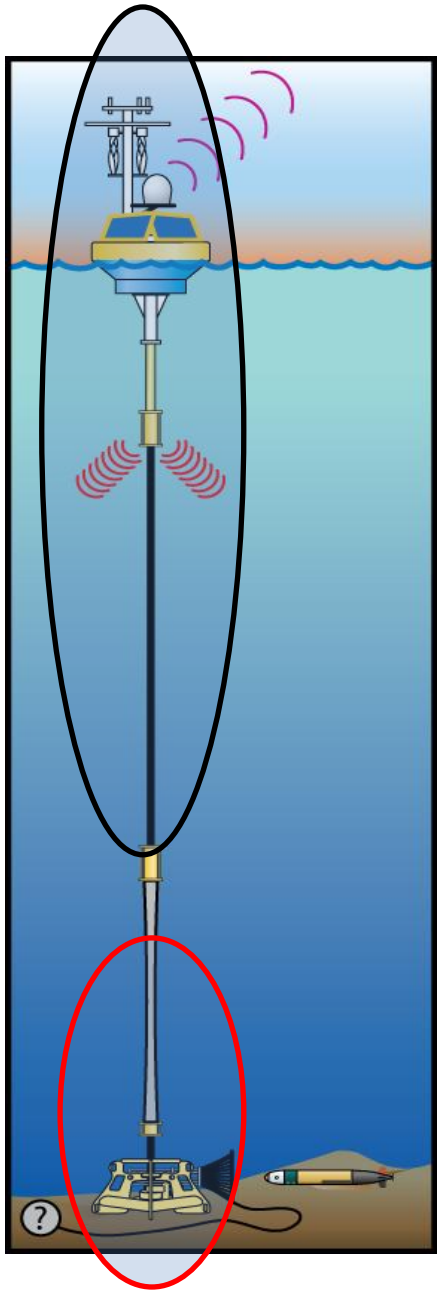


Figure courtesy of WHOI

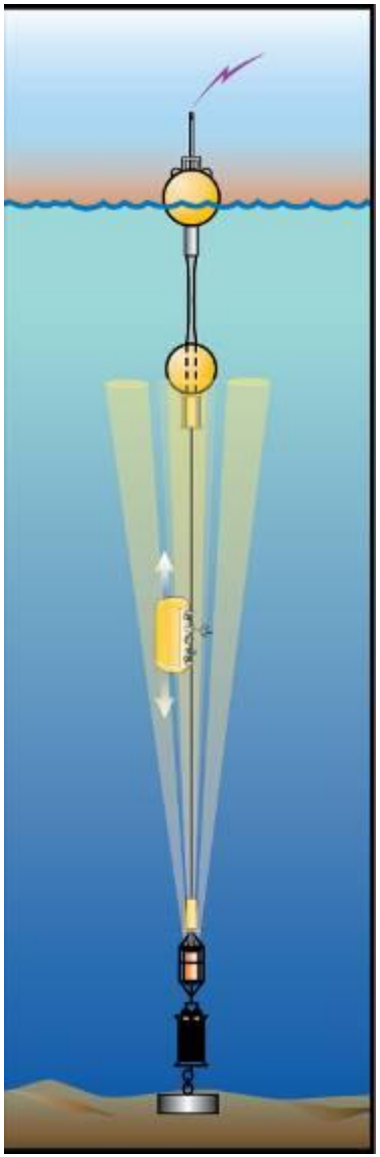
Surface Mooring

- 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



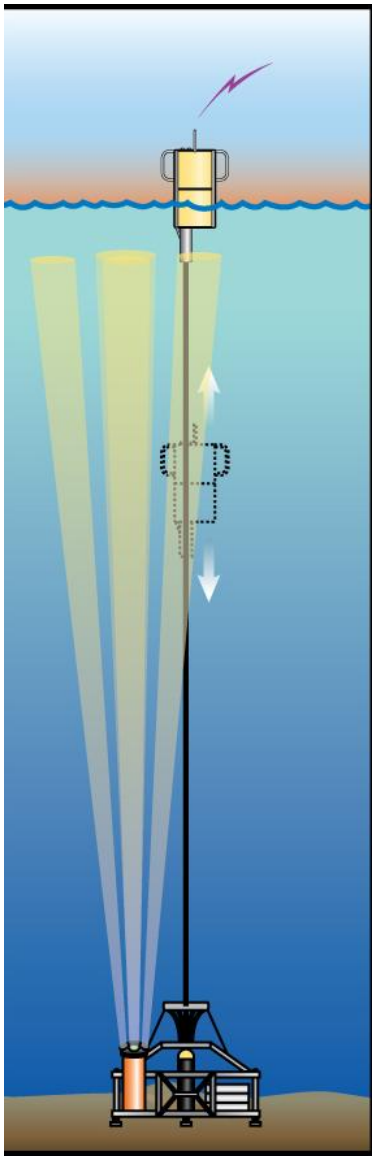
Moored (wire-following) Profiler

- 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

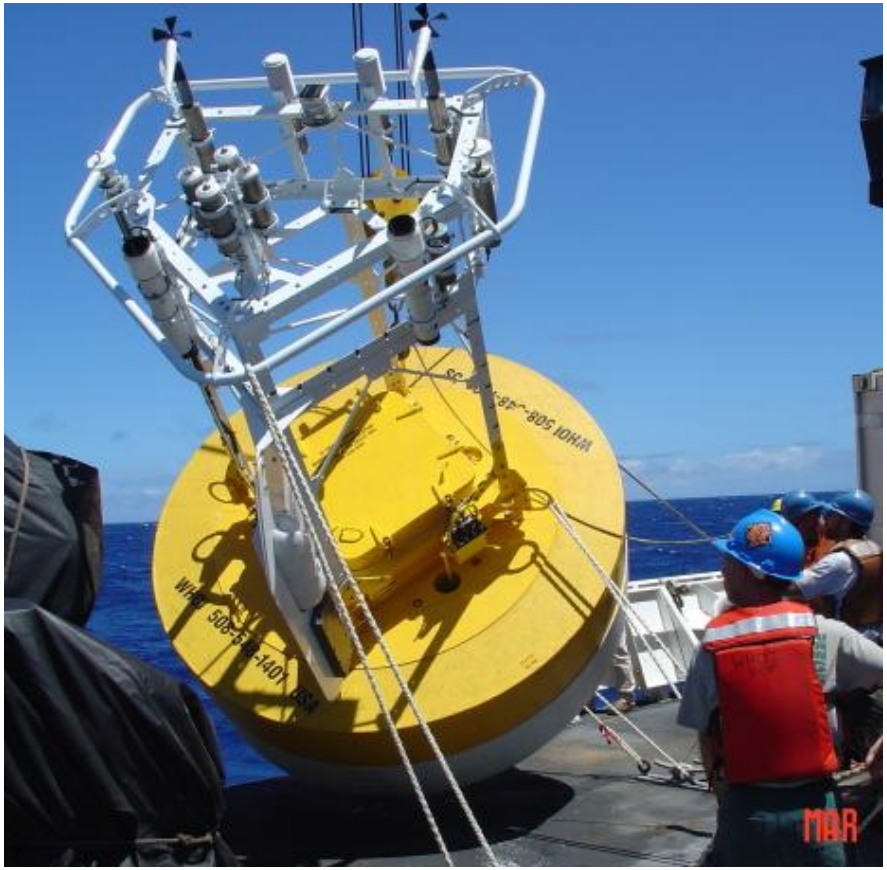


Winched (surface-piercing) Profiler

- 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

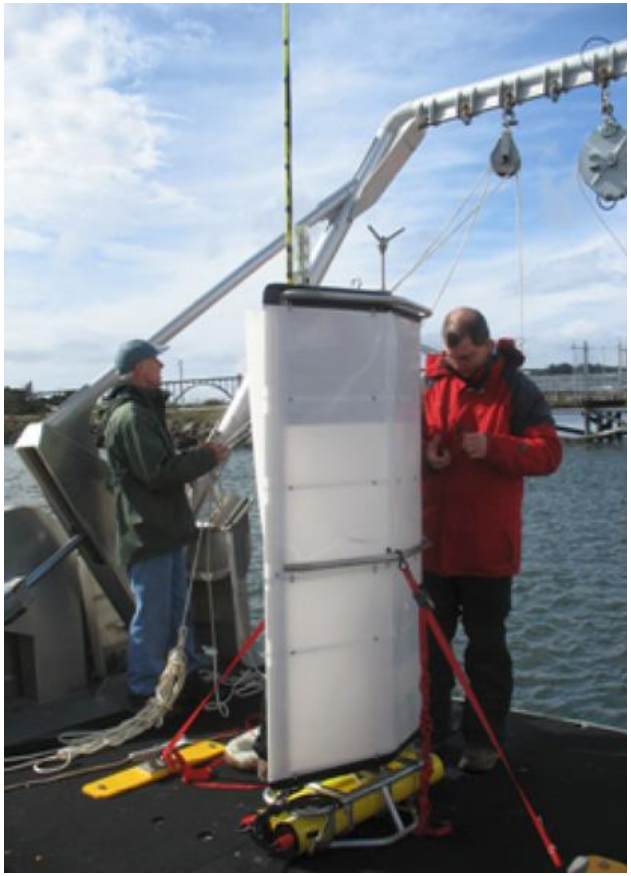


Representative Buoys



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)

Representative Glider

Representative AUV

PIONEER ARRAY INSTALLATION SCHEDULE

Ocean Observatories Initiative

The OOI Pioneer Array

Micro-siting Revisions and Rationale

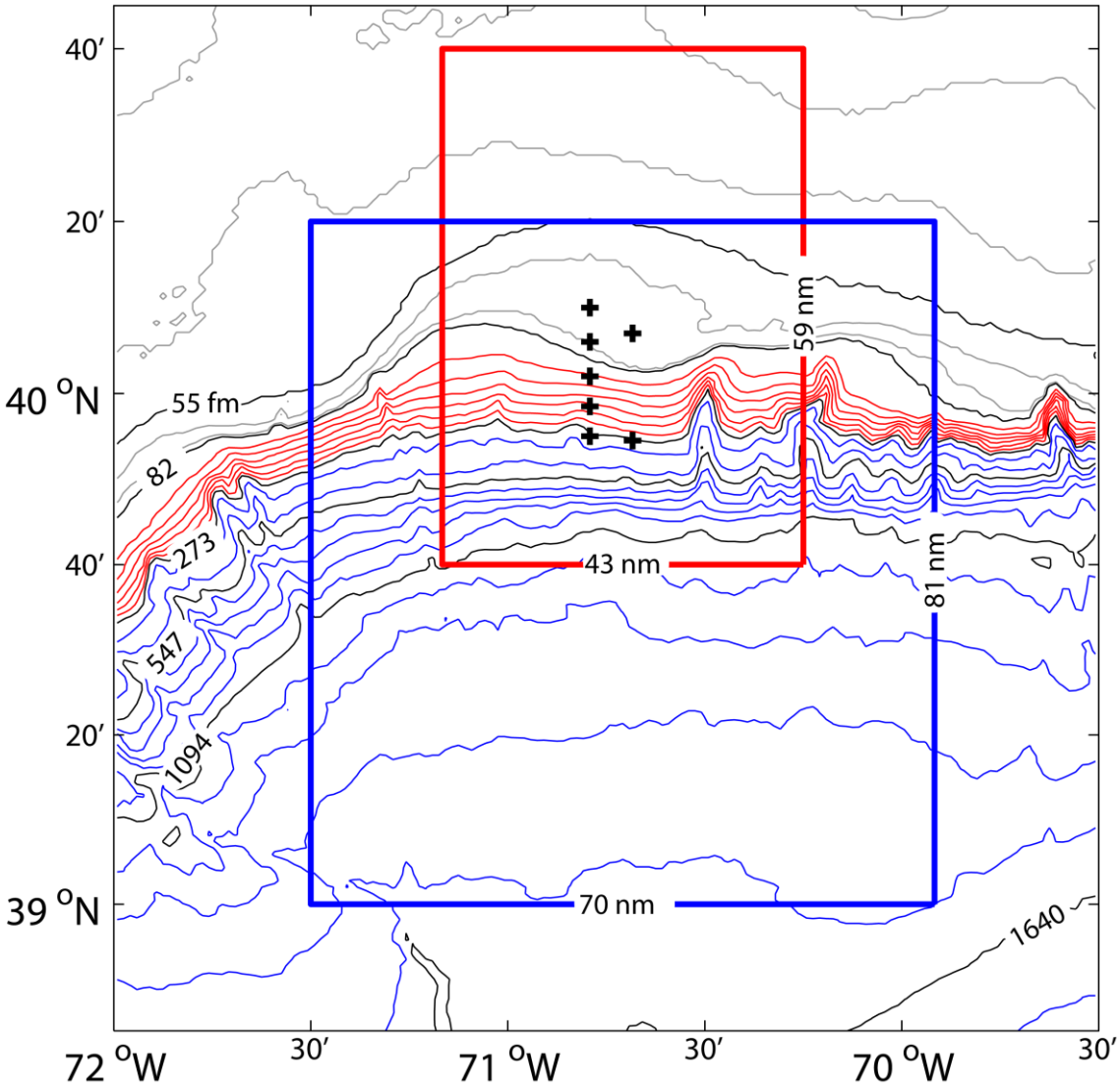
June 14, 2011

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

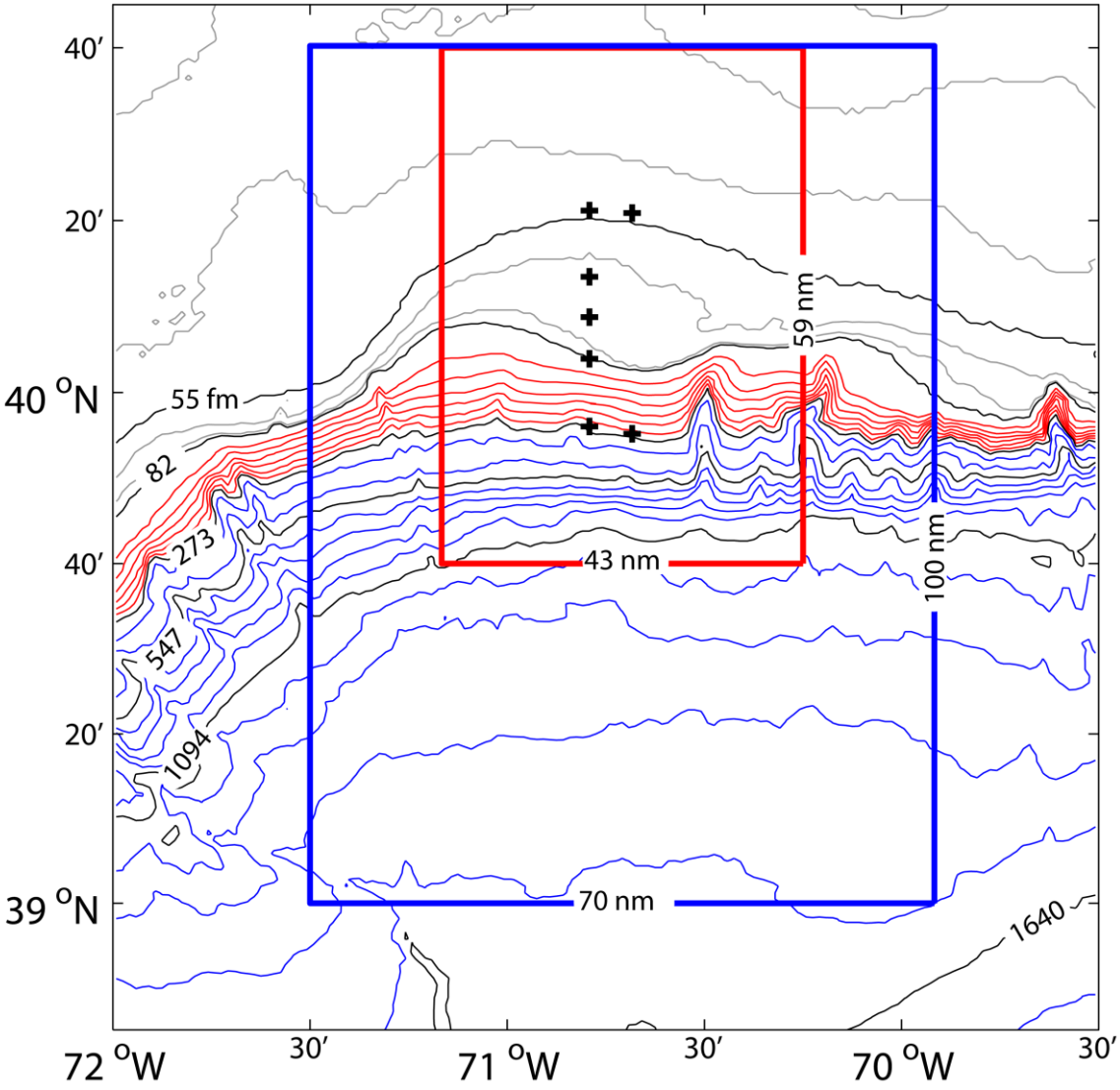


Revised Pioneer Array (April 2011)

Moored Array
25 nm x 5 nm

AUV Operations
43 nm x 59 nm

Glider Operations
70 nm x 100 nm



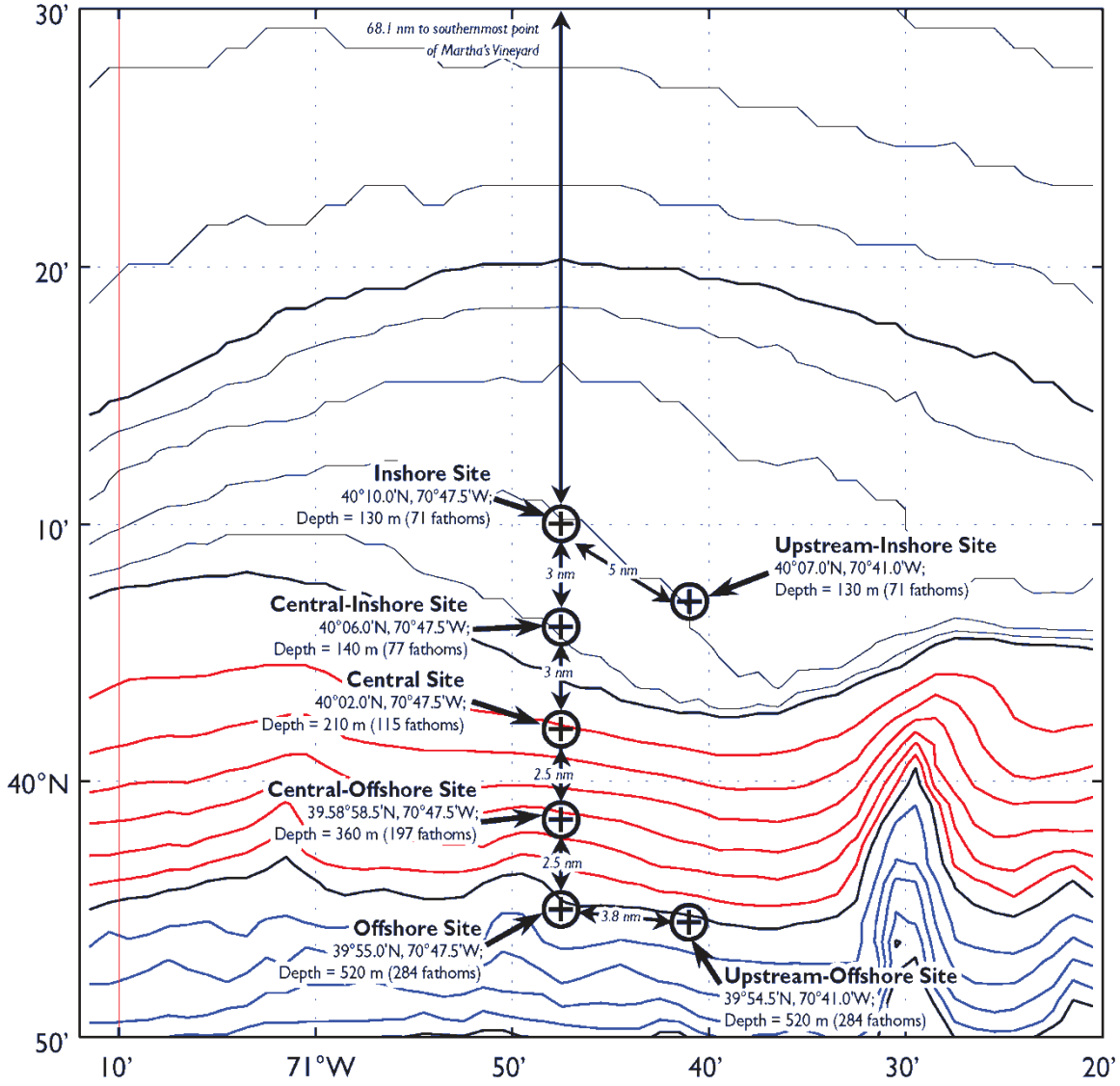
Pioneer Moored Array (Nov 2010)

North/South extent 15 nm
East/West extent 5 nm

Distance between moorings 3.5 nm to 6 nm

Buffer Zone Radius 0.5nm

Distance between Buffer Zones 2.5 nm to 5 nm (see chart)



Revised Moored Array (April 2011)

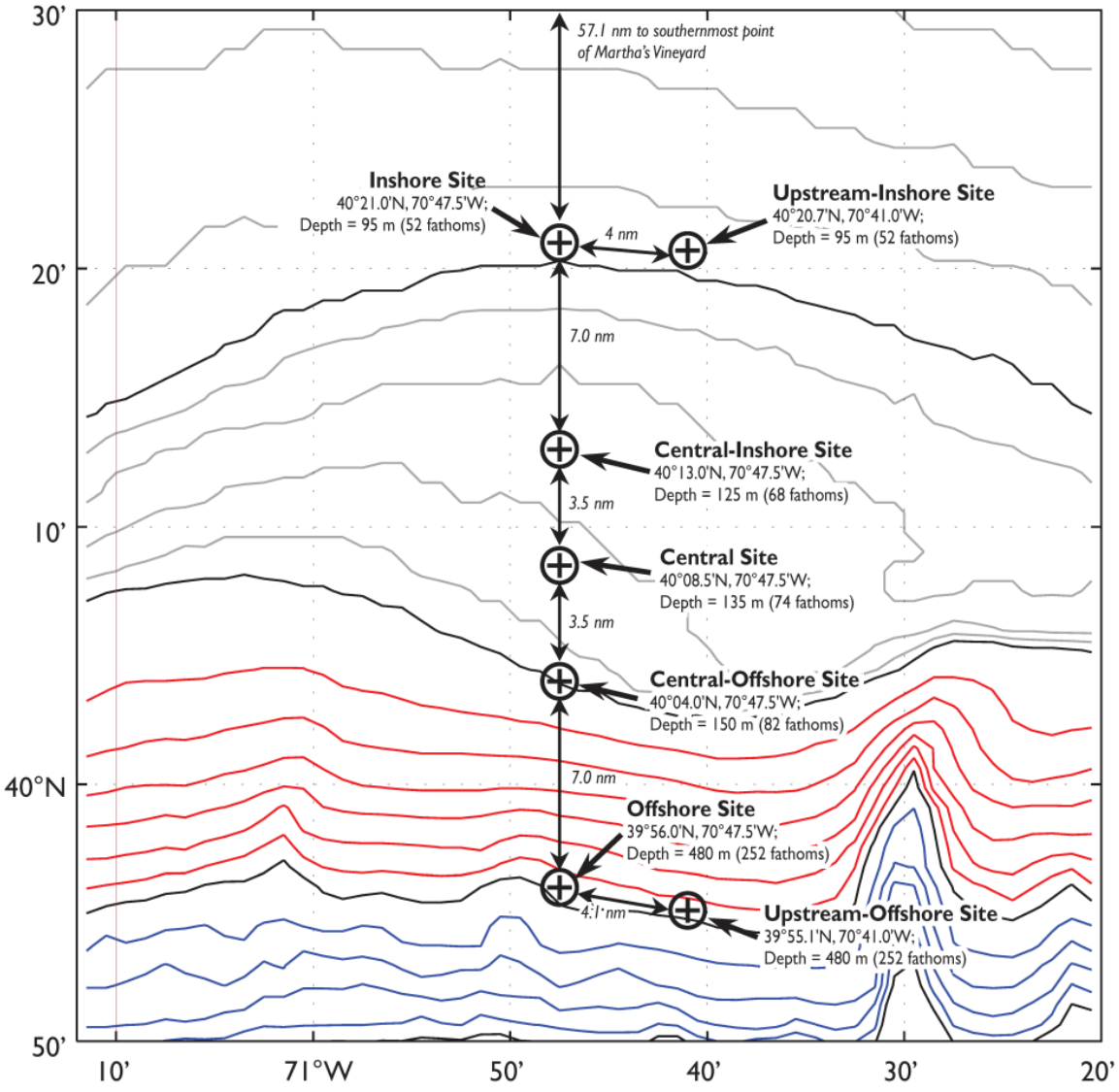
North/South extent 25 nm
East/West extent 5 nm

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

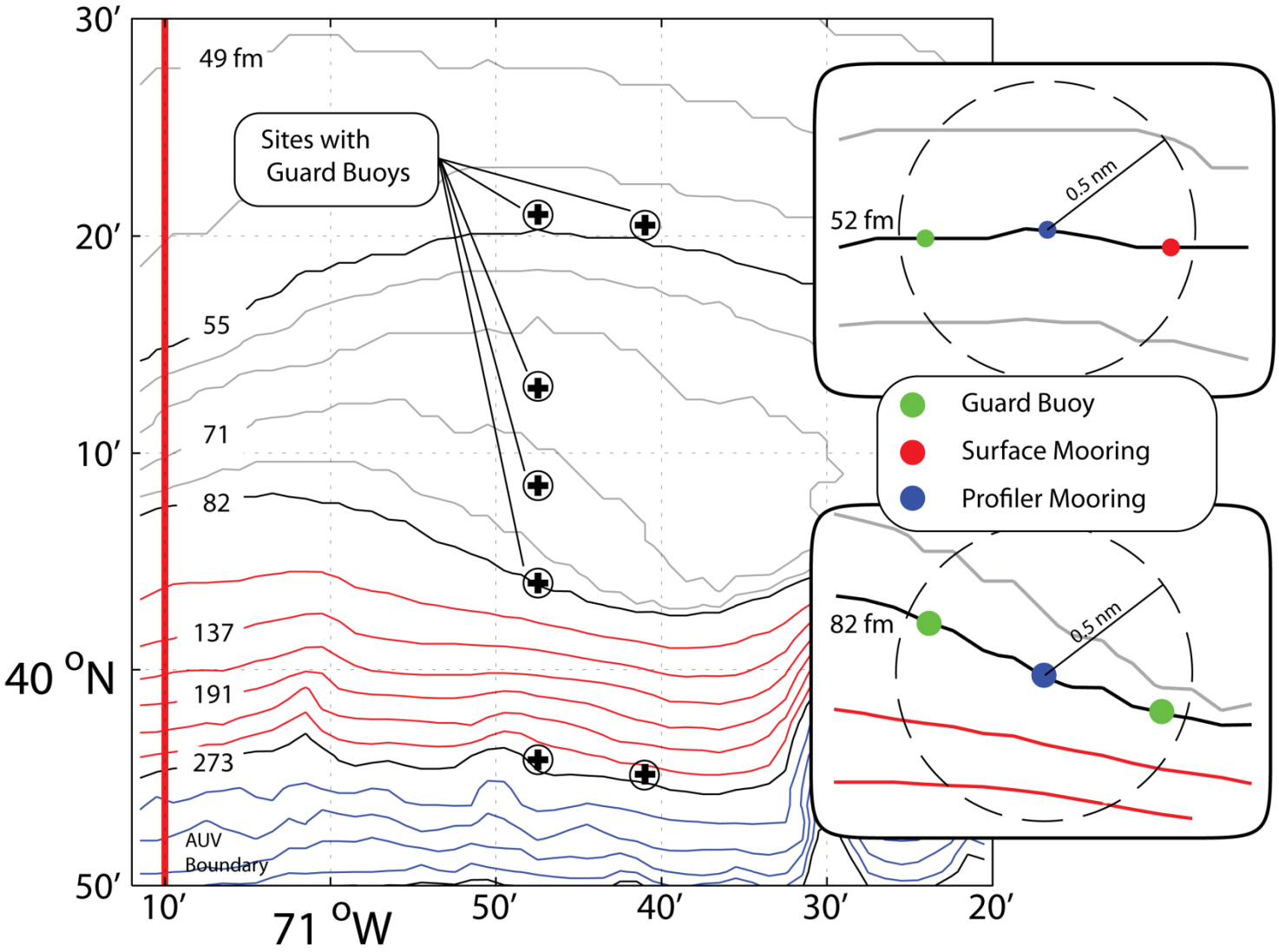
Navigation Safety

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)

Representative Guard Buoy

Guard Buoys in the Revised Array



Revised Moored Array Description

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

Ocean Observatories Initiative

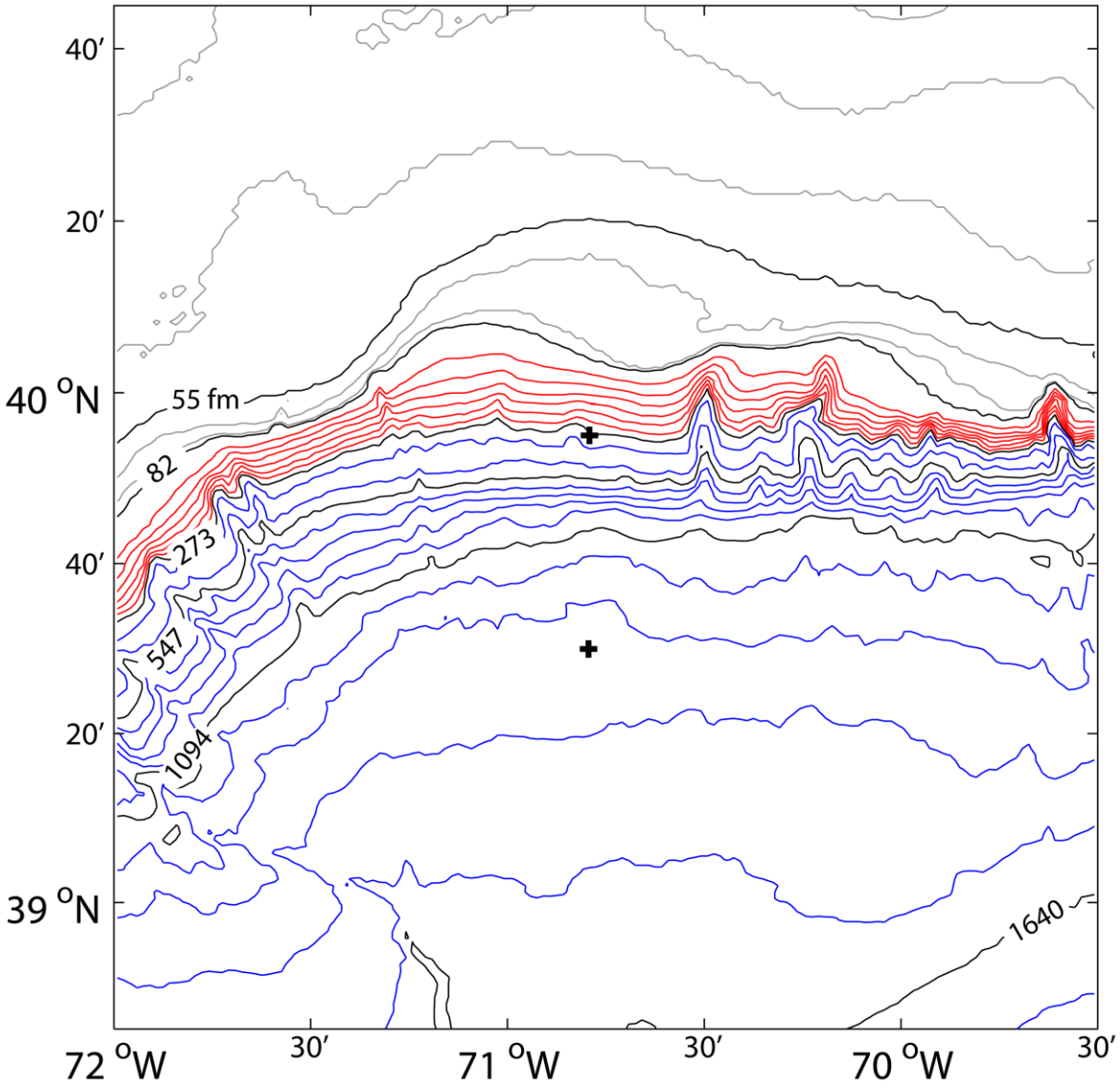
Ocean Observatories Initiative Test Deployments

What, When, Where

OOI Test Deployments: 2011-2012

- Shelfbreak site, 39^{o} 55.0’ N, 70^{o} 47.5’ W
  - two moorings at 285 fm (520 m)
  - Surface mooring
  - Moored profiler
- Deep Ocean site, 39^{o} 30.0’ N, 70^{o} 47.5’ W
  - one mooring at 1356 fm (2480 m)
  - Moored profiler (hybrid type)
- Time frame
  - Deploy September 2011
  - Recover April 2012

Test Deployment Locations



Plueddemann (WHOI)

PIONEER 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

PIONEER ARRAY Q&A

- Questions & Answers

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