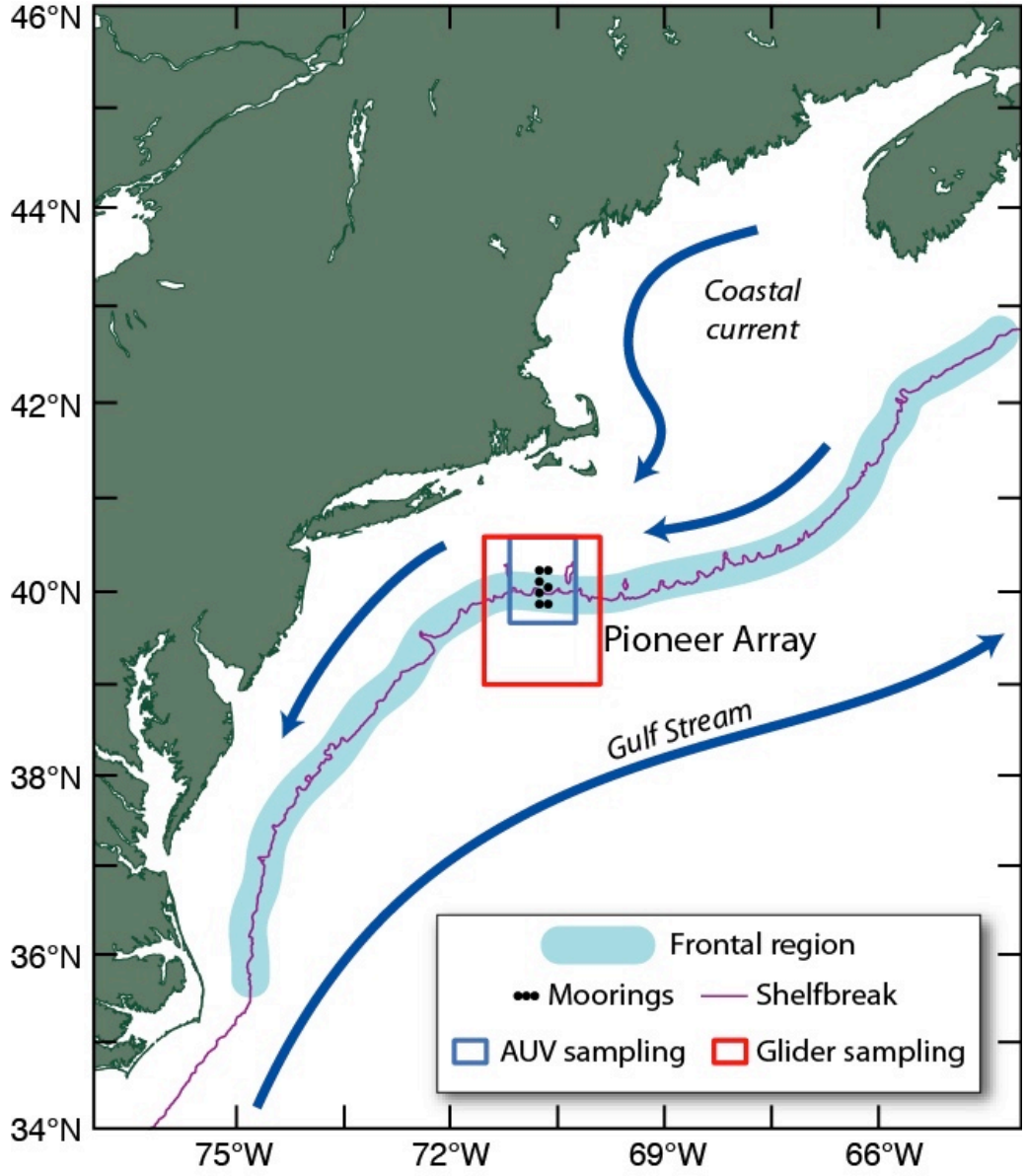
Coastal Pioneer Array

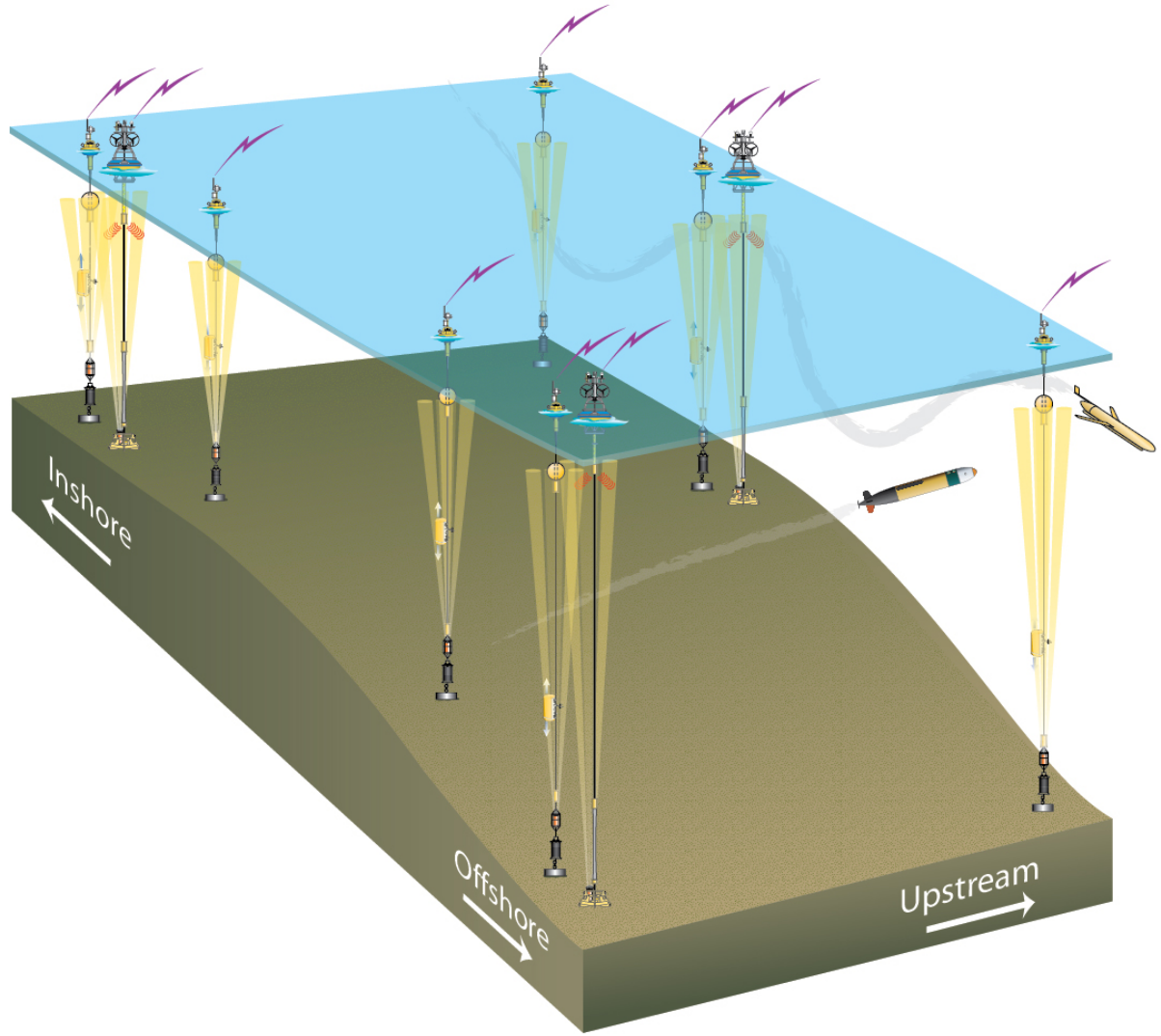
- Centered near 40° N, 71° W
- Spans the shelfbreak front south of New England
- Science focus is on shelf/slope exchange processes
- Multi-scale, multi-platform array captures relevant dynamical processes



3204-00007 Pioneer Site Characterization Paper

Coastal Pioneer Array

- 3 Surface Mooring- Profiler Mooring pairs
- 4 single Coastal Profiler Moorings
- 6 Coastal Gliders
- 2 Coastal Profiling Gliders
- 2 AUVs

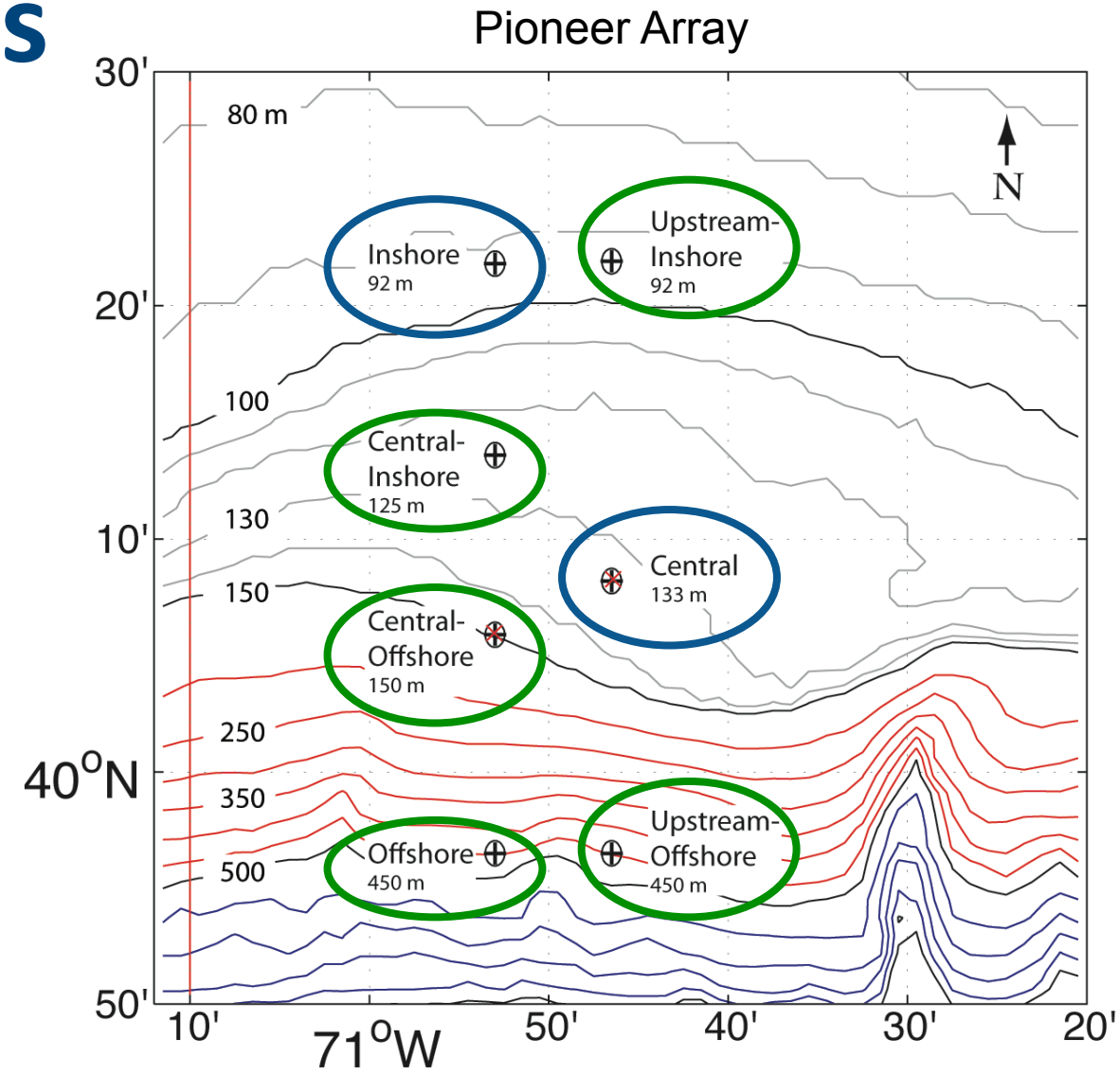


http://oceanobservatories.org/array/coastal-pioneer/

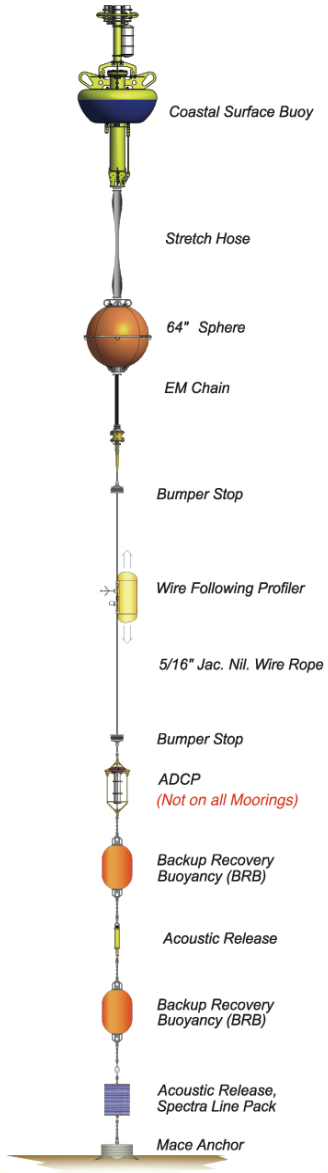
Coastal Profiler Moorings

- Capabilities
  - Surface telemetry, inductive modems
  - Wire Following Profilers, ADCPs

- 7 moorings at Pioneer
  - Central Inshore (125 m)
  - Central Offshore (150 m)
  - Upstream Inshore (91.5 m)
  - Upstream Offshore (450 m)
  - Inshore (91.5 m) – Winter only
  - Central (133 m) – Winter only
  - Offshore (450 m)



Coastal Profiler Mooring



Sub-System	Coastal Profiler Mooring Configuration
Surface Buoy	Submersible Surface Buoy
Platform Control	Sensor & Telemetry Controller (STC)
Telemetry	Iridium 9522, Iridium SBD, Freewave, Wi-Fi, inductive modem
Power System	Primary Batteries
Mooring Riser	EM stretch hose, Sub-surface float, Inductive Wire, Anchor with Release Line Pack
Profiler	McLane Moored Profiler
Instruments *(6 total)*	CTDPF, DOFST, FLORT, PARAD, VEL3D on profiler ADCP mounted in in-line frame

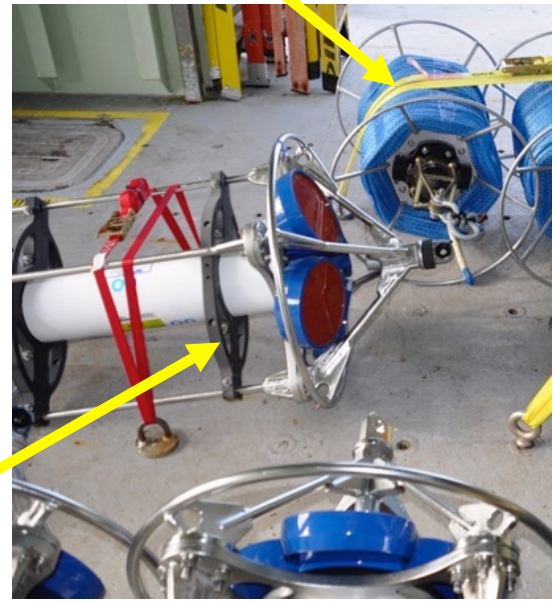
Coastal Profiler Moorings

Subsurface Sphere

Wire Following Profilers

Submersible Surface Buoy

Recovery Line Pack

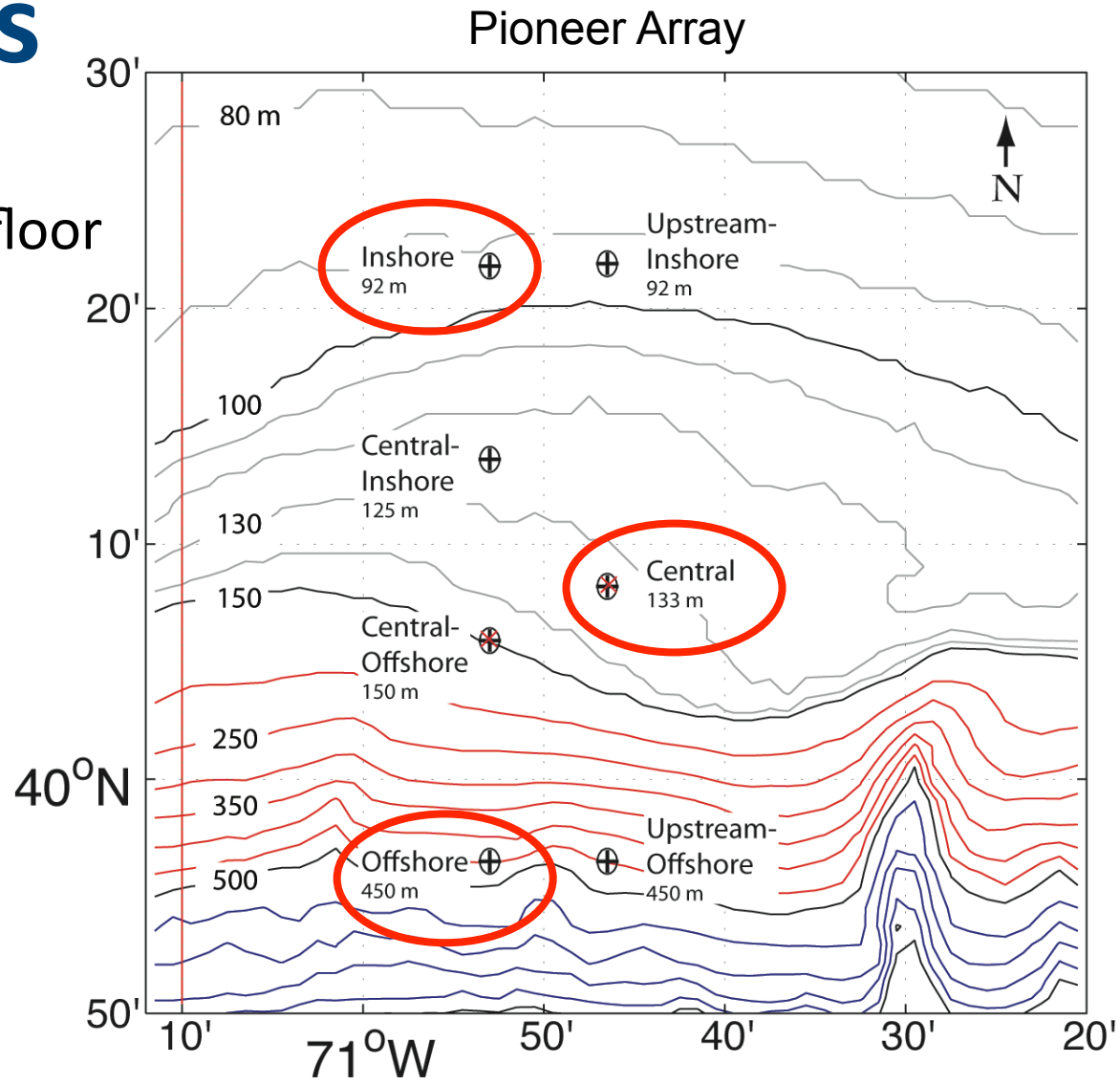


ADCP

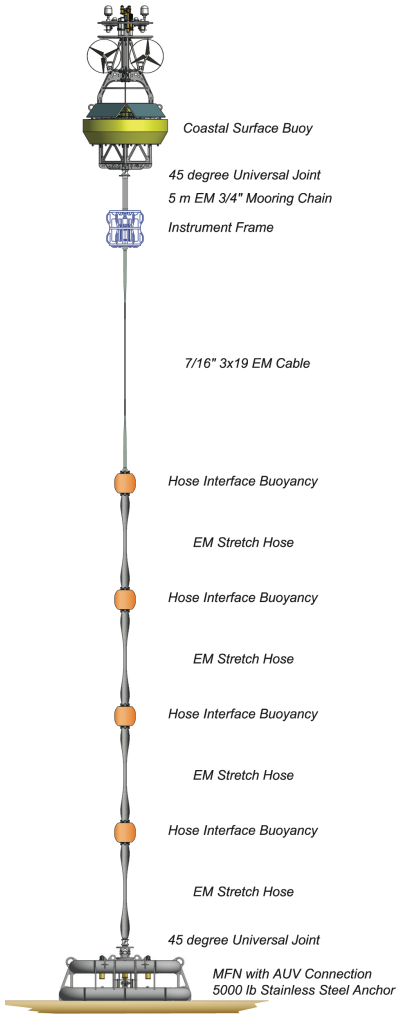
Coastal Surface Moorings

- Capabilities
  - Surface telemetry, EM connectivity to seafloor
  - Power generation (solar and wind)
  - Instruments on Buoy, NSIF and MFN

- 3 moorings at Pioneer
  - Central (133 m)
    - Dual METBK, WAVSS, FDCHP
  - Inshore (91.5 m)
  - Offshore (450 m)

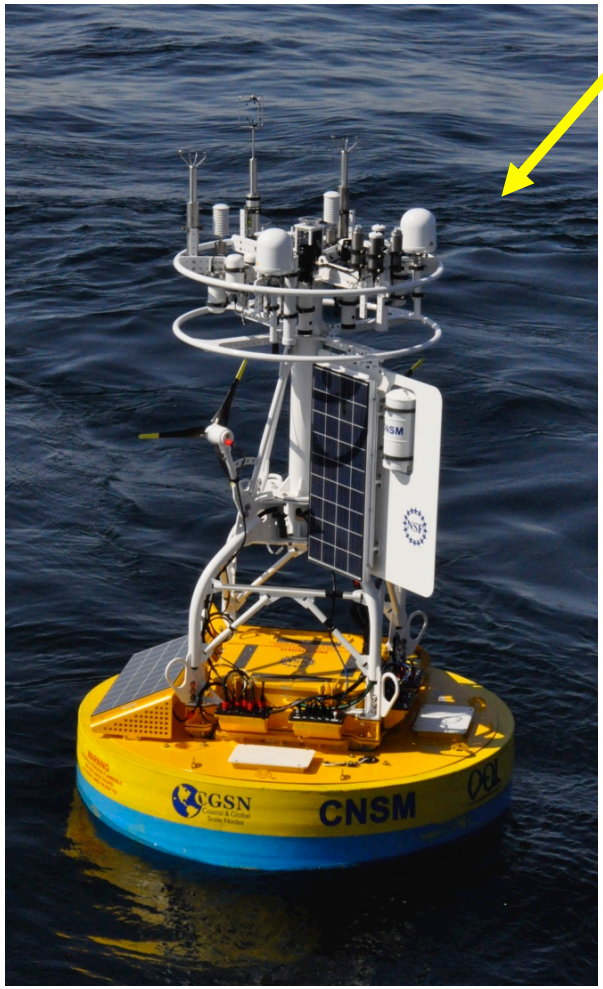


Coastal Surface Moorings



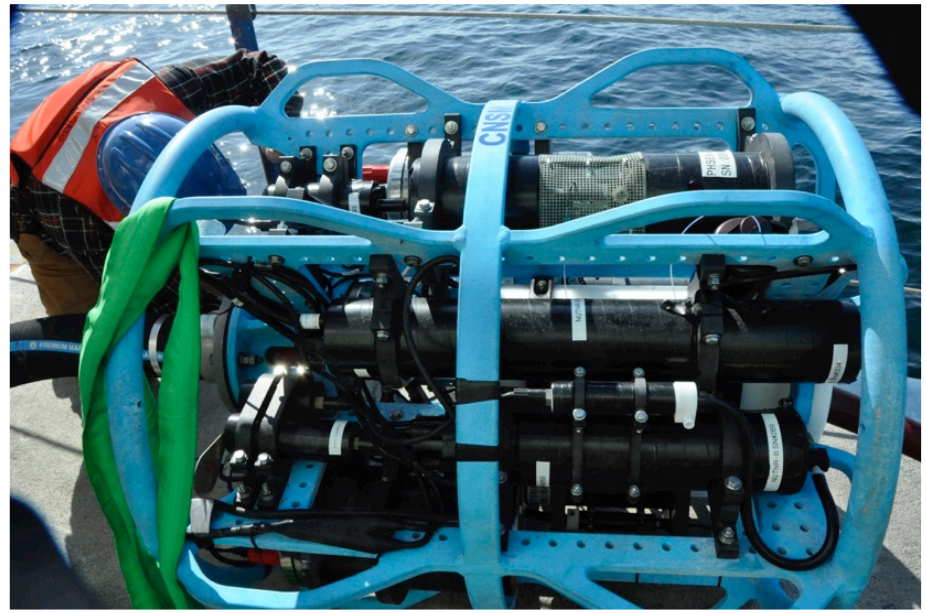
Sub-System	Coastal Surface Mooring Configuration
Surface Buoy	Coastal Surface Buoy
Platform Control	CPM/DCL Controller
Telemetry	**Satellite:** Fleet BroadBand, Iridium 9522, Iridium SBD **Line-of-Sight:** Freewave, Wi-Fi **Subsurface:** acoustic modem
Power System	Wind Turbines, Solar Panels, Rechargeable Batteries
Mooring Riser	EM Chain, Near Surface Instrument Frame, EM Cable, EM Stretch Hose
Multi-Function Node	Benthic Anchor Recovery Frame w/ Power, PlatCon and Instruments
Instruments *(19-22 total)*	**Buoy:** METBK, PCO2A, WAVSS, DCHP
	NSIF: CTDBP, DOSTA, PHSEN, NUTNR, VELPT, FLORT, OPTAA, SPKIR
	MFN: CTDBP, DOSTA, PHSEN, PCO2W, PRESF, VELPT, ADCPT, OPTAA, ZPLSC

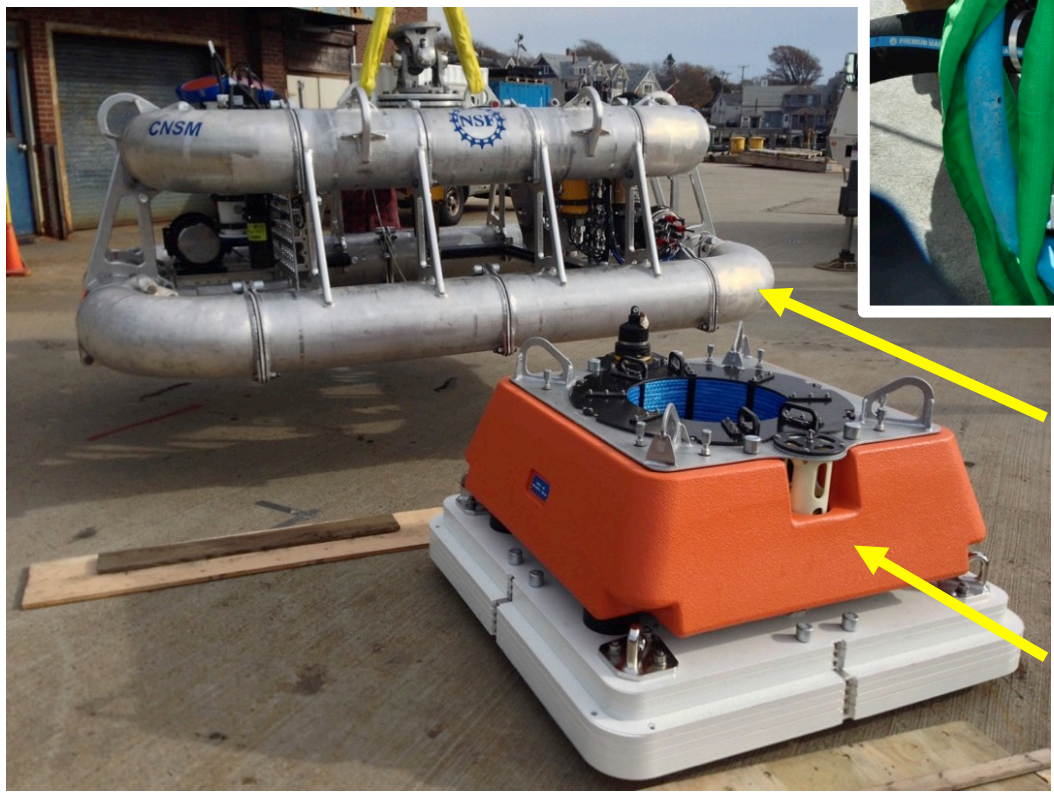
Coastal Surface Moorings



Coastal Surface Buoy

Near Surface Instrument Frame





Modular frame provides buoyancy

Anchor Recovery Module (ARM)

Coastal Gliders

- Teledyne Webb G2 Slocum Glider
  - 200 and 1000 m engines
- Instruments

  CTDGV – SBE CTD

  DOSTA – AADI 4831

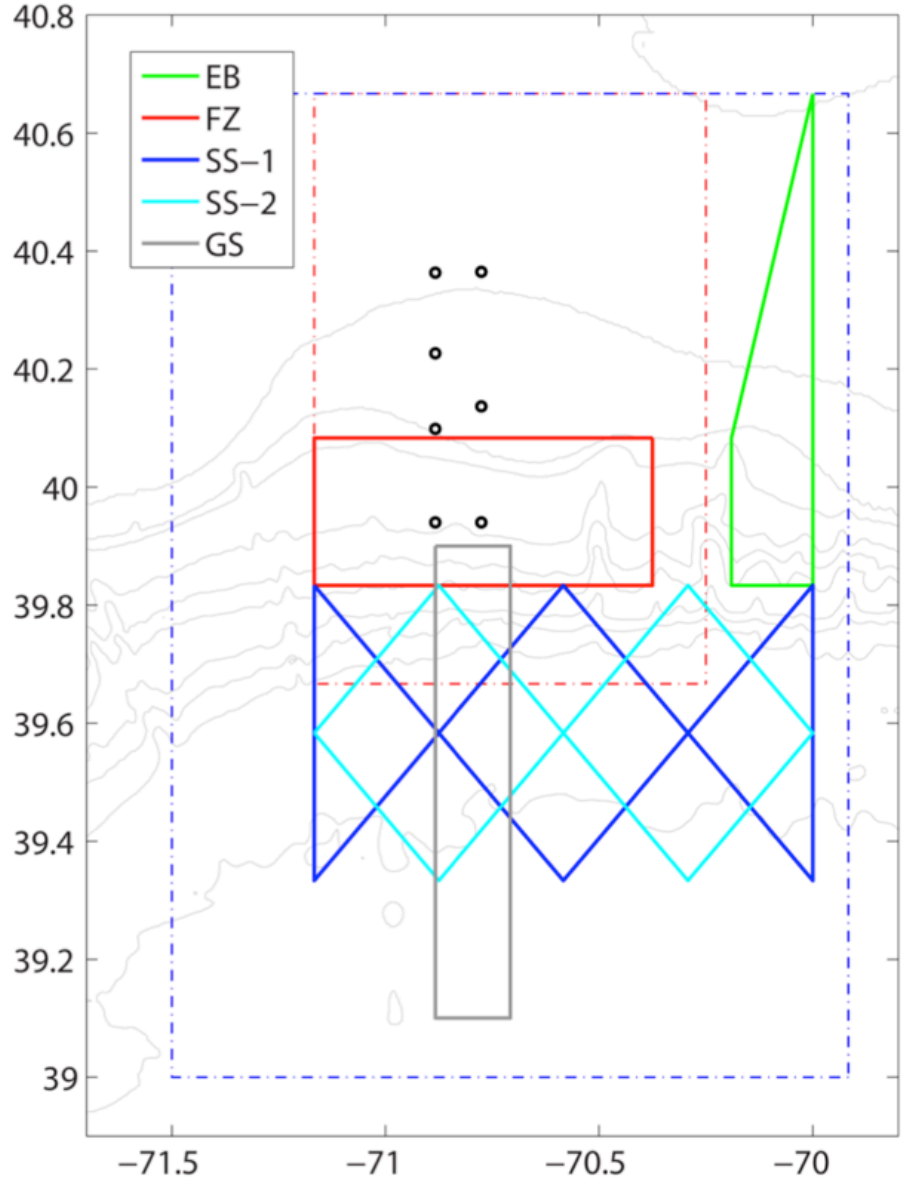
  PARAD – Biospherical QSP 2150

  FLORT – WET Labs ECO triplet

  ADCPA – RDI Explorer 600 DVL

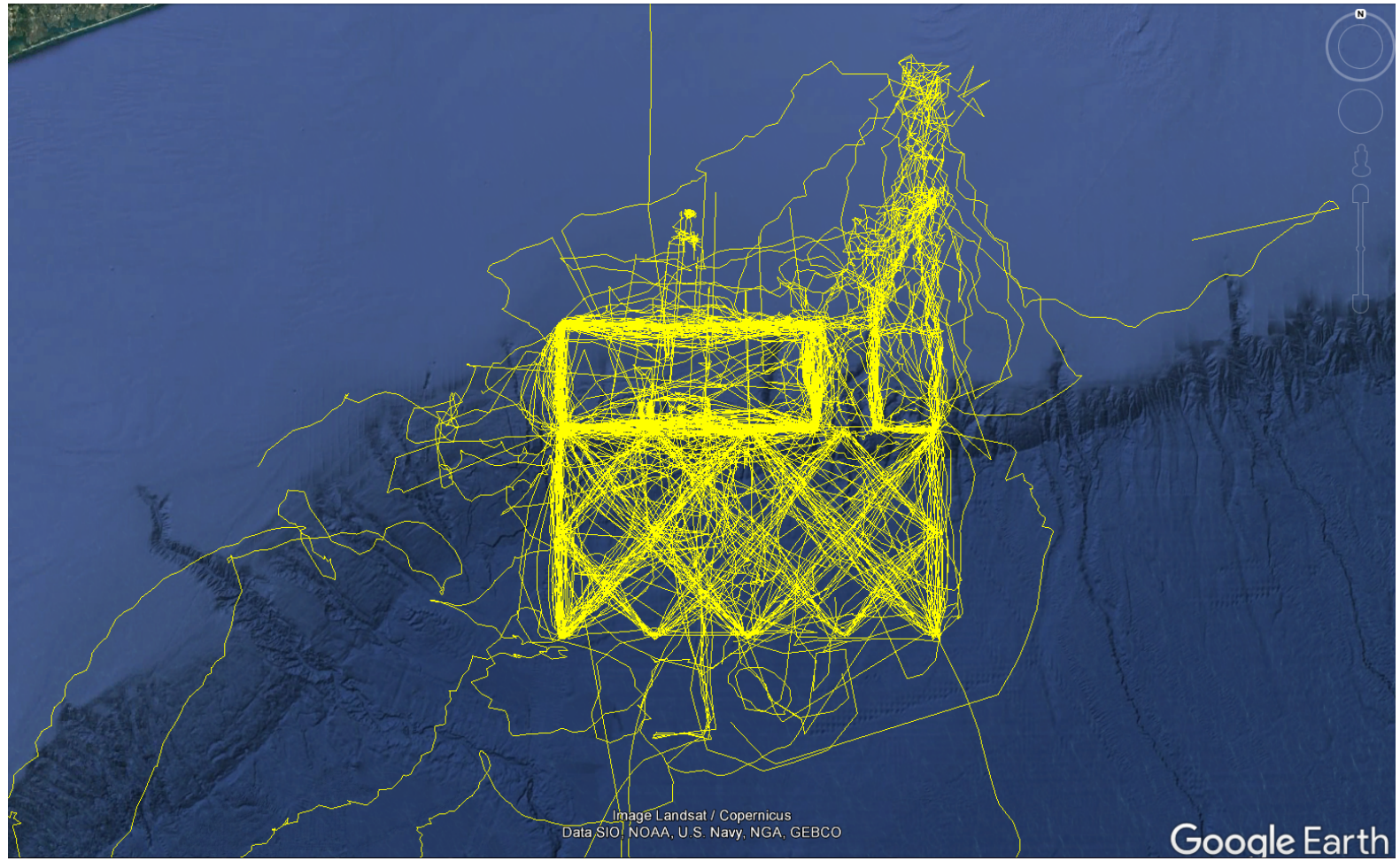
Pioneer Coastal Gliders

Name	Region	Buoyancy Engine
EB	Eastern Boundary	200 m
FZ-1	Frontal Zone	1000 m
SS-1	Slope Sea	1000 m
SS-2	Slope Sea	1000 m
FZ-2	Frontal Zone	200 m
GS	Gulf Stream	1000 m



Pioneer Coastal Gliders

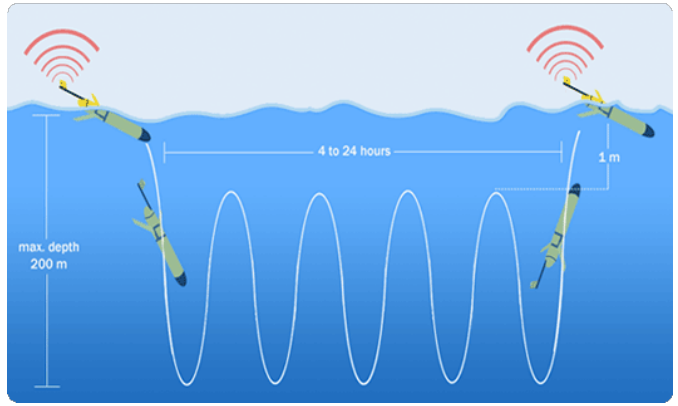
Cumulative tracks of 41 of 48 gliders deployed at the Pioneer Array

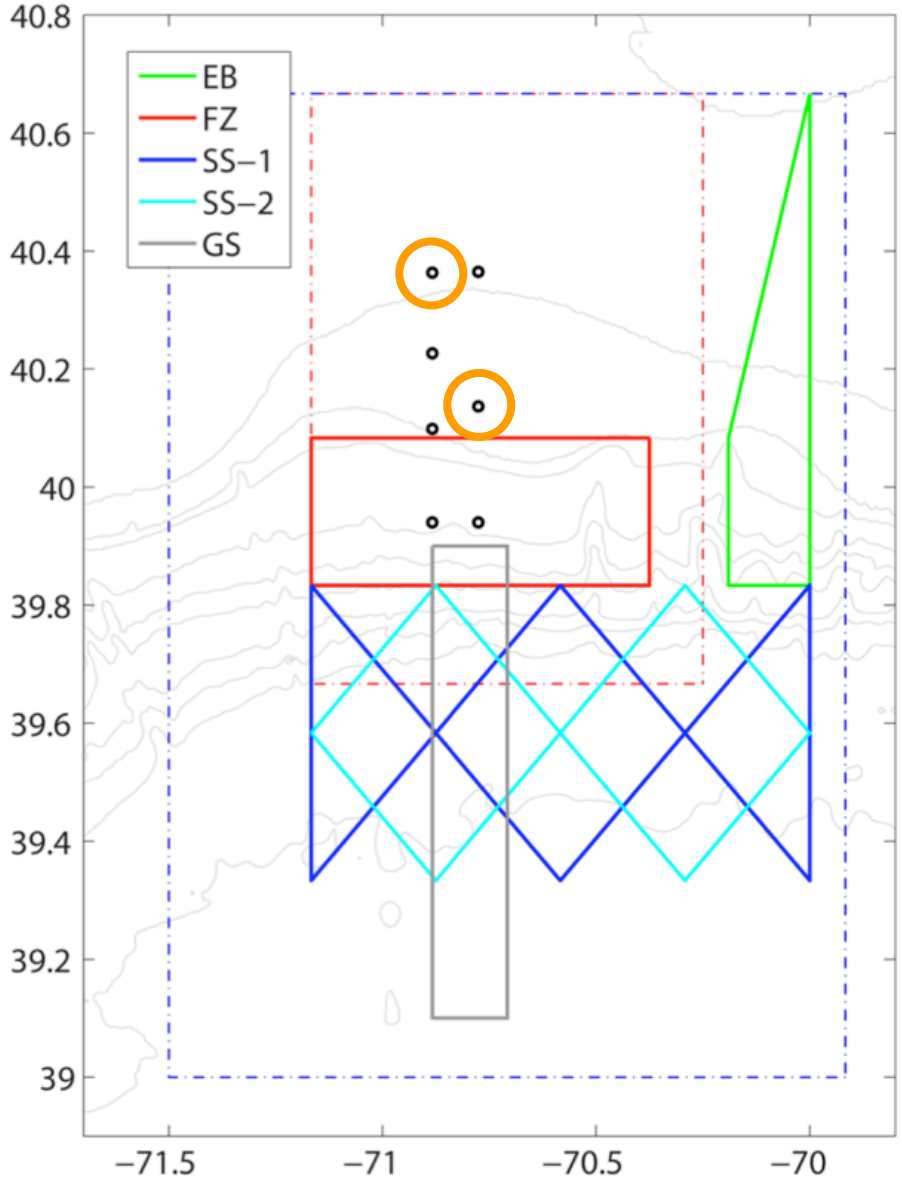


Pioneer Profiling Gliders

- Teledyne Webb G2
  - 200 m engine
- Operations
  - Hold position @ 130 m
  - Profile at least 4 profiles / day
- Instruments

  CTDGV – SBE CTD-GP
  DOSTA – AADI 4831
  NUTNR – Satlantic SUNA
  PARAD – QSP-2155 PAR
  FLORT – ECO FLBBCD
  FLORT – ECO BB3





Autonomous Underwater Vehicle (AUV)

- Kongsberg Hydroid
  - REMUS 600
- Instruments

  CTDAV – Seabird CTD

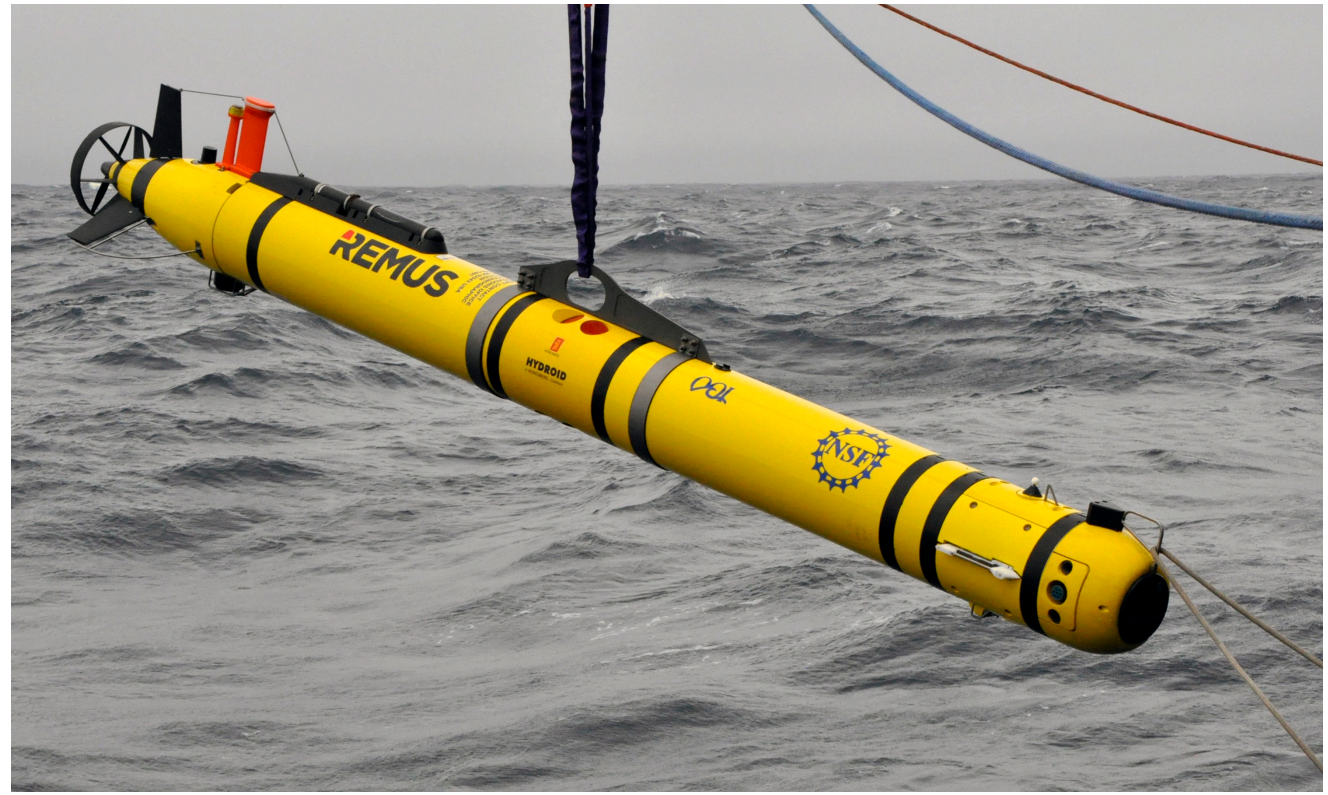
  DOSTA – AADI Optode 4330

  PARAD – Biospherical QSP 2150

  FLORT – WET Labs Eco triplet

  NUTNR – Satlantic SUNA

  ADCPA – RDI Navigator 600



AUV Operations

- 2 AUVs
  - Deployment from ship once per month
  - Surface to 600 m depth in “sawtooth” mode
- Operations
  - Frontal transect: 9 hr at 1.5 m/s ~48 km
  - Mission box: 24 hr at 1.5 m/s, ~130 km
  - Horizontal resolution <= 10x water depth (<5km)

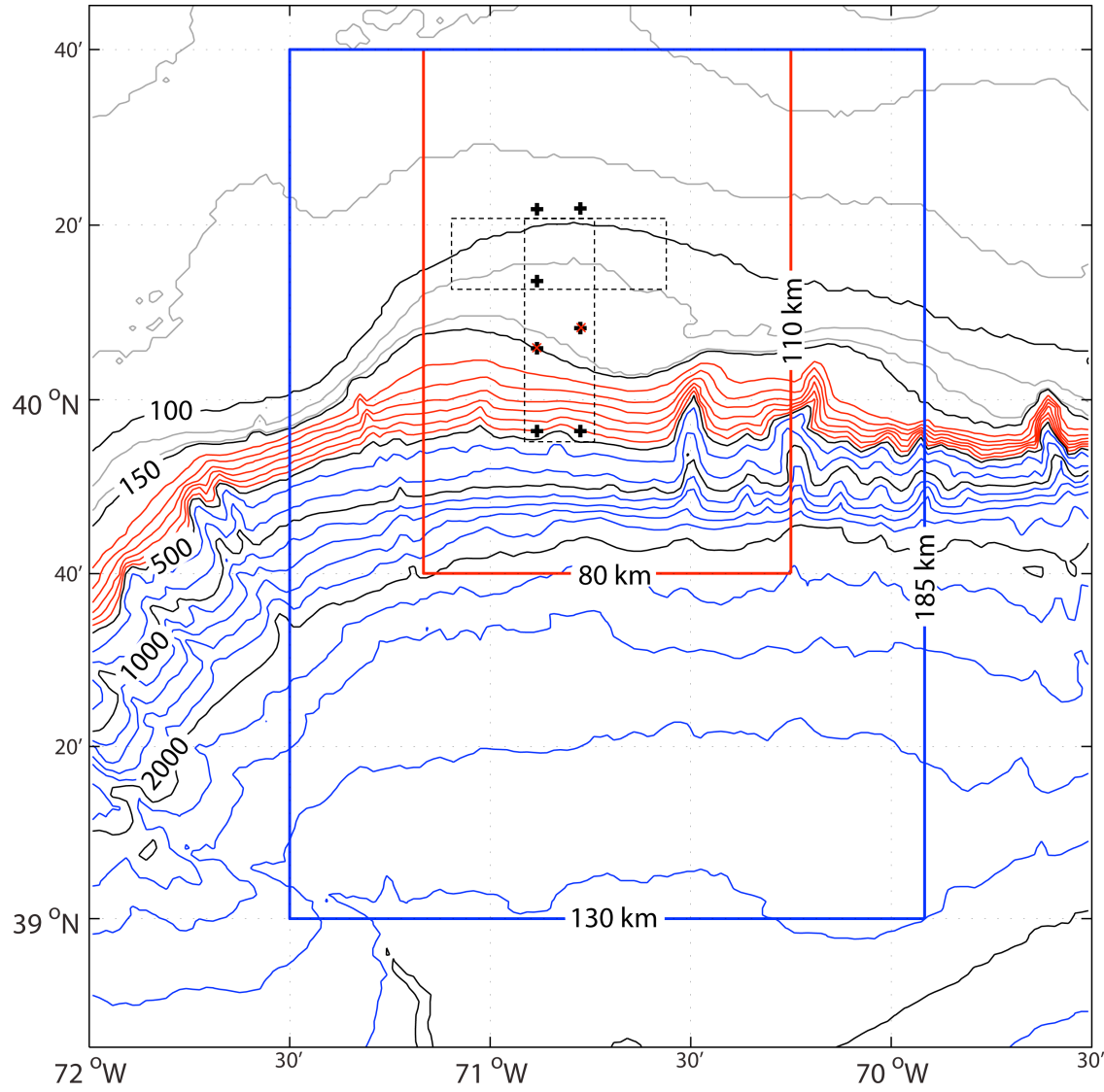


Figure 27 from 3204-00007 Pioneer Array Site Characterization

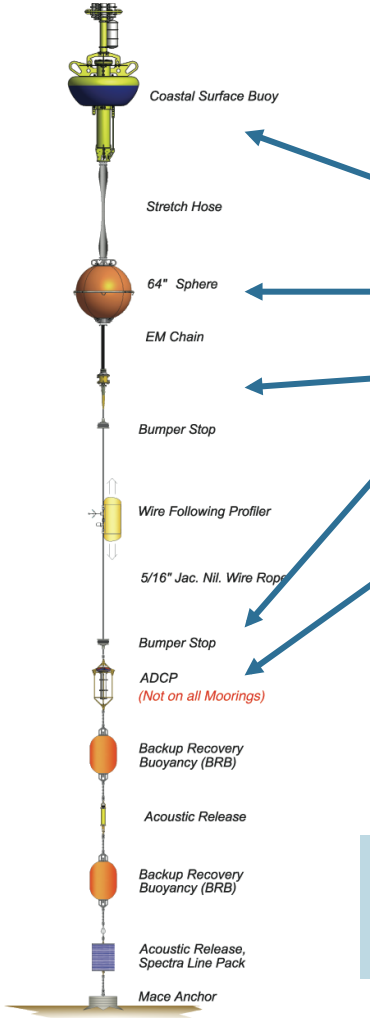
Coastal Pioneer Array

- Operational since Nov 2013
  - Full installation Dec 2014
- What's deployed now
  - 3 of 3 Surface Moorings
  - 5 of 5 Profiler Moorings
  - 2 of 6 Coastal Gliders
  - 1 of 2 Coastal Profiling Glider
  - 2 AUVs in "campaign mode"

- Changes from baseline
  - AUV docks descoped, transition to campaign mode
  - CSPPs replaced with CPM + CPG
- Issues
  - Incidental contact with fishing gear fouls WFPs
  - MFN power/telemetry shutdown if persistent low wind
  - Gliders blown off course in storms

Back-ups and Extras

Coastal Profiler Mooring Instruments

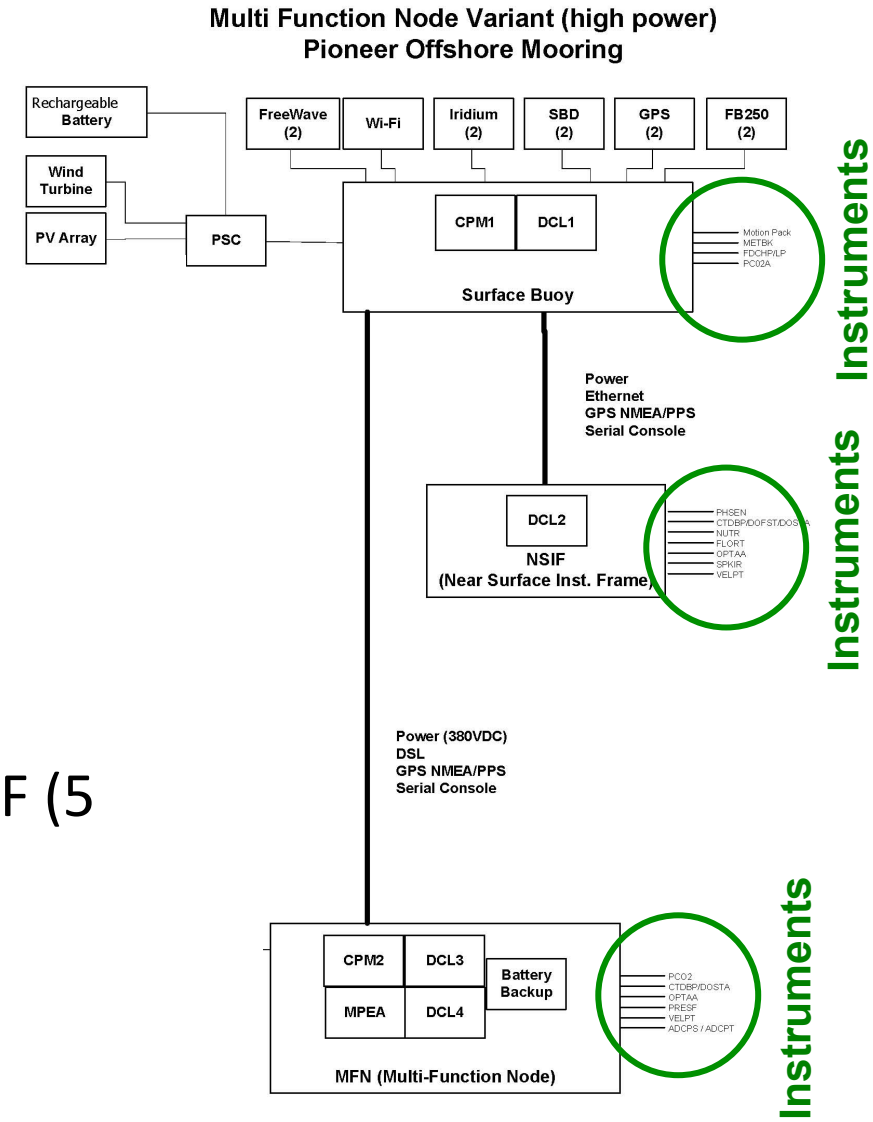


- Instruments can be mounted in the following locations
  - On the submersible surface buoy
  - On the 64” sphere (~20 m depth)
  - On the inductive line above the top profiler stop or below the bottom profiler stop
  - In the ADCP frame
- Adding instrumentation to the profiler would require a design change of the profiler by McLane

NOTE: Addition of instruments in any location requires reanalysis of mooring design due to added weight/drag

Coastal Surface Mooring

- Power
  - Wind Turbines (2)
  - Solar Panels (4)
  - Rechargeable Batteries
- Communications
  - Redundant telemetry
- Instruments
  - Instruments mounted/connected to buoy, NSIF (5 m) or MFN (seafloor)
  - DCLs can provide 12V or 24 V to instruments
  - Serial or Ethernet communications



Pioneer CSPP Moorings

- Locations
  - Inshore (91.5 m depth)

    CSPP profiles from 80 m depth to the surface
  - Central (133 m depth)

    CSPP profilers from 100 m depth to the surface