



OOI Coastal Pioneer New England Shelf Array



40°N

70°W

Array Center - 39° 40'N, 70° 40'W
Depth Range - 95-450 meters

Scientific Motivation

The Mid-Atlantic Bight shelf-break front is a persistent oceanographic feature associated with the changing bathymetry of the continental shelf and slope. The front separates cold, fresh continental shelf water to the north from warm, salty oceanic water to the south. This dynamic, highly biologically productive environment permits investigation of key features of coastal processes and ecosystems.

The frontal region is associated with along- and cross-shelf fluxes of heat, freshwater, nutrients, and carbon. These fluxes control water mass and ecosystem characteristics in multiple regions including at the shelf break, over the continental shelf inshore of the front, and in the slope sea offshore. Many of the processes along the shelf-break front evolve rapidly and occur over short spatial scales.

Design

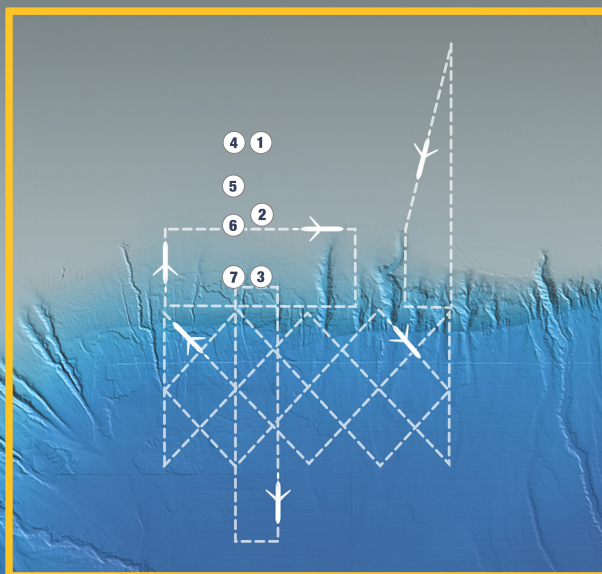
Located over the continental shelf and slope in the Northwest Atlantic Ocean south of New England, the Pioneer Array is centered near the front and samples the nearby shelf waters inshore and the slope sea offshore. The seven-site mooring array spans along- and across-shelf distances of 9 km and 47 km; mooring sites are separated from each other by distances of 9.2 km to 17.5 km. Some sites have paired moorings.

Moorings are supplemented by 6 coastal gliders (dashed lines), 2 profiling gliders, and 2 AUVs. Coastal gliders monitor the slope sea and outer shelf resolving Gulf Stream rings, eddies, and meanders. Profiling gliders are used as “virtual moorings” at the Central and Inshore sites in the summer. The overall glider operating area is 185 km × 130 km, roughly centered on the mooring array. Nominal AUV missions are two 14 km × 47 km rectangles, with the along-shelf rectangle intersecting the inshore end of the mooring array and the cross-shelf rectangle encompassing the mooring array.

Pioneer Array data enable scientists to examine how exchange processes structure physical, chemical and biological properties over the continental shelf and slope. The Pioneer Array was designed to be relocatable. The Array was removed from the New England Shelf in fall 2023 and will be moved to the Southern Mid-Atlantic Bight in 2024.

The core of the Pioneer Array is a rectangular, seven-site mooring array located at:

- 95 meters (4,1)
- 127 meters (5)
- 135 meters (2)
- 147 meters (6)
- 450 meters (7,3)



Pioneer Array

- 1 Upstream Inshore Profiler Mooring
- 2 Central Surface Mooring & Profiler Mooring
- 3 Upstream Offshore Profiler Mooring
- 4 Inshore Surface Mooring & Profiler Mooring
- 5 Central Inshore Profiler Mooring
- 6 Central Offshore Profiler Mooring
- 7 Offshore Surface Mooring & Profiler Mooring

Mobile Assets

39°N 40'

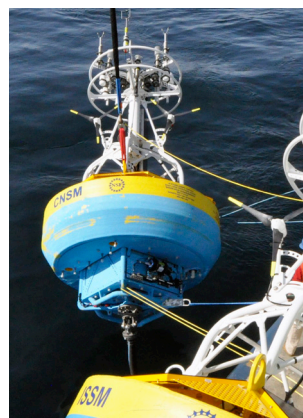
70°W 40'



Coastal Pioneer Array Platforms & Instruments

Coastal Profiler Moorings

Instrument	Data Products
CTD	Salinity, Temperature, Depth, Density
Dissolved Oxygen	Dissolved Oxygen Concentration
3-Wavelength Fluorometer	Chlorophyll, CDOM, Optical Backscatter
PAR	Photosynthetically Active Radiation
3-D Single Point Velocity Meter	Turbulent Point Water Velocity
ADCP	Water Velocity Profile



Coastal Gliders

Instrument	Data Products
CTD	Salinity, Temperature, Depth, Density
Dissolved Oxygen	Dissolved Oxygen Concentration
3-Wavelength Fluorometer	Chlorophyll, CDOM, Optical Backscatter
PAR	Photosynthetically Active Radiation
ADCP	Water Velocity Profile

Coastal Profiling Gliders

Instrument	Data Products
CTD	Salinity, Temperature, Depth, Density
Dissolved Oxygen	Dissolved Oxygen Concentration
3-Wavelength Fluorometer	Chlorophyll, CDOM, Optical Backscatter
3-Wavelength Fluorometer	Optical Backscatter
PAR	Photosynthetically Active Radiation
Nitrate	Nitrate Concentration

Autonomous Underwater Vehicles (AUVs)

Instrument	Data Products
CTD	Salinity, Temperature, Depth, Density
Dissolved Oxygen	Dissolved Oxygen Concentration
3-Wavelength Fluorometer	Chlorophyll, CDOM, Optical Backscatter
PAR	Photosynthetically Active Radiation
Nitrate	Nitrate Concentration
ADCP	Water Velocity Profile

Coastal Surface Moorings

Instrument	Data Products
Meteorological Instrument Package	Water Temperature & Salinity, Precipitation, Atmospheric Pressure, Air-Sea Heat Flux, Wind Velocity, Humidity, Air Temperature, Downwelling Longwave & Shortwave Irradiance
Air-Sea Interface pCO ₂	Partial Pressure of CO ₂ in Atmosphere & Surface Seawater, Air-Sea CO ₂ Flux
Bio-acoustic Sonar	Multi-Frequency Acoustic Backscatter
CTD	Salinity, Temperature, Depth, Density
Dissolved Oxygen	Dissolved Oxygen Concentration
3-Wavelength Fluorometer	Chlorophyll, CDOM, Optical Backscatter
Spectral Irradiance	Downwelling Irradiance
Nitrate	Nitrate Concentration
Seafloor Pressure	Seafloor Pressure
Seawater pCO ₂	Partial Pressure of CO ₂
Seawater pH	pH
Spectrophotometer	Optical Absorption & Attenuation
ADCP	Water Velocity Profile
Single Point Velocity Meter	Mean Point Water Velocity
Direct Covariance Flux	Air-Sea Heat Flux, Wind Velocity, Air Temperature
Surface Wave Spectra	Wave Properties

