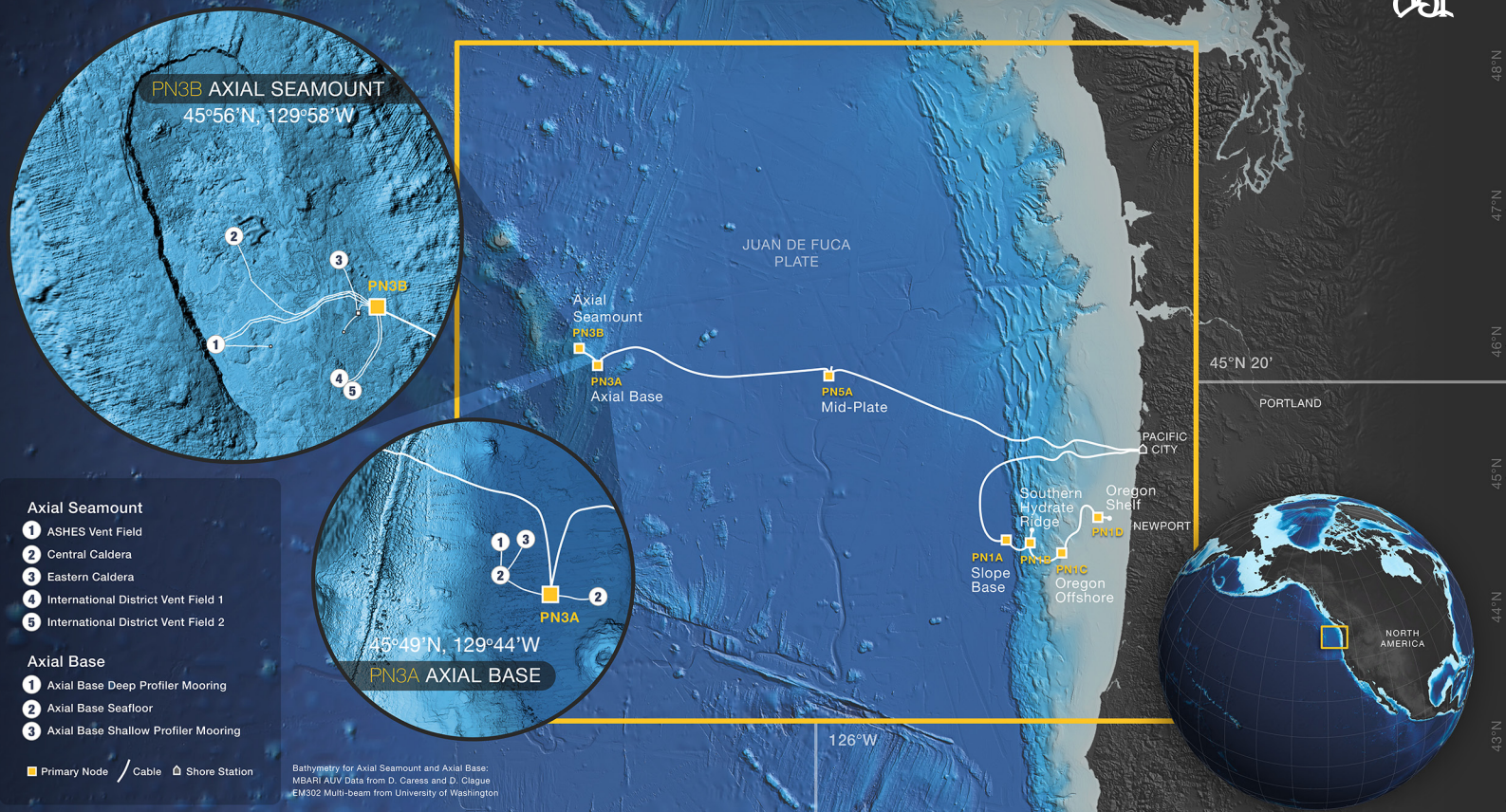


# CABLED AXIAL SEAMOUNT ARRAY



## Scientific Motivation

The Axial Seamount portion of the Cabled Array focuses on blue water environments >500 km offshore (Axial Base) and the Juan de Fuca mid-ocean ridge spreading center (Axial Caldera). Additional instrumentation has been added to the Cabled Array through NSF PI funding.

Axial Base is in an open-ocean environment that permits collection of data linking ocean dynamics, climate, and ecosystem response from basin to regional scales. Here, large-scale currents (North Pacific/California Currents, and the subpolar gyre) interact, transporting heat, salt, oxygen, biota, and other crucial elements of the region's ecosystem.

Axial Caldera, the summit of the seamount, hosts the most advanced underwater volcanic observatory in the world ocean. Using data from this site, scientists examine formation and alteration of oceanic crust, the relationships between seismic activity, volcanic eruptions, and fluid flow in diffuse and black smoker sites, and how changes in fluid temperature and chemistry impact microbial and macrofaunal communities.

## Design

The Cabled Array spans coastal to blue-water environments and includes electro-optical submarine cables that provide high-power, bandwidth, and two-way real-time communication to seafloor and water column instrumentation. Within the Axial Seamount Array, infrastructure is located in the active caldera of Axial Seamount and at its base.

Five Medium-Power Junction Boxes are located on the Axial Caldera site. Several contain geophysical instruments (seismometers, hydrophones) paired with pressure-tilt devices to monitor volcanic inflation and deflation. Hydrothermal vents are examined using an HD camera, a myriad of sensors to examine vent fluid and volatile chemistry (including a mass spectrometer), a microbial DNA sensor, and a 3D thermister array.

At Axial Base, observations are made from the seafloor to near the sea surface using instrumented junction boxes paired with a Cabled Deep Profiler Mooring and a Cabled Shallow Profiler Mooring with an instrumented science pod that rises from 200 m to just below the surface.

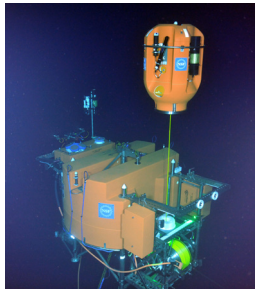
All infrastructure is connected to the cable for power, communication and real-time data flow.

*The OOI Cabled Array spans the Juan de Fuca Plate in the Northeast Pacific; its observations allow for the in-depth study of volcanic activity, methane seeps, hydrothermal vents, and submarine earthquakes, as well as biological, chemical, and physical processes in the overlying water column.*



OCEAN  
OBSERVATORIES  
INITIATIVE

# Cabled Axial Seamount Array Platforms & Instruments



## International District Vent Field 1

Instrument	Data Products
Digital Still Camera	Still Image
Particulate DNA Sampler	Microbial DNA
Hydrothermal Vent Fluid In-situ Chemistry	H <sup>+</sup> & H <sub>2</sub> S Concentration, pH, Vent Fluid Temperature
Hydrothermal Vent Fluid Temperature & Resistivity	Chloride Concentration, Oxidation-Reduction Potential, Water Temperature
Hydrothermal Vent Fluid Interactive Sampler	Water Temperature, Vent Fluid Samples for Laboratory Chemical Analysis
Mass Spectrometer	Hydrothermal Vent Volatile Chemistry

## International District Vent Field 2

Instrument	Data Products
Seafloor Pressure and Tilt	Bottom Pressure, Uplift & Deflation, Tilt
Short-period Seismometer	Ground Motion
3-D Single Point Velocity Meter	Turbulent Point Water Velocity

## Central & Eastern Caldera

Instrument	Data Products
Low Freq. Hydrophone	Acoustic Pressure Waves
Seafloor Pressure and Tilt	Bottom Pressure, Uplift & Deflation, Tilt
Broadband & Short-period Seismometers	Ground Motion

## ASHES Vent Field

Instrument	Data Products
HD Video Camera	HD Video
Osmosis-Based Water Sampler	Physical Fluid Samples for Diffuse Fluid Chemistry
Diffuse Vent Fluid 3-D Temperature Array	Diffuse Vent Fluid Temperature
Short-period Seismometers	Ground Motion

## Cabled Shallow Profiler Mooring

Instrument	Data Products
CTDs	Salinity, Temperature, Depth, Density
Digital Still Camera	Still Image
Dissolved Oxygen	Dissolved Oxygen Concentration
2- & 3-Wavelength Fluorometers	Chlorophyll, CDOM, Optical Backscatter
Broadband Hydrophone	Acoustic Pressure Waves & Frequency
Spectral Irradiance	Downwelling Irradiance
Nitrate	Nitrate Concentration
PAR	Photosynthetically Active Radiation
Seawater pCO <sub>2</sub>	Partial Pressure of CO <sub>2</sub>
Seawater pH	pH
Spectrophotometer	Optical Absorption & Attenuation
ADCPs	Water Velocity Profile
Single Point Velocity Meter	Mean Point Water Velocity

## Cabled Deep Profiler Mooring

Instrument	Data Products
CTD	Salinity, Temperature, Depth, Density
Dissolved Oxygen	Dissolved Oxygen Concentration
2-Wavelength & CDOM Fluorometers	Chlorophyll, CDOM, Optical Backscatter
Spectrophotometer	Optical Absorption & Attenuation
3-D Single Point Velocity Meter	Turbulent Point Water Velocity

## Axial Base Junction Boxes

Instrument	Data Products
CTD	Salinity, Temperature, Depth, Density
Dissolved Oxygen	Dissolved Oxygen Concentration
Broadband & Low-Freq. Hydrophones	Acoustic Pressure Waves and Frequency
Tidal Seafloor Pressure	Seafloor Pressure
Broadband Seismometer	Ground Motion
Spectrophotometer	Optical Absorption & Attenuation
Horizontal Electric Field, Pressure and Inverted Echo Sounder (HPIES)	Vertically Averaged Horizontal Water Velocity, Water Column Heat Content, Bottom Pressure
ADCP	Water Velocity Profile
3-D Single Point Velocity Meter	Turbulent Point Water Velocity