



OCEAN  
OBSERVATORIES  
INITIATIVE

# The Pioneer MAB Array: Location and Sensors

Al Plueddemann and the CGSN Team

OOI SUGR Workshop  
8 Dec 2024







# Pioneer Array Relocation

- NSF announcement Feb 2020
  - Relocate or re-establish
  - Solicited community input
- NSF decision Apr 2021
  - Relocate to southern MAB
- New array installed Apr 2024
  - Everything from NES Array
  - Plus: new shallow-water moorings, new sensors

OCEAN SCIENCES MEETING 2022

## Moving Pioneer Array to Southern MAB

**Monday 28 Feb | 3-4 pm ET**

Status of plans, permitting, and projected timeline for relocating the Pioneer Array

Join the discussion:  
[bit.ly/UpdatePioneerMove](https://bit.ly/UpdatePioneerMove)

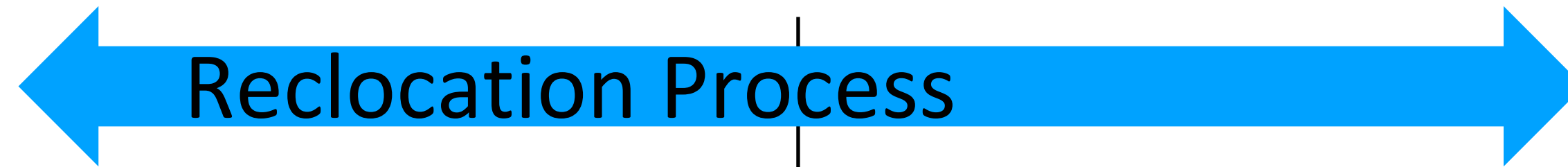
AGU ADVANCING EARTH AND SPACE SCIENCE ASLO THE OCEANOGRAPHY SOCIETY





# Pioneer Array Relocation Milestones

2020	2021	2022	2023	2024
------	------	------	------	------



- Feb: NSF Announcement of intent
- Mar: Innovations Lab #1
- Apr: Decision to relocate
- Jun: Innovations Lab #2
- Jul: OOI process starts
- Nov: NES Array recovered
- Apr: MAB Array deployed

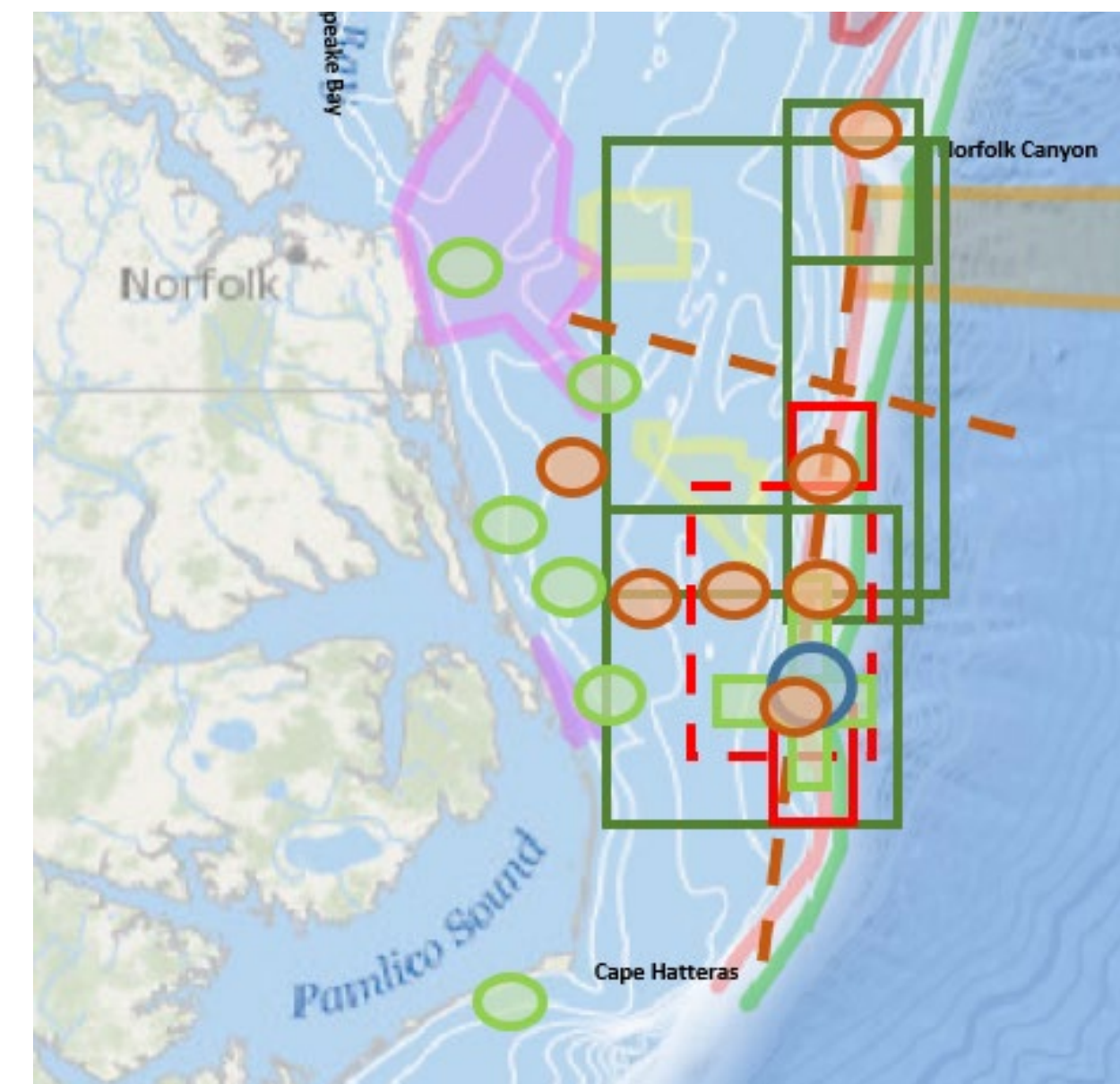






# Relocation Process

- Approach
  - Guided by community input from Innovations Labs:
    - Address high-level science themes
    - Implement consensus Array design
  - Assessment and refinement by OOI Team
- Constraints
  - Optimize use of existing inventory
  - Ensure feasible implementation
  - Operate within existing budget



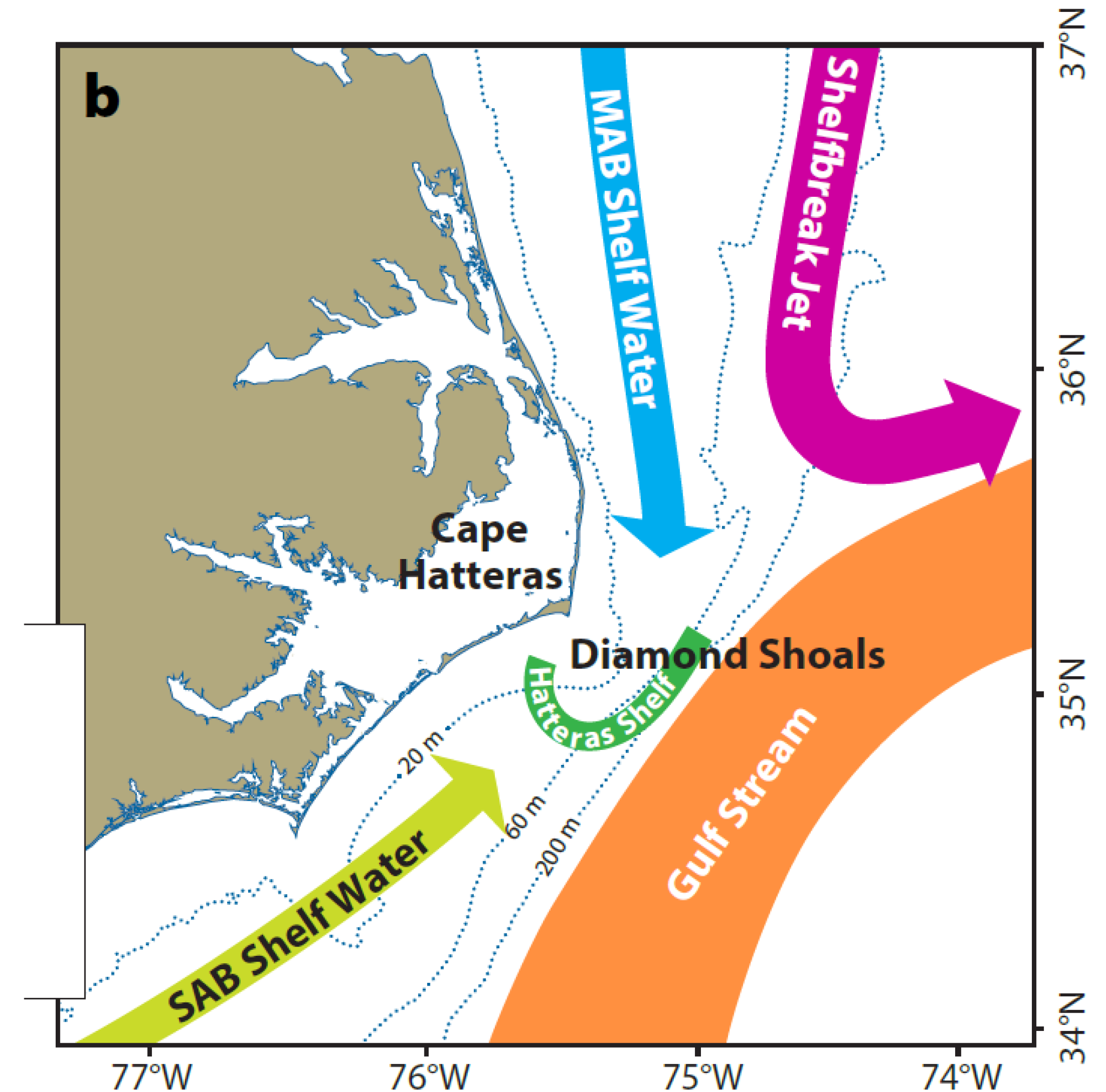
OOI Innovations Lab, June 2021





# MAB Science Themes

- Approach
  - Created broad themes based on Innovations Lab input and ranking
- High level themes
  - Dynamics of shelf/slope exchange
    - Wind forcing, frontal instability, Gulf Stream influence
  - BGC cycling and transport
    - Carbon, nutrients, particulates
    - Ecosystem response
  - Extreme events
    - Hurricanes, freshwater outflows

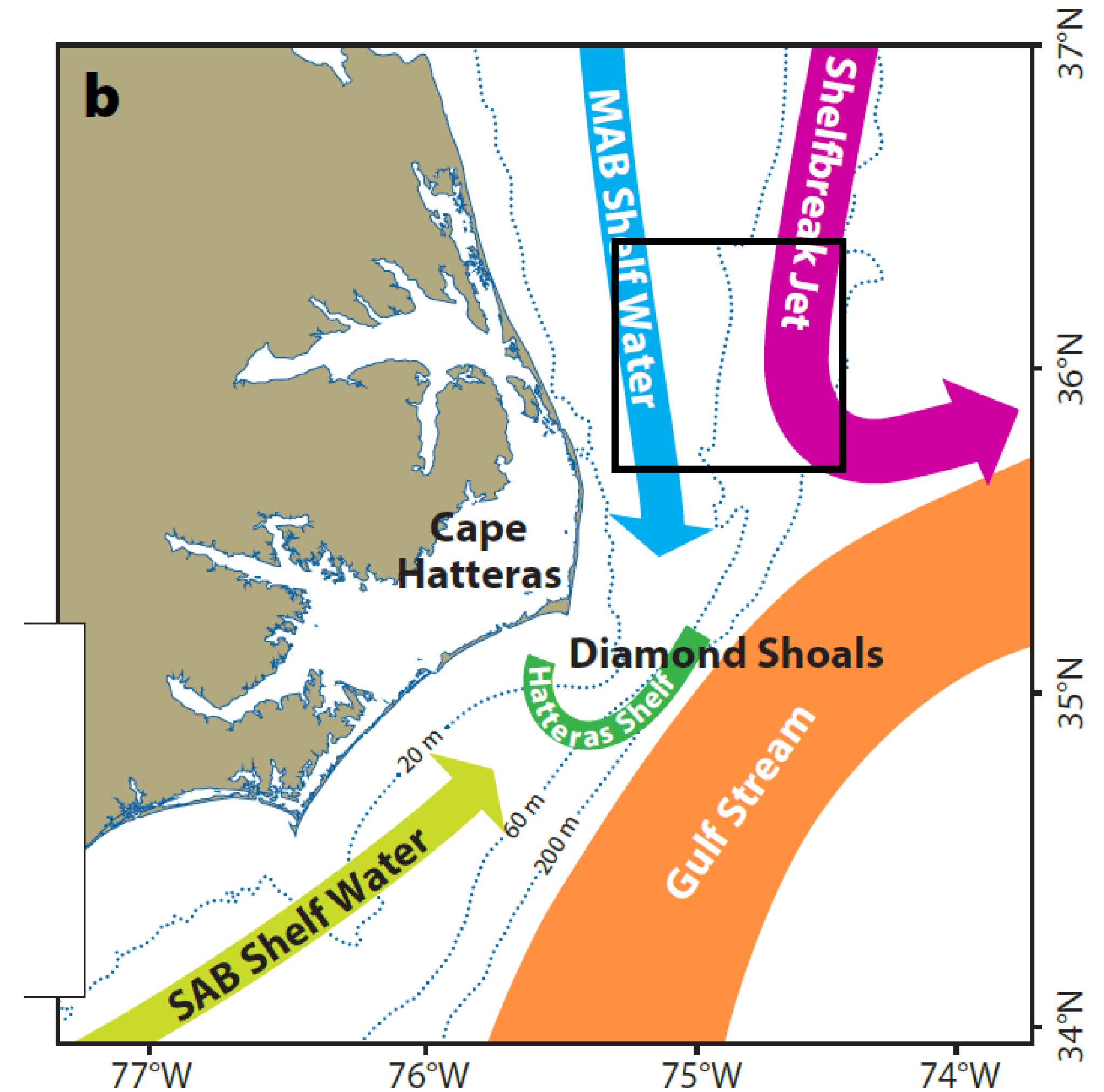


Seim et al., 2022, PEACH



# MAB Observing Region

- Consensus to focus on:
  - Shelf-slope region
  - S of Chesapeake, N of Hatteras
- Constraints
  - Away from: Gulf Stream, shallow water, strong fronts, strong currents
  - Waterspace management
  - Environmental compliance
- A spatially coherent array
  - Moored array ~ 60 km x 60 km

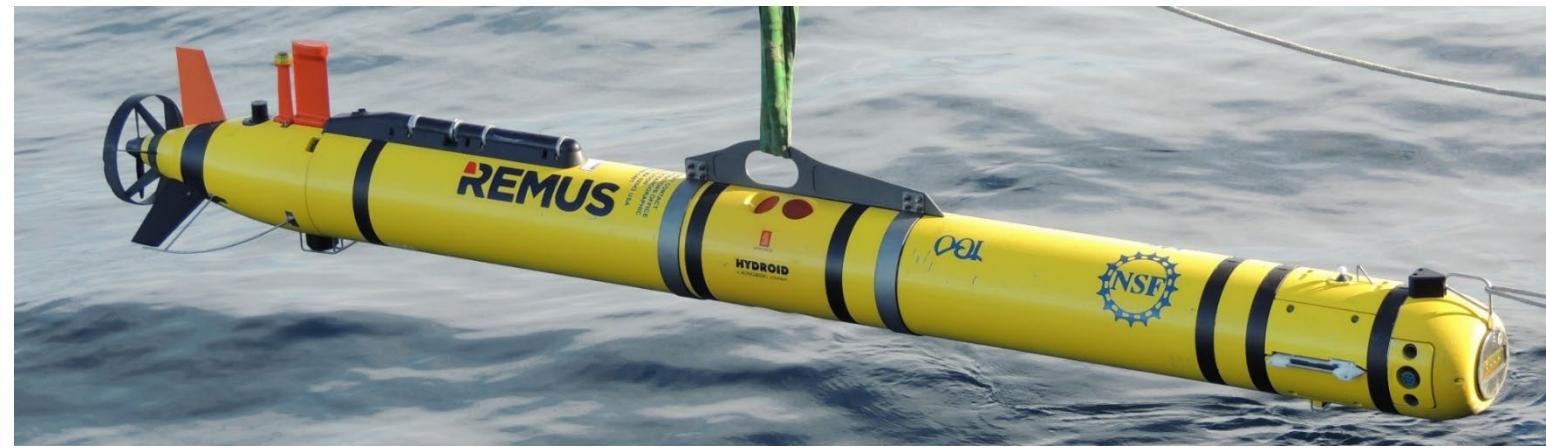


Seim et al., 2022, PEACH

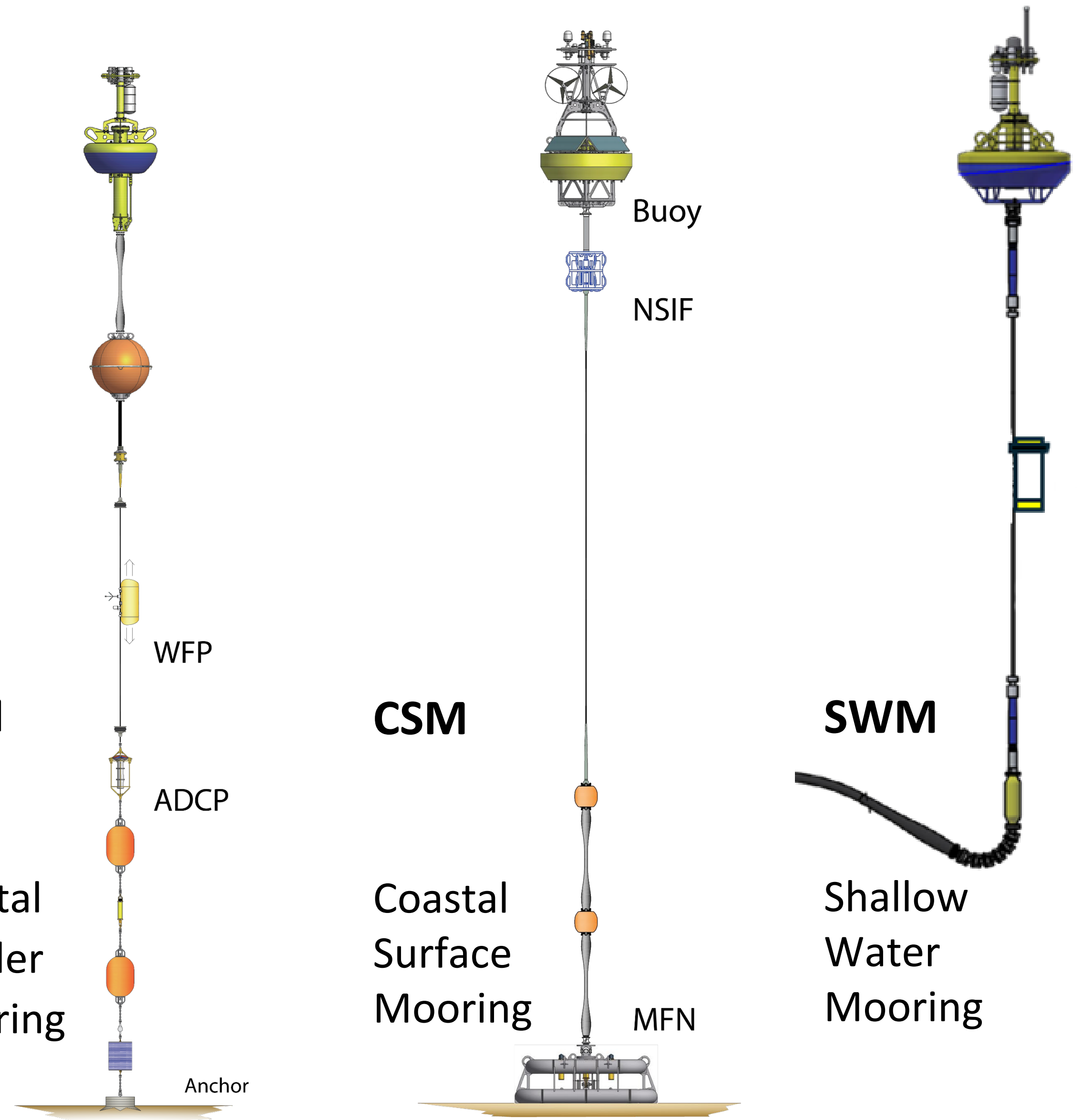


# MAB Platforms

**AUV**



**Glider**





# MAB Core Instruments

Pioneer Array Core Instrumentation		
Instrument Series	Measurement(s)	Platform
CTD	Temp, cond, press	all
Oxygen	Dissolved oxygen	all
Fluorometer	Chl-a, CDOM, optical backscatter	all
Radiometer	Spectral irradiance or PAR	all
Velocity profile	Profile and/or single point	all
Nutrients	Nitrate concentration	CSM, AUV
Surface Meteorology	AT, RH, BP, PRC, WSPD, WDIR, SWR, LWR, SST, SSS, covariance flux	CSM
Surface Waves	Surface wave properties	CSM
CO2	Partial press CO2 in air, water	CSM
pH	Seawater pH	CSM
Pressure	Seafloor pressure	CSM
Spectrophotometer	Optical absorp, attenuation	CSM
Bio-acoustics	Multi-frequency acoustic backscatter	CSM





# MAB New Instruments

Instrument Series	Measurement(s)	Platform
Phytoplankton	IFCB images	CSM
Particulates	Particle size and concentration	CSM
Turbidity	Optical Backscatter	CSM
Pressure	Seafloor Pressure	CSM
Velocity Profile	Short-range Profile	CPM



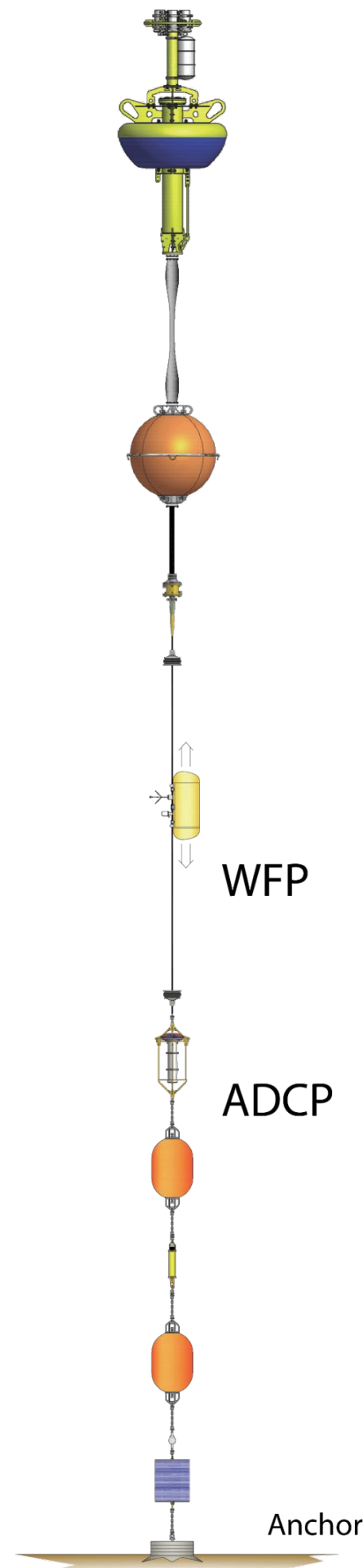


# Instrumentation: CPM and CSM

## MAB added

Surface Buoy  
Buoy base CTD

Sphere  
Uplooking ADCP



## NES Core

Wire Following Profiler  
CTD, oxygen, fluorometer, PAR, single-point velocity

In-Line Cage  
Uplooking ADCP

## MAB added

Surface Buoy  
Buoy: SPKIR

NSIF  
Phyto imagery (CNSM only), particulates, turbidity

MFN  
Particulates, turbidity



## NES Core

Surface Buoy  
Meteorology, waves  
CTD, pCO2,

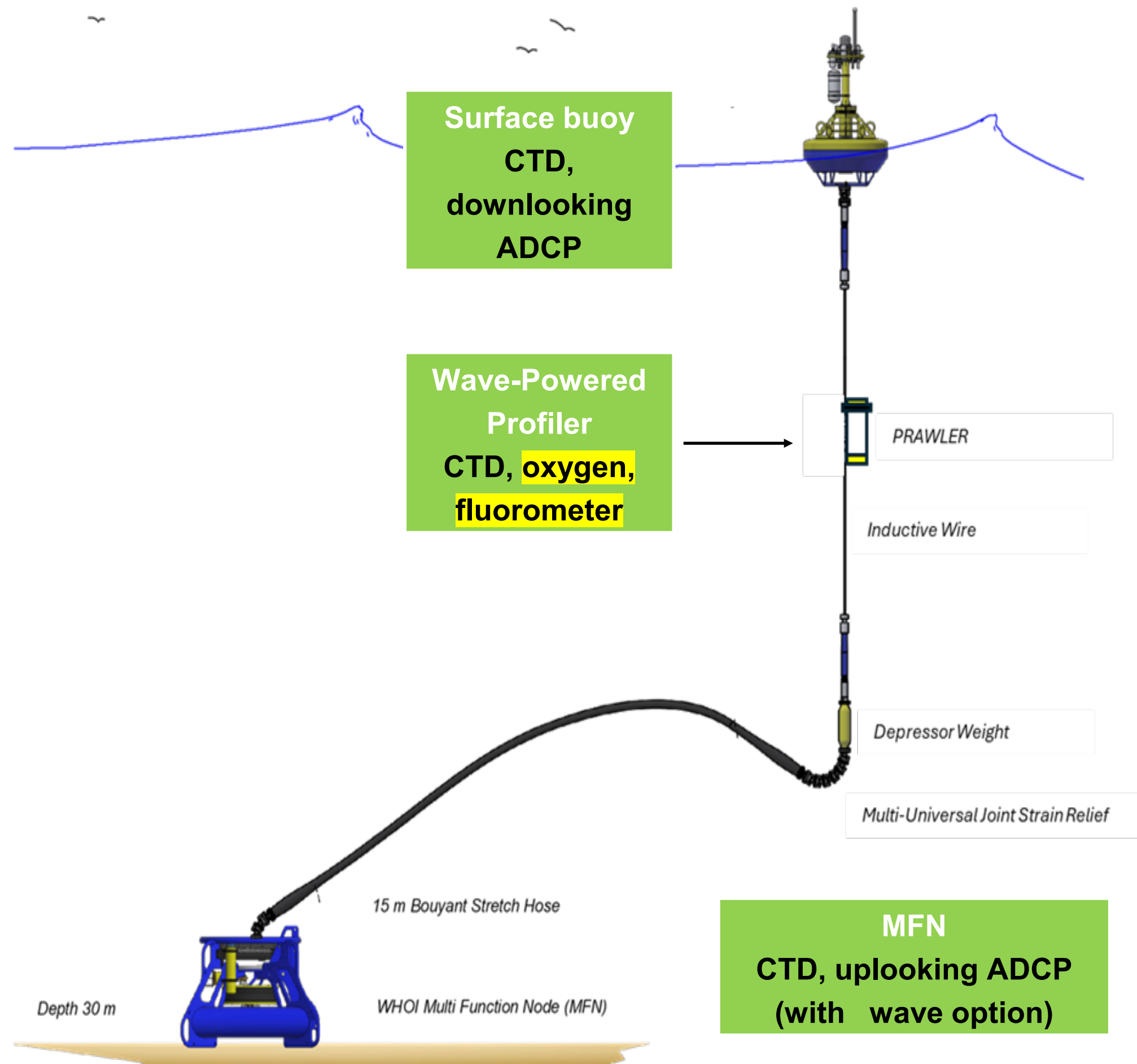
NSIF  
CTD, oxygen, pH, fluorometer, nitrate, spectral irradiance, optical absorption and attenuation, single-point velocity

MFN  
CTD, oxygen, pH, pCO2, optical absorption and attenuation, pressure, single-point velocity, uplooking ADCP, bioacoustics sonar





# Instrumentation: SWM, glider, AUV



**Glider**  
CTD, oxygen,  
fluorometer, PAR,  
short-range ADCP

Nitrate (1x)

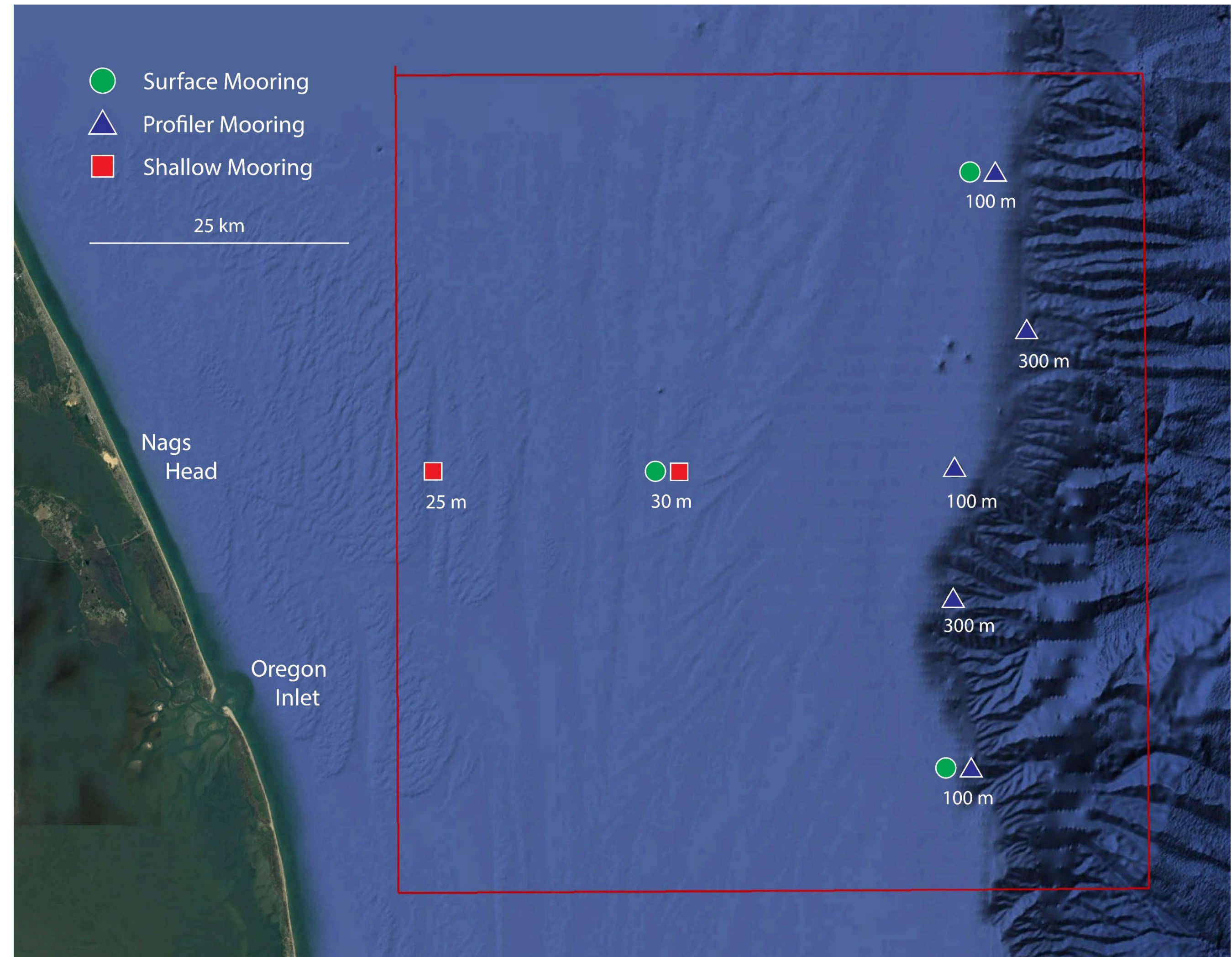
**AUV**  
CTD, oxygen,  
fluorometer, PAR,  
ADCP, nitrate





# Moored Array

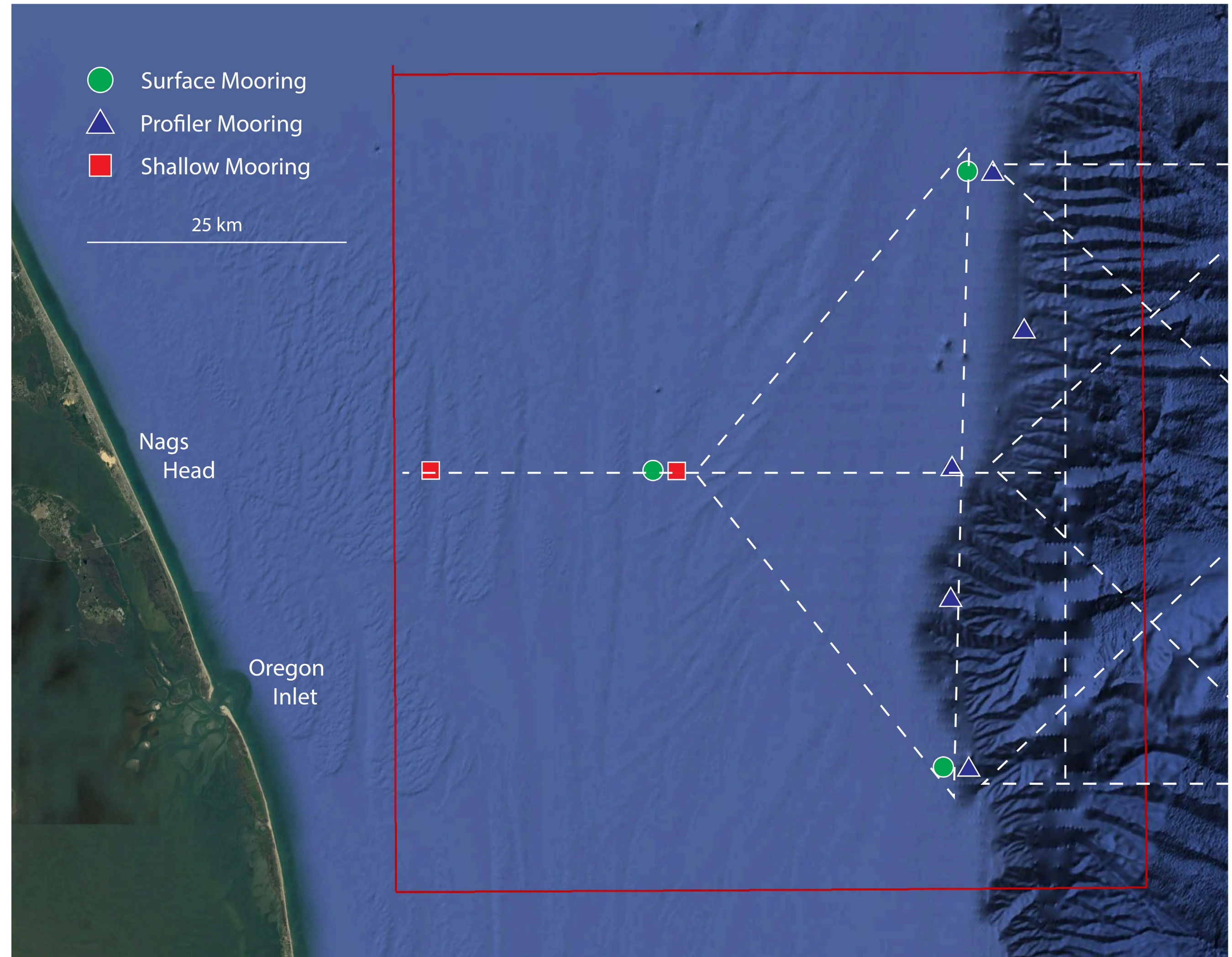
- Ten moorings at seven sites
  - 3 Surface (CSM)
  - 5 Profiler (CPM)
  - 2 Shallow (SWM)
- 30 – 300 m depths





# Gliders

- Four tracklines
  - Cross-shelf
  - Moored array
  - Offshore mesoscale
  - Offshore flux







OCEAN  
OBSERVATORIES  
INITIATIVE

# Questions?

