The Endurance Array







Jack Barth (Project Scientist), Ed Dever (Project Manager/Principal Investigator), Jon Fram (Systems Engineer), Bob Collier (former Project Manager/Principal Investigator, cyberinfrastructure), Tom Kearney (Operations and Management)

Chris Wingard, Craig Risien, Linda Fayler, Walt Waldorf, Tully Rohrer, Stuart Pearce, David Neiman, Russ Desiderio, Kent Fletcher, Jeff Woods, Ian Black

... in collaboration with our WHOI (buoys, design, etc.), UW (cabled infrastructure: Deb Kelley, Orest Kawka) and Rutgers/Raytheon (cyberinfrastructure) colleagues

barth@coas.oregonstate.edu edever@coas.oregonstate.edu jfram@coas.oregonstate.edu



Endurance Array
Science drivers
Array design
Instruments & sampling
Deploy, recover, deploy, ...
Present status

UW CEV Graphics

Coastal Upwelling

Climate Change

Ocean Acidification

Dissolved Oxygen

SCIENCE

A1 Global Biogeochemistry and Carbon Cycling
A2 Ocean-Atmosphere Exchange
A3 Ocean Circulation, Mixing and Ecosystems
A7 Climate Variability and Ecosystems
A9 Coastal Ocean Dynamics and Ecosystems -Hypoxia on Continental Shelves
A10 Coastal Ocean Dynamics and Ecosystems Shelf/Slope Exchange.

Carbon Cycle







OOI in the Pacific Northwest

Axial

Mid Plate • • Endurance Grays Harbor

> Portland CyberPOP

> > Endurance Newport

Meters

Endurance Array and Cabled Array

Hydrate

Ridge

Primary Node Low Voltage Node O Coastal Mooring

3500

Endurance Array

- Cross-shelf mooring lines at Newport and Grays Harbor (N & S of Columbia River)
- Oregon Line connected to the Cabled Array
- 6 deployed gliders year-round
- 20 platforms: EA ~240 sensors Cabled EA ~39 sensors
- Locations chosen based on existing long-term data





Endurance Array: Oregon Line



Endurance Array: Oregon Line



Endurance Array - Grays Harbor Line





Endurance Array: Washington Line





OOI FB May 2017

Cabled Array off central Oregon





Cabled Benthic Experiment Package

Designed & Built at OSU Operating since summer 2014





<u>Instruments</u>

- CTD, O₂, pH, pCO₂
- Chl-a, OBS, CDOM
- ADCP, fast point velocity,
- hydrophone
- Opt. Atten. & Absorp.
- Multi-frequency bioacoustics (on nearby platform)



OOI FB May 2017

- Design & Build
 - Started 1-Sep-2009

OOI's Timeline

- 5+1 year build.
- All Endurance platforms and sensors have been deployed
- Operate and Maintain



Default Sampling Strategy

- Big Surface Moorings
 - Burst interval 15 min to 1 hour, depending on sensor
 - Mooring powered by wind & solar. Some instruments with batteries.
- Inshore Surface Moorings
 - Burst interval 15 min to 1 hour, depending on sensor
 - Mooring powered by lithium batteries. Some instruments with batteries.
- Wire Following Profiler
 - 3 profiles per day
 - 25 cm vertical resolution
- Coastal Surface Piercing Profiler
 - 2-3 profiles per day, depending on depth & sea state
 - 25 cm vertical resolution (1.5 cm for CTD, 300 cm for nitrate)
- Cabled Infrastructure
 - Always on except for reagent or lamp-limited sensors
 - Bioacoustic sonar and camera share power source
- Gliders

Details in document posted to oceanobservatories.org

Uncabled platforms telemeter decimated data at least twice a day



Endurance Array Gliders

- Lithium batteries \rightarrow 3 month deployments
- 20 km per day
- CTD, O₂, PAR, Chl-a, OBS, CDOM, velocity









Glider Coverage 6 planned, 2 averaged ADCP sometimes off (battery, electronics) Science bay sometimes off (battery) collected data Offshore 2017-05-18 recovered early Coos Bay La Push Grays H Deep Grays H Shallow Newport Deep Newport Shallow 04/14 07/14 10/14 01/15 04/15 07/15 04/16 07/16 10/15 01/16 10/16 01/17 04/17







Endurance Array Platform Status

- All deployed platforms deployed with full complement of instruments.
- Of telemetering uncabled platforms, 12 of 163 instruments not working.

Not telemetering, but sampling

- CE01ISSM buoy CTD, FLORT
- CE06ISSM buoy CTD, FLORT
- CE06ISSM ZPLSC
- CE07SHSM CAMDS
- CE09OSSM CAMDS

Deployed, failed

- CE02SHSM FDCHP
- CE06ISSM VEL3D
- CE07SHSM NSIF ADCF
- CE09OSSM MFN PCO2W

OOI FB May 2017

CE09OSSM NSIF OPTAA



platform for mounting sensors

cabled connections.

the RSN cable





Biofouling

Buoy sensors covered (PCO2A, METBK-CT)



OOI FB May 2017



Endurance Array – Grays Harbor Line

Subsurface Instruments

sometimes get cut off from surface telemetry

- Most instruments continue to sample even if:
 - Stretch hoses stop sending power and data
 - Mooring telemetry fails
 - Mooring data loggers fail
- Recent improvements in stretch hoses and mooring electronics are:
 - Reducing failure rate
 - Reducing need for extensive refurbishment or replacement
- Autonomously collected data are recovered following semiannual cruises







Endurance Array Summary

operate, maintain, deliver data, improve, make efficient, collaborate, work transparently, share ...

Opportunities

- Use data
- Add instruments
- Change sampling
- Ancillary projects
- Join a cruise
- Talk with us



