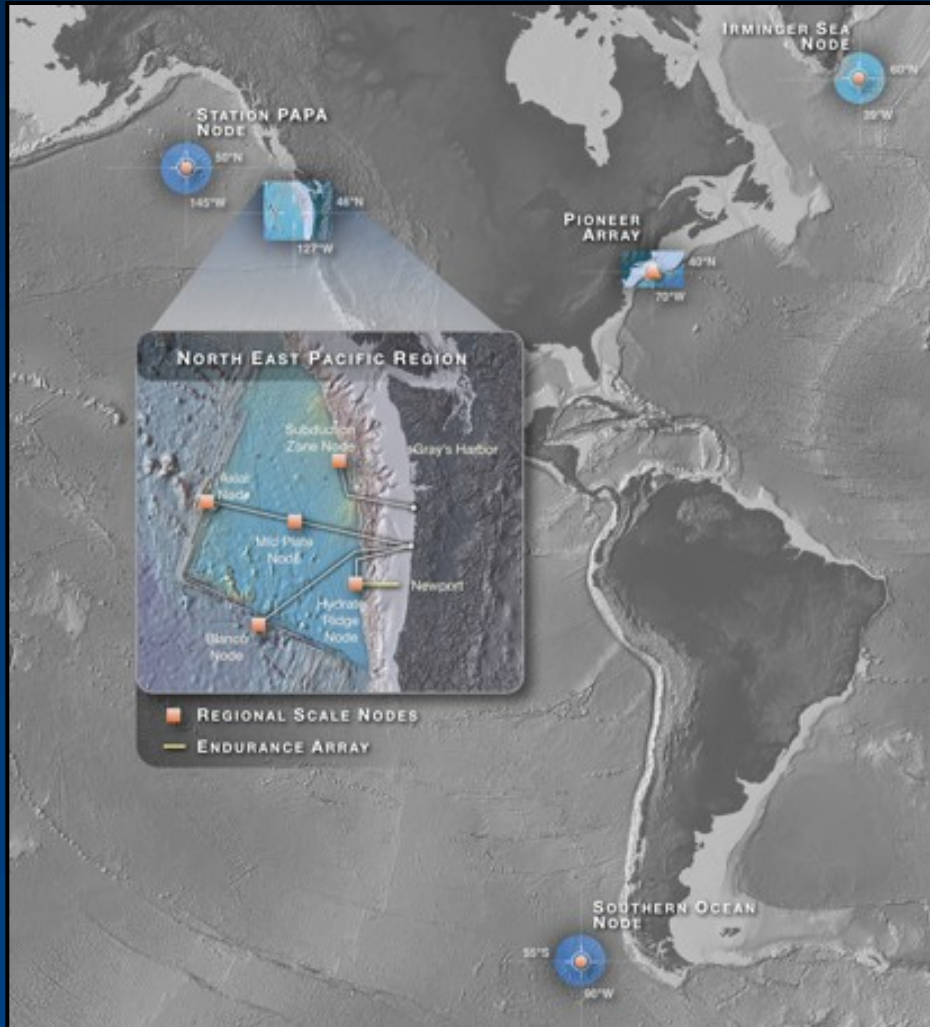


Ocean Observatories Initiative



Shelby Walker
Division of Ocean Sciences
National Science
Foundation

Ocean Carbon and
Biogeochemistry Workshop

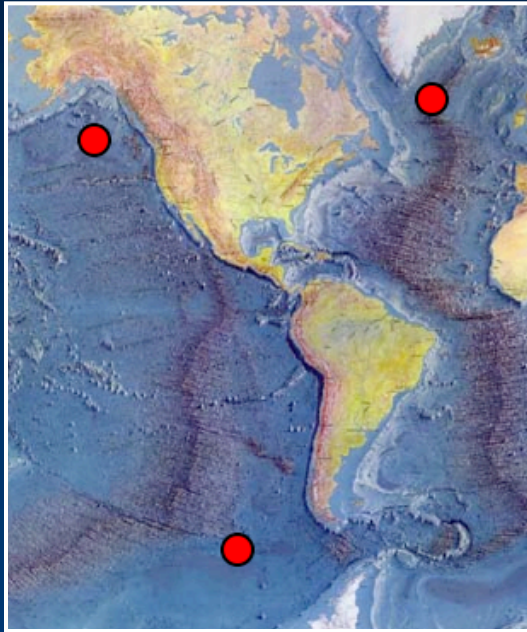
Woods Hole, MA

July 23, 2008

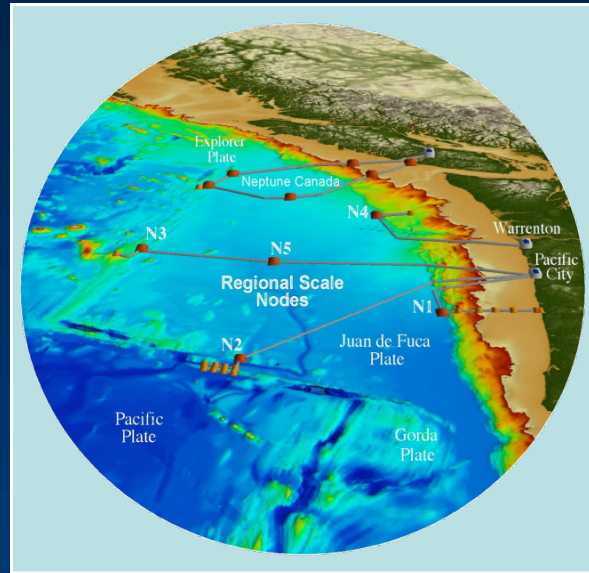
Ocean Observatories Initiative



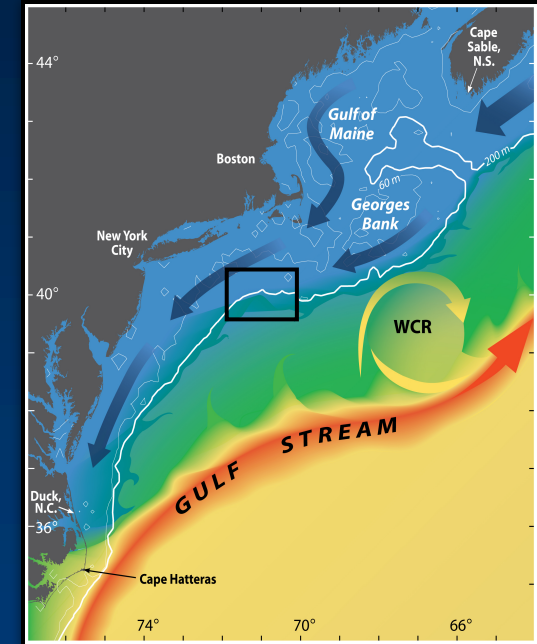
Global



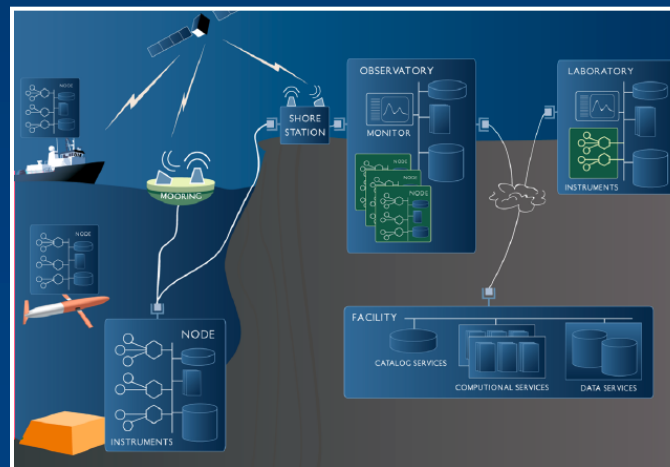
Regional



Coastal



Cyberinfrastructure



Technology

- * Expanded power and bandwidth to the seafloor
- * Interactive capabilities
- * Integrated components
- * Reconfigurable network components
- * New way to provide access to the ocean for education/public awareness

Science

- * Long time-series across multiple spatial scales
- * Investigate short-term episodic events
- * Multi-disciplinary approach to study complex natural systems and non-linear processes
- * Complex models for analysis and prediction

OOI Research Themes

- Climate Variability, Ocean Food Webs, and Biogeochemical Cycles
- Coastal Ocean Dynamics and Ecosystems
- Global and Plate-Scale Geodynamics
- Turbulent Mixing and Biophysical Interactions
- Fluid-Rock Interactions and the Sub-Seafloor Biosphere

OOI Scientific Drivers

- Ocean's role in storing anthropogenic carbon
- Impact of increased atmospheric CO₂ on ocean chemistry and ecosystems
- Impact of climate change and human activity on coastal ecosystems
- Impact of storms on exchanges of heat, gases and nutrients
- Importance of microbial activity in the ocean and in the sub-seafloor biosphere
- Processes controlling the size and frequency of earthquakes

OCB Priorities

- Ocean acidification
- Ocean carbon uptake and storage
- Terrestrial/coastal carbon fluxes and exchanges
- Climate sensitivities of and change in ecosystem structure and associated impacts on biogeochemical cycles
- Mesopelagic ecological and biogeochemical interactions
- Benthic-pelagic feedbacks on biogeochemical cycles

OOI Development



Community driven

OOI Programmatic EA

Final

June 2008

Table 2-1. Summary of Major Workshops and Associated Documents Related to the Development of the Proposed OOI

Date	Workshop and/or Report
1988	Workshop on Broad-Band Downhole Seismometers in the Deep Ocean, 26-28 April 1988, Woods Hole, MA. http://www.joiscience.org/ussp/workshops/downhole_seis .
1990	Chave, A.D., R. Butler, and T.E. Pyle, eds. 1990. Workshop on Scientific Uses of Undersea Cables. Joint Oceanographic Institutions, Washington, DC.
1995	Purdy, G.M. and J.A. Orcutt, eds. 1995. Broadband seismology in the oceans - Towards a five-year plan. Prepared for Ocean Seismic Network/Joint Oceanographic Institutions, Inc., Washington, DC.
1999	UNESCO. 1999. First International Conference on the Ocean Observing System for Climate (OceanObs99). Intergovernmental Oceanographic Commission Report IOC/INF-1137. 18-22 October 1999, St. Raphael, France. http://unesdoc.unesco.org/images/0012/001205/120594Eo.pdf . DEOS Global Working Group. 1999. Moored Buoy Ocean Observatories Report. December. http://orionprogram.org/PDFs/DEOS_Global_Buoy_Rpt.pdf .
2000	R. Detrick, D. Frye, J. Collins, J. Gobat, M. Grosenbaugh, R. Petitt, A. Plueddeman, K. von der Heydt, B. Wooding, J. Orcutt, J. Berger, R. Harriss, F. Vernon, J. Halkyard, and E. Horton. 2000. DEOS Moored Buoy Ocean Observatory Design Study. http://obslab.whoi.edu/buoy.html .
	Ocean.US. 2002. An Integrated and Sustained Ocean Observing System (IOOS) for the United States: Design and Implementation. Workshop, 23 May 2002, National Office for Integrated and Sustained Ocean Observations, Arlington, VA. http://www.ocean.us/documents/docs/FINAL-ImpPlan-NORLC.pdf .
2002	Office of Naval Research/Marine Technology Society Buoy Workshop. 9-11 April 2002, Seattle, WA. http://www.whoi.edu/buoyworkshop/2002/program_final.html . Jahnke, R., L. Atkinson, J. Barth, F. Chavez, K. Daly, J. Edson, P. Franks, J. O'Donnell, and O. Schofield. 2002. Coastal Ocean Processes and Observatories: Advancing Coastal Research. Coastal Ocean Processes (CoOP) Report No. 8. Skidaway Institute of Oceanography Technical Report TR-02-01. Report on the CoOP Observatory Science Workshop, 7-9 May 2002, Savannah, GA. November. http://www.skio.peachnet.edu/research/coop/materials/COS_report.pdf .
	Glenn, S.M. and T.D. Dickey, eds. 2003. SCOTS: Scientific Cabled Observatories for Time Series. NSF Ocean Observatories Initiative Workshop, 26-28 August 2002, Portsmouth, VA. http://www.geo-prose.com/projects/pdfs/scots_rpt_6.20.03.pdf .
	Rudnick, D.L. and M.J. Perry, eds. 2003. ALPS: Autonomous and Lagrangian Platforms and Sensors. Report on the Workshop held 31 March-2 April 2003, La Jolla, CA. http://www.geo-prose.com/ALPS/alps_rpt_12.16.03.pdf .
2003	Jahnke, R., J. Bane, A. Barnard, J. Barth, F. Chavez, H. Dam, E. Dever, P. DiGiacomo, J. Edson, R. Geyer, S. Glenn, K. Johnson, M. Moline, J. O'Donnell, J. Oltman-Shay, O. Persson, O. Schofield, H. Sosik, and E. Terrill. 2003. Coastal Observatory Research Arrays: A Framework for Implementation Planning. Coastal Ocean Processes (CoOP) Program Report No. 9. Skidaway Institute of Oceanography Technical Report TR-03-01. Report on the CoOP CORA Workshop, 12-13 November 2003, Chicago, IL. http://www.skio.peachnet.edu/research/coop/cora.php . Howe, B.M., A.M. Baptista, J.A. Barth, E.E. Davis, J.K. Horne, S.K. Juniper, R.M. Letelier, S.E. Moore, J.D. Parsons, D.R. Toomey, A.M. Tréhu, M.E. Torres, and N.L. Penrose. 2003. Science Planning for the NEPTUNE Regional Cabled Observatory in the Northeast Pacific Ocean. Report of the NEPTUNE Pacific Northwest Workshop, 23-24 April 2003, Portland State University, Portland, OR. JOI/USSSP and NEPTUNE. 2003. Workshop on Linkages between the Ocean Observatories Initiative and the Integrated Ocean Drilling Program, 17-18 July 2003, University of Washington, Seattle, WA. Final Version-23 December. http://www.neptune.washington.edu/pub/workshops/IODP_OOI/ . RECONN: REgional Cabled Observatory Network (of Networks). Report of the Cabled Regional Observatory Workshop, 7-10 October 2003, San Francisco, CA. March. http://www.geo-prose.com/cabled_wksp/ .

OOI Development



Community driven

OOI Programmatic EA

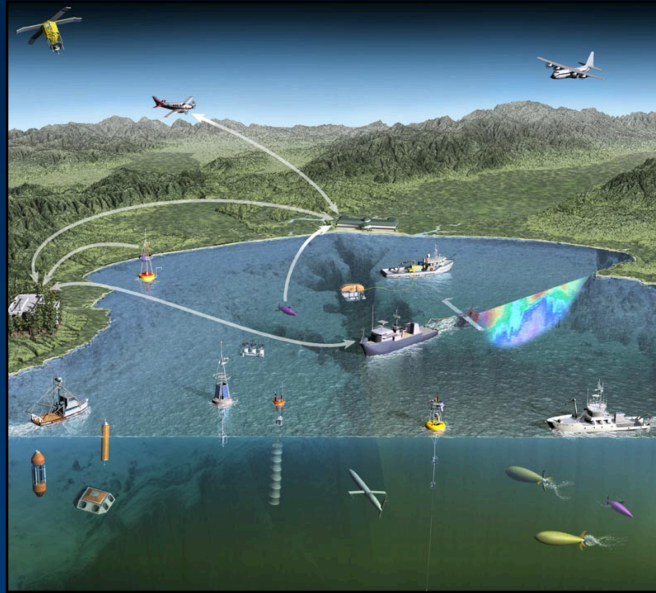
Final

June 2008

Table 2-1. Summary of Major Workshops and Associated Documents Related to the Development of the Proposed OOI

Date	Workshop and/or Report
2004	ORION: Ocean Research Interactive Observatory Networks. A Report of the Workshop held 4-8 January 2004, San Juan, PR. http://www.joiscience.org/ocean_observing/workshops/SanJuan .
	NEPTUNE Canada. 2004. NEPTUNE Canada Ocean Observing Systems Workshop 1 Report, 3-5 May 2004, University of Victoria, BC. http://www.neptunecanada.ca/workshops/index.html .
2005	ORION Executive Steering Committee. 2005. Ocean Observatories Initiative Science Plan: Revealing the Secrets of Our Ocean Planet. Joint Oceanographic Institutions, Inc. Washington, DC. http://oceanleadership.org/files/OOI_Science_Plan.pdf .
2006	JOI. 2006. Report of the ORION Design and Implementation (D & I) Workshop, 27-30 March 2006, Salt Lake City, UT. http://orionprogram.org/PDFs/DI_report_final.pdf .
	JOI. 2006. Coastal Observatory Conceptual Network Design for ORION's Ocean Observatories Initiative (OOI). Version 2.0. Issued by the ORION Program Office, Washington, DC. 30 June. http://orionprogram.org/PDFs/OOI_CND_Coastal30June.pdf .
	JOI. 2006. Regional Cabled Conceptual Network Design for ORION's Ocean Observatories Initiative (OOI). Version 2.0. Issued by the ORION Program Office, Washington, DC. 19 June. http://orionprogram.org/PDFs/OOI_CND_RCO19June.pdf .
	JOI. 2006. Global Conceptual Network Design for ORION's Ocean Observatories Initiative (OOI). Version 3.0. Issued by the ORION Program Office, Washington, DC. 30 June. http://orionprogram.org/PDFs/OOI_CND_Global30June.pdf .
	NSF. 2006. Review Report of the NSF Conceptual Design Review Panel for the Ocean Observatories Initiative. 14-17 August 2006, Monterey Bay Aquarium Research Institute, Moss Landing, CA. 8 September. http://orionprogram.org/capabilities/cdr/Final_OOI_CDR_Report.pdf .
	JOI. 2006. Cyberinfrastructure Conceptual Architecture Conceptual Design Review. 14-18 August 2006, Monterey Bay Aquarium Research Institute, Moss Landing, CA. http://orionprogram.org/advisory/committees/ciarch/default.html .
2007	JOI. 2007. ORION's Ocean Observatories Initiative Conceptual Network Design: A Revised Infrastructure Plan. Washington, DC. 8 March. http://orionprogram.org/PDFs/RevisedOOICND08Mar07.pdf .
	Consortium for Ocean Leadership. Profiling Mooring Workshop, 9-12 July 2007, Denver CO. Report in prep. http://oceanleadership.org/ocean_observing/workshops/profiling .
	University of Washington. 2007. Regional Scale Nodes Wet Plant Primary Infrastructure White Paper. Prepared for JOI, Washington, DC. 11 June. http://oceanleadership.org/files/ocean_observing/OOI_RSN_WetPlant_1_4.pdf .
	University of Washington. 2007. Regional Scale Nodes Shore Station Options White Paper. Prepared for JOI, Washington, DC. 15 June. http://oceanleadership.org/files/ocean_observing/OOI_RSN_ShoreStation.pdf .
	University of Washington. 2007. Regional Scale Nodes Secondary Infrastructure White Paper. Prepared for JOI, Washington, DC. 30 July. http://oceanleadership.org/files/ocean_observing/OOI_RSN_Secondary.pdf .

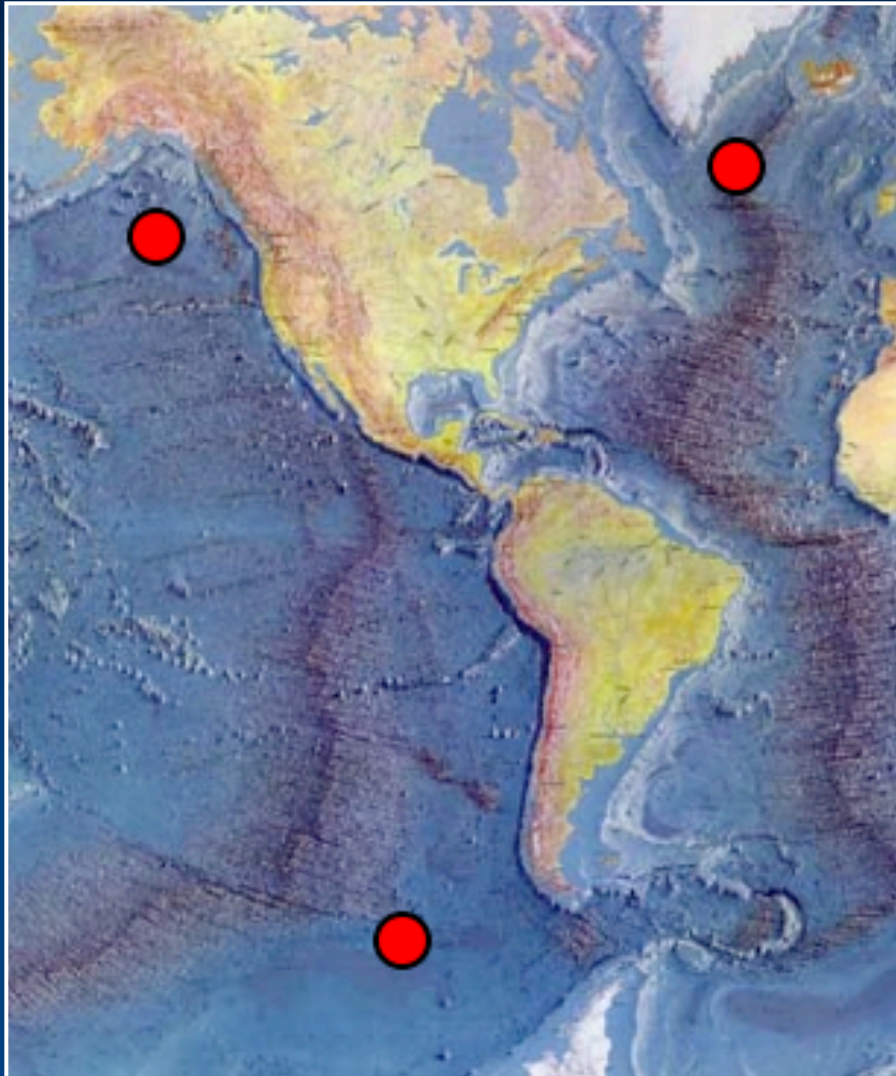
OOI Development Activities

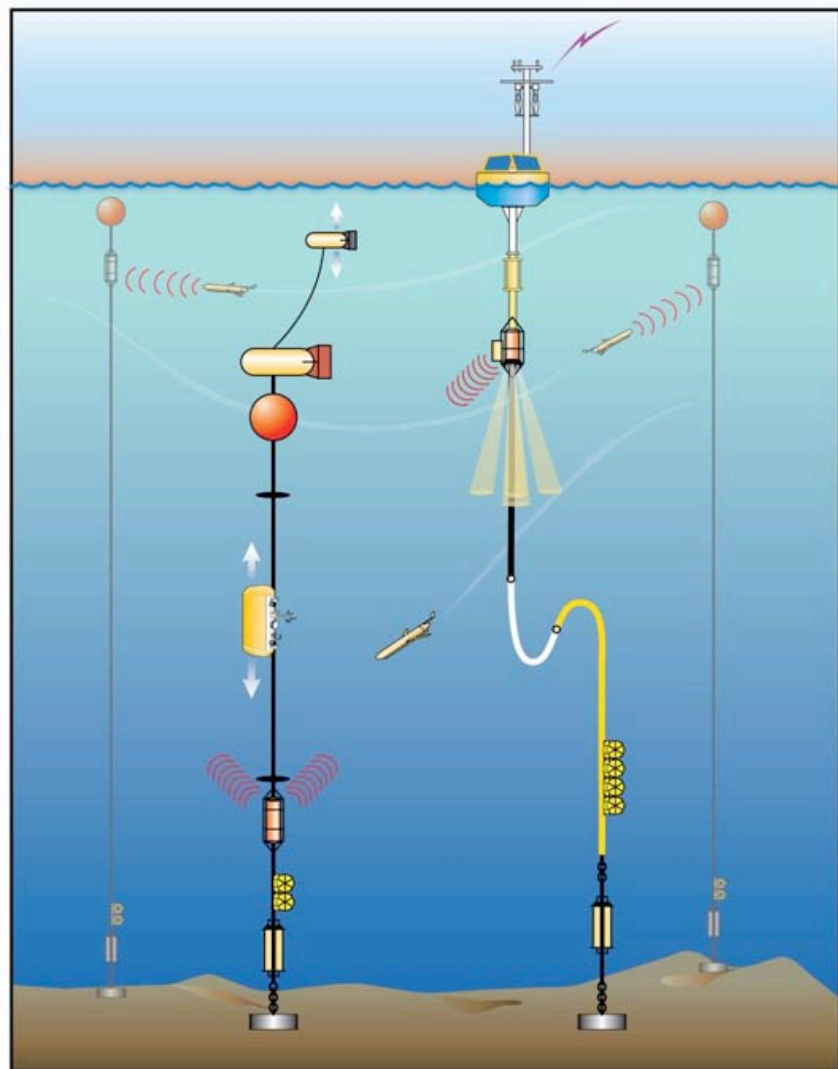


- Ocean Community observing planning efforts **1988-2004**
- ORION Community meeting **January 2004**
- Project Office awarded **March 2004**
- Review of community Request for Assistance proposals **September 2005**
- Design and Implementation workshop **March 2006**
- Science and Design Reviews **June-August 2006**
- Award of Implementing Organizations **March-August 2007**
- Adaptation of Network Design in response to community comments **August-October 2007**
- Science and Design Reviews **October-December 2007**



OOI Components-Global

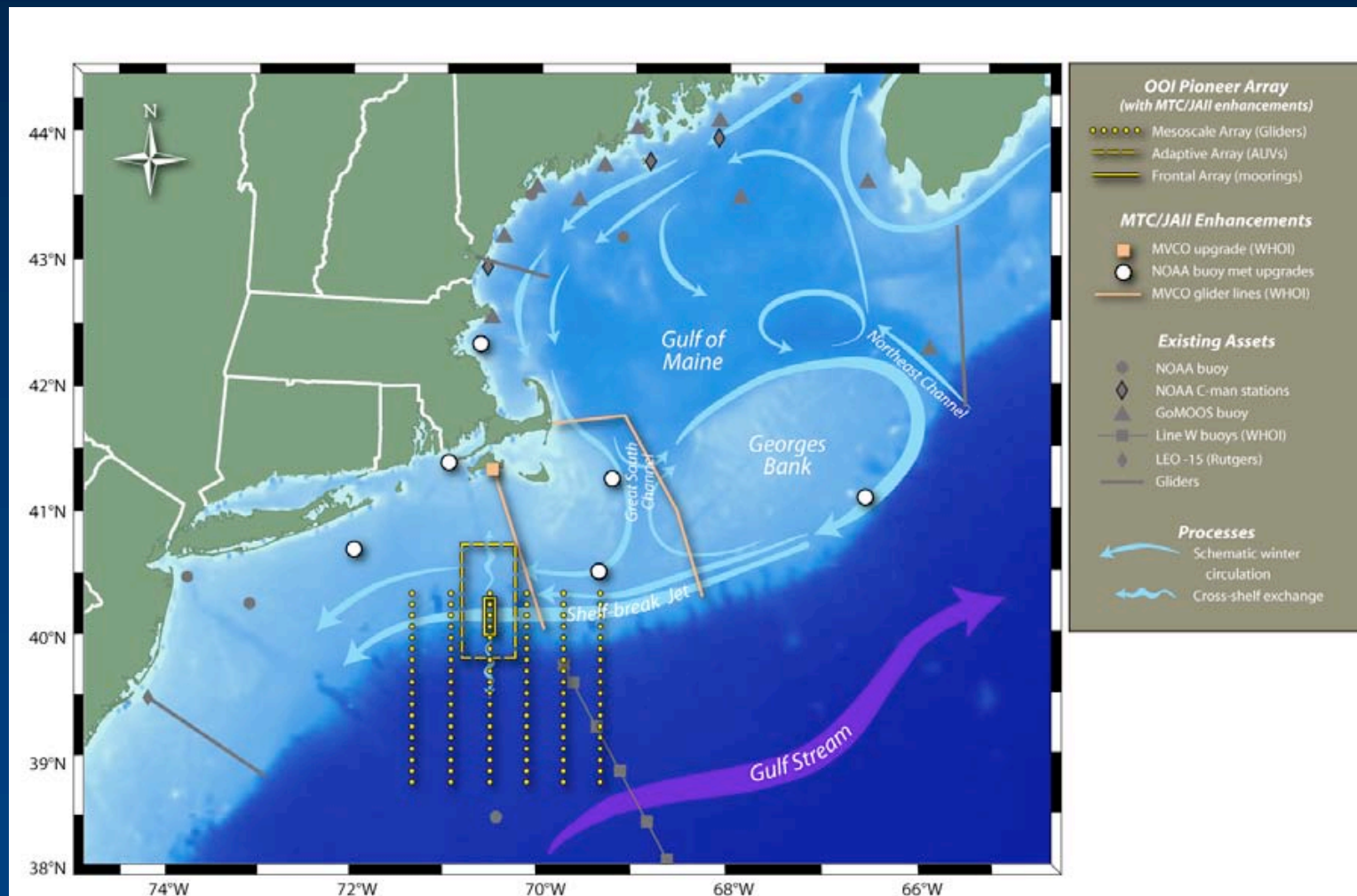


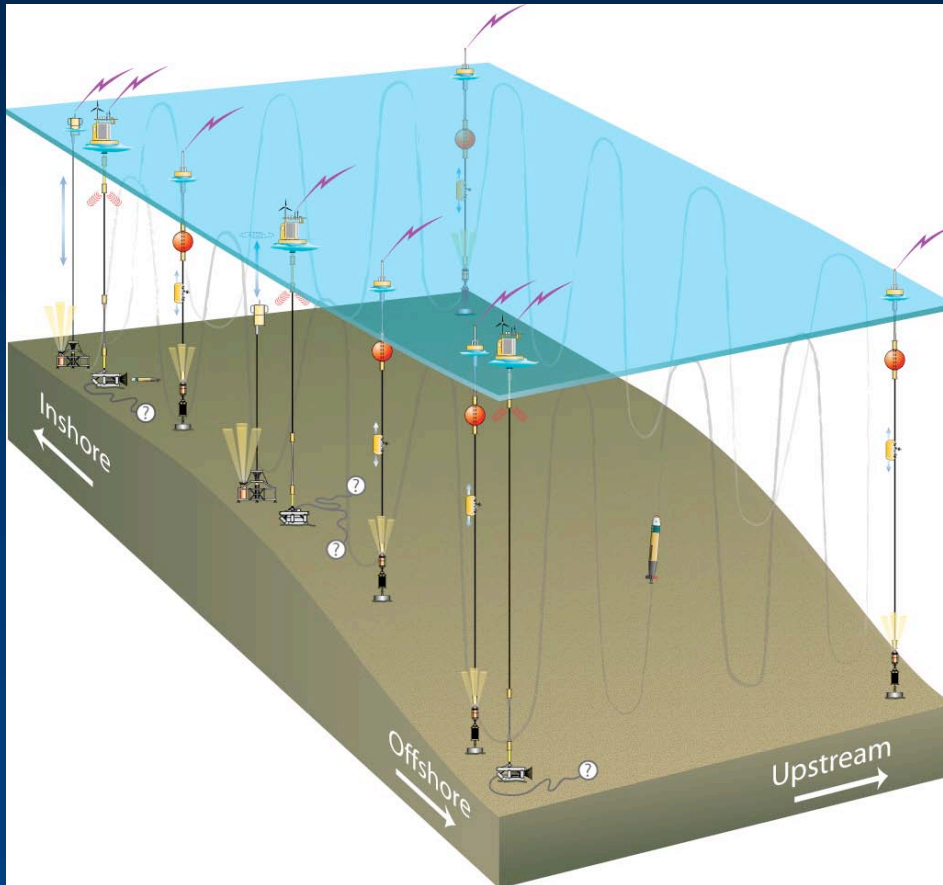


Global node infrastructure

- Central mooring with wire-crawler and winched profiler
- Mesoscale flanking moorings-fixed sensors and acoustic communication
- Gliders
- Core sensors include:
 - Bulk met, $\Delta p\text{CO}_2$, current profiles, surface wave spectra
 - Nitrate, optical attenuation and absorption
 - T, S, pH, DO
 - Chl-a, CDOM

OOI Components-Coastal

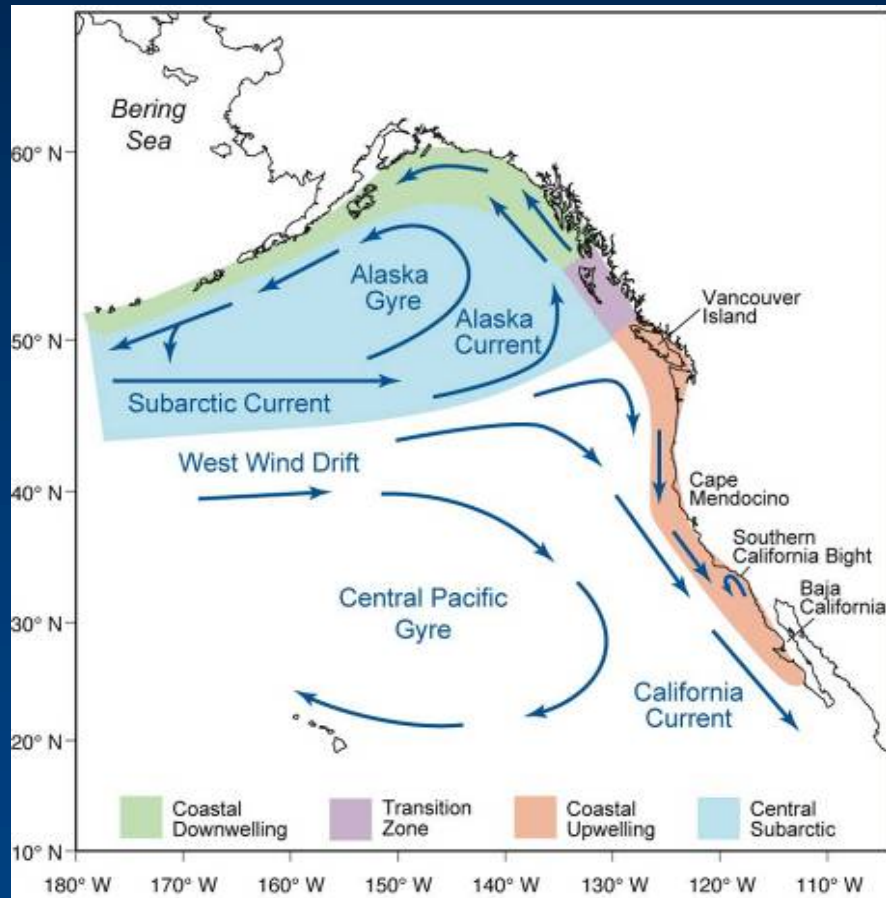




Pioneer Array

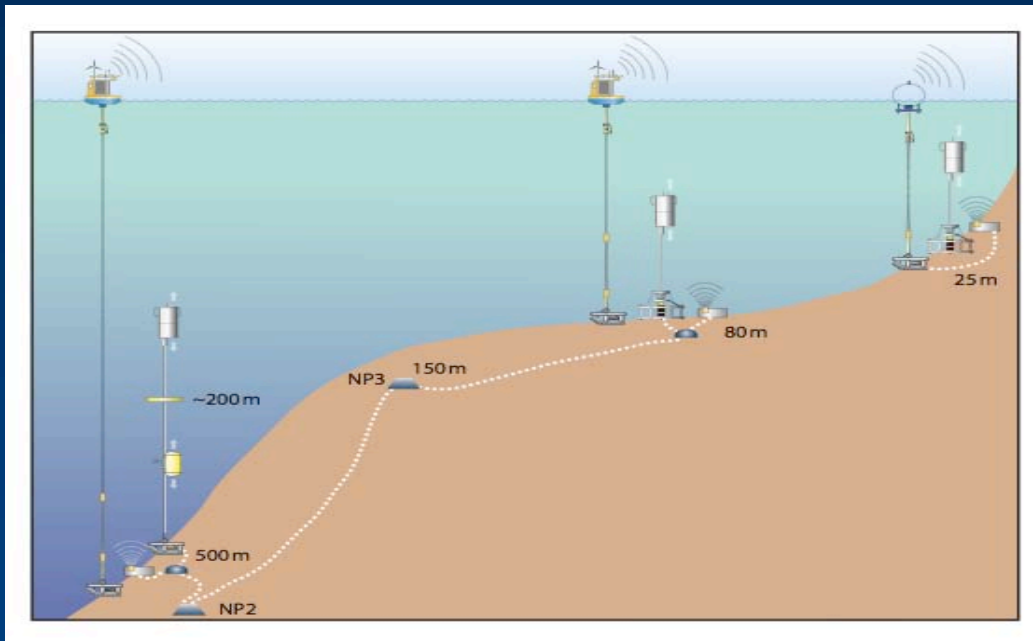
- Moorings with wirecrawler and winched profilers
- Multi-function nodes/AUV docks
- AUVs and gliders
- Core sensors include:
 - Bulk met, $\Delta p\text{CO}_2$, surface wave spectra
 - Nitrate, nutrients, optical attenuation and absorption
 - T, S, pressure, pH, DO
 - Chl-a, CDOM, turbulent velocities, mean currents

OOI Components-Coastal

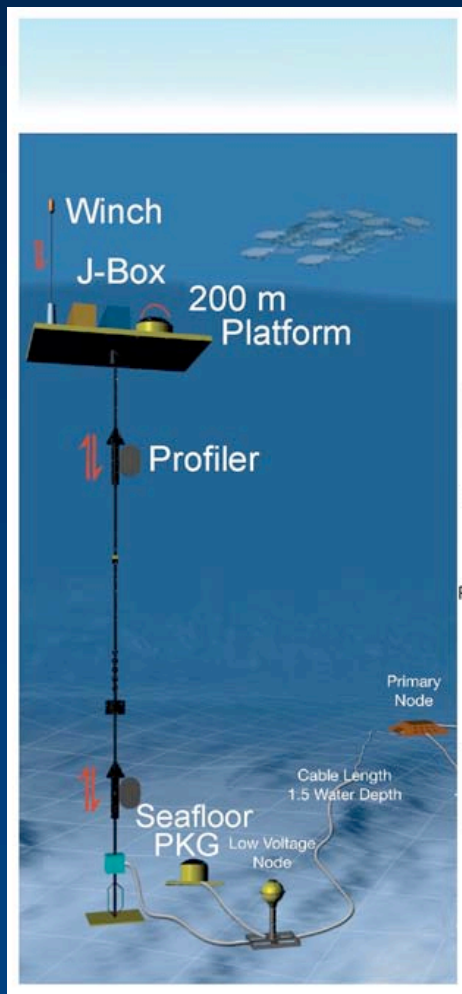


Endurance Array

- Moorings with wirecrawler and winched profilers
- Gliders
- Core sensors include:
 - Bulk met, $\Delta p\text{CO}_2$, surface wave spectra
 - Nitrate, optical attenuation and absorption
 - T, S, pressure, pH, DO
 - Chl-a, CDOM, turbulent velocities, mean currents
 - Broadband acoustics



OOI Components-Regional

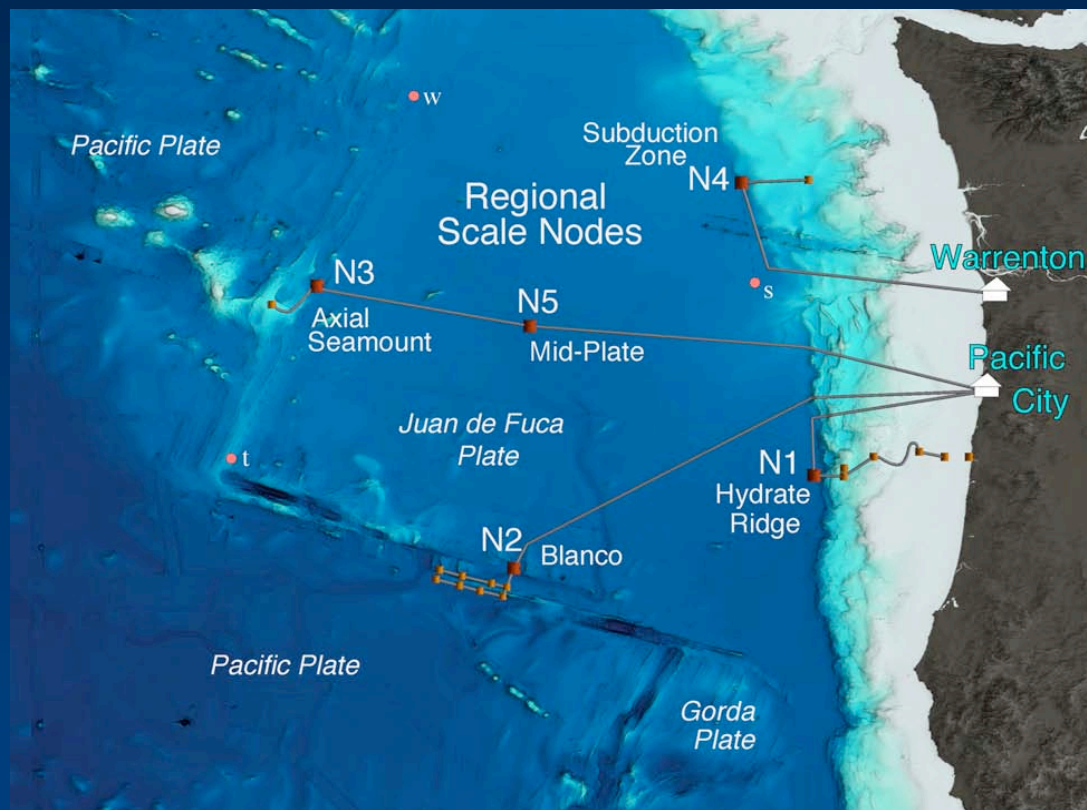


Moorings at Hydrate Ridge and Axial Seamount

Core sensors include

- $\Delta p\text{CO}_2$, T, S, pressure, pH, DO
- Chl-a, CDOM, optical backscatter, turbulence profiles, velocity, mean currents

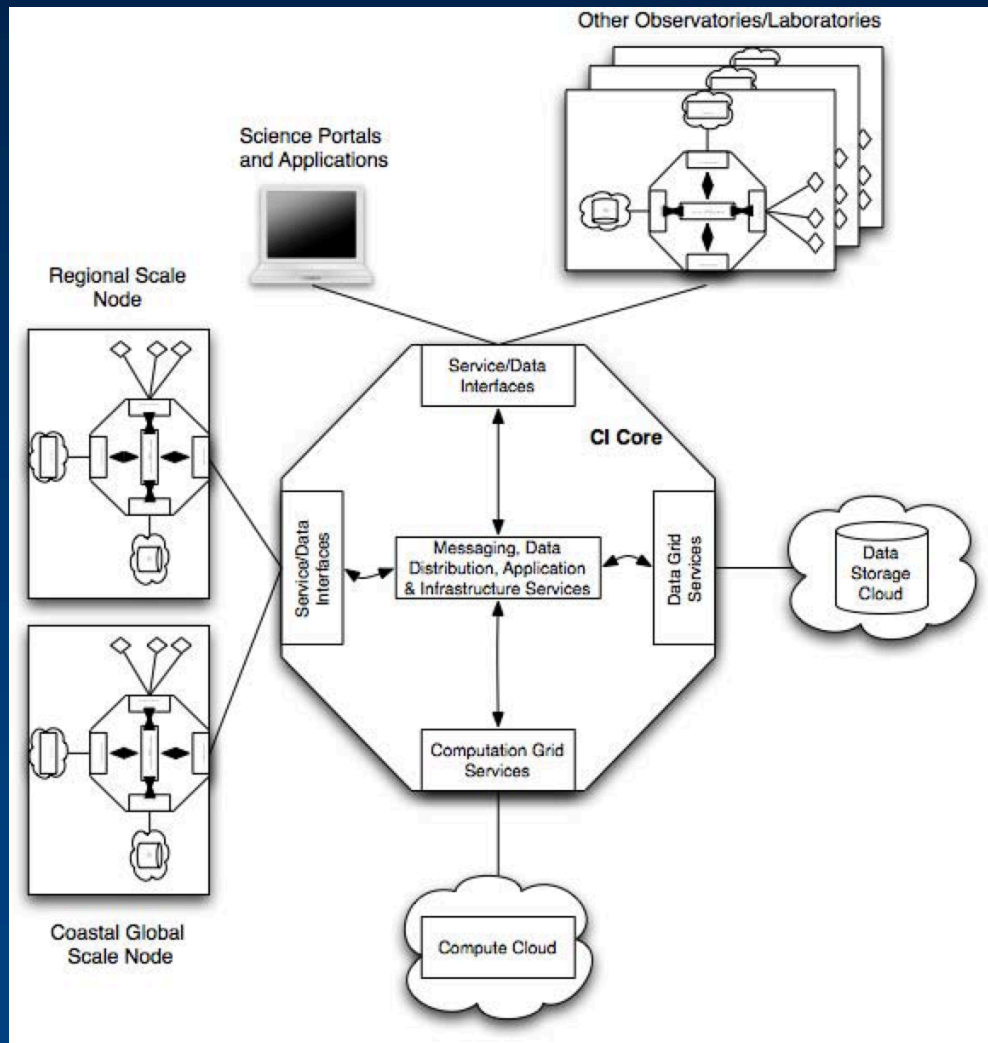
OOI Components-Regional



**Seafloor nodes-
core sensors
include**

- Seismometers, hydrophones, current meter and temp, pressure
- ADCP, bottom tilt recorder, HDTV

OOI Components-CI



CI Capabilities

- Data management and access
- Data archive
- Command and control
- Data transfer with other observing systems

OOI as an MREFC



Major Research Equipment and Facilities Construction (MREFC) project

- Requires NSB approval to enter queue and start construction
- Requires Congressional appropriation
- Bound by requirements set forth in Large Facilities Guide for
 - Project Planning
 - Project Management
 - Oversight
 - Reviews

OOI Status

- Legacy projects (NEON, ARRV and OOI) require successful Final Design Review (FDR) before asking NSB for approval, or Congress for additional construction funds
- OCE will fund OOI planning in FY '08, '09, in anticipation of starting construction in FY '10

Next steps

- Preparation for FDR November 2008
- Pending successful FDR, NSB approval for construction start-May 2009

Using the OOI



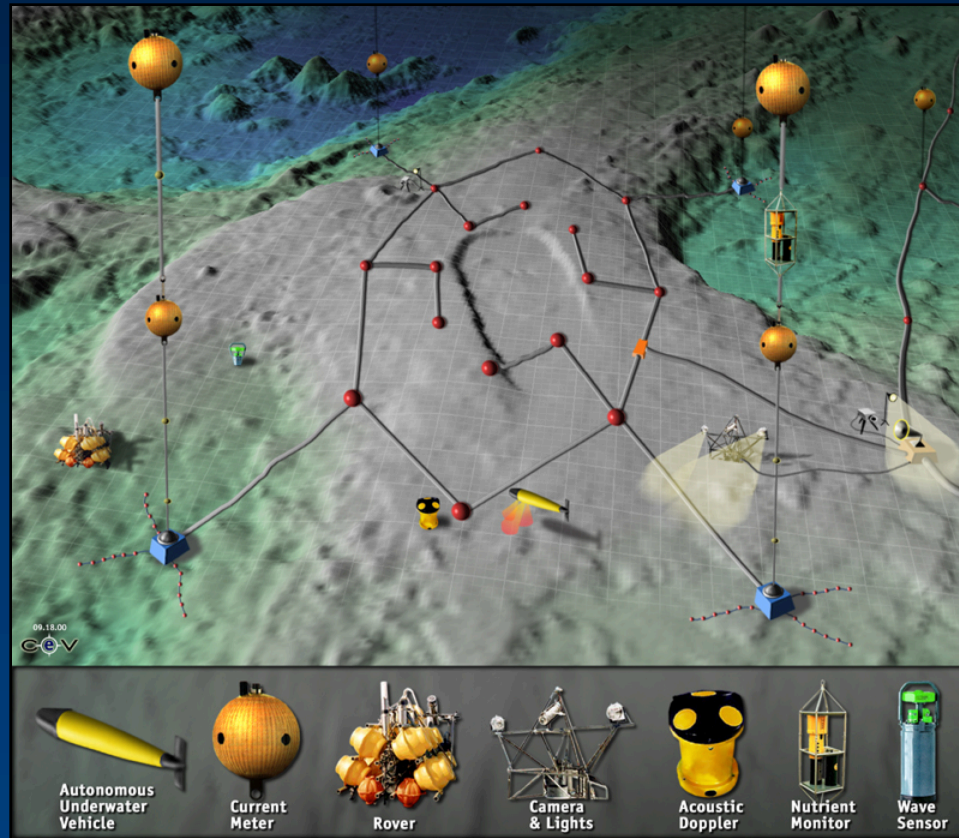
- Two general types of proposals envisioned
 - Data only
 - Open data access
 - One year data sequestration for PI instruments
 - Changes or impacts to the system
 - Adding a sensor/using the OOI as a sensor testbed
 - Modifying sampling rates-event response
 - Deploying assets around the network
- Proposal type will dictate proposal path
 - NSF merit review in core programs for all proposals
 - Data only-normal NSF review process
 - Changes or impacts to the system will require: technical, security, environmental assessment (initial and final); scheduling

Help guide the OOI

- Committee participation
 - OOI Advisory committee-Construction and operations phase
 - Scientific oversight committee
- Reviews
 - Annual project construction reviews
 - Operational readiness review
 - NSF merit review
- Competitions
 - Pioneer Array relocation solicitation and review
 - O&M Recompetition



Ocean Observatories Initiative



All documents @
www.oceanleadership.org/ocean_observing