Ocean Observatories Initiative (OOI)

National Science Foundation

Consortium for Ocean Leadership

Implementing Organizations

(UW, UCSD, WHOI academic and industry partners)

OCEAN OBSERVATORIES INITIATIVE

For further information, see links at
Wikipedia: Ocean Observatories Initiative

NSF

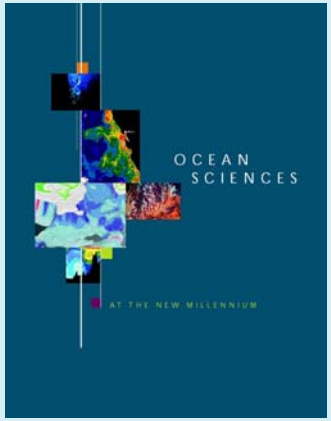
OOI Concept

- Establish and sustain a networked, multi-disciplinary ocean observing infrastructure
- Occupy multiple domains critical to science which presently have limited or no sustained observing capability
- Design a state-of-the-art, integrated system
  - Extended space/time sampling
  - Increased power and bandwidth
  - Uber-network
  - Two-way command and control
  - Open data access

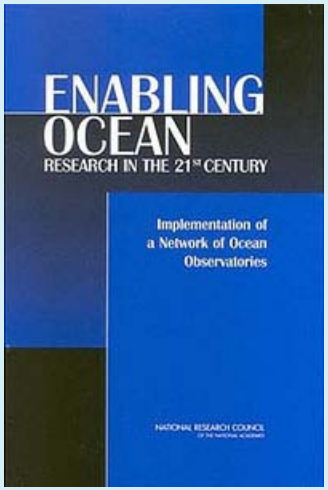
OOI Development

The Ocean Sciences Division of the National Science Foundation's (NSF) has developed the Ocean Observatories Initiative (OOI) based on years of community-wide scientific planning efforts, both nationally and internationally

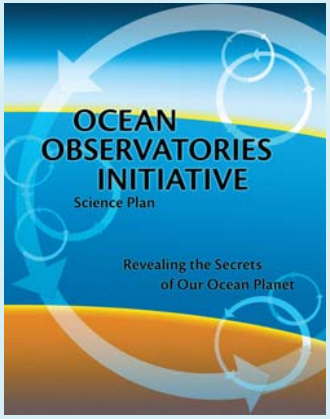
2000



2001



2003



2005

2009

OOI Context

"The research-driven OOI Program is a major contribution by NSF to a broader national and international effort to establish the Global Earth Observation System of Systems (GEOSS)"

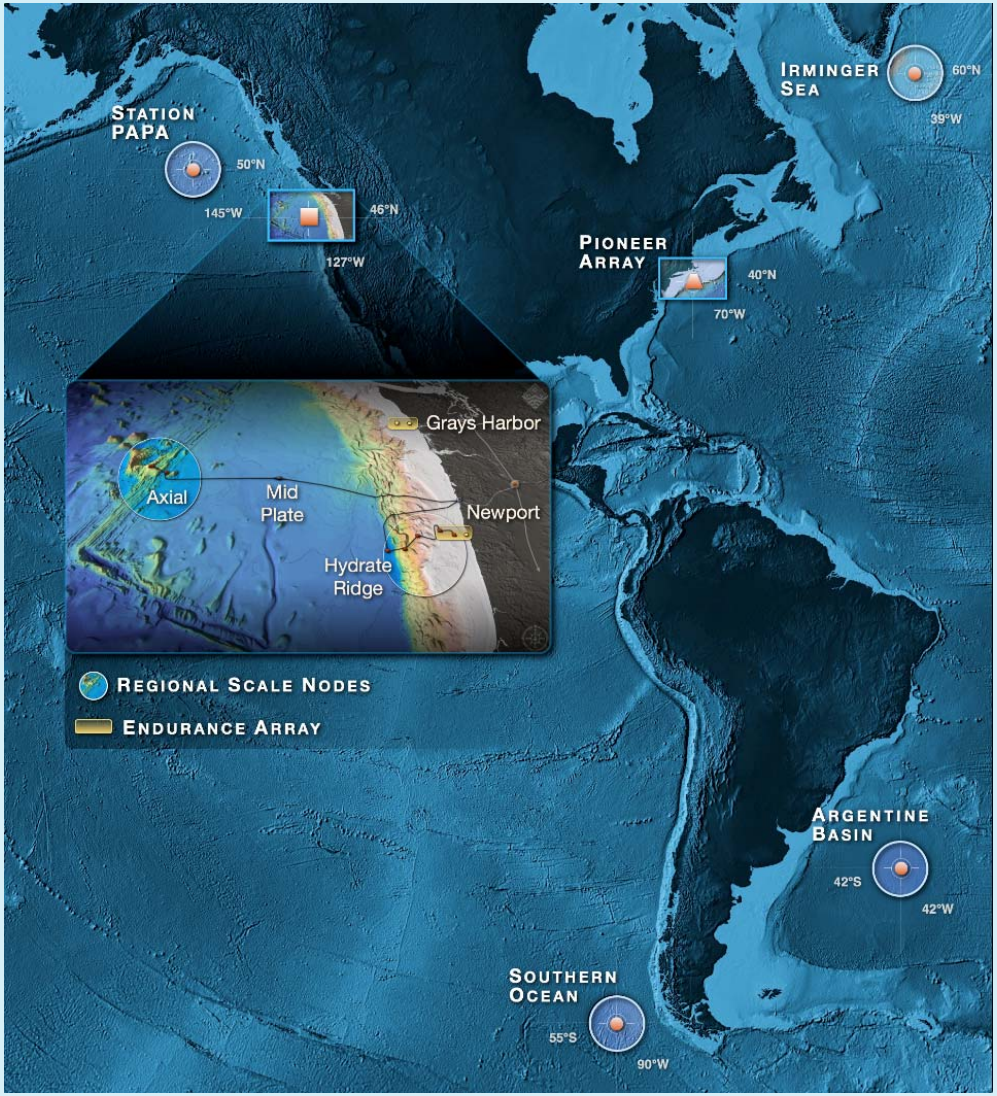
OOI Science Plan, 2005

OOI Science Questions

- Ocean-atmosphere exchange
- Climate variability, ocean circulation, and ecosystems
- Turbulent mixing and biophysical interactions
- Coastal ocean dynamics and ecosystems
- Fluid-rock interaction and the sub-seafloor biosphere
- Plate-scale and ocean geodynamics

OOI Infrastructure

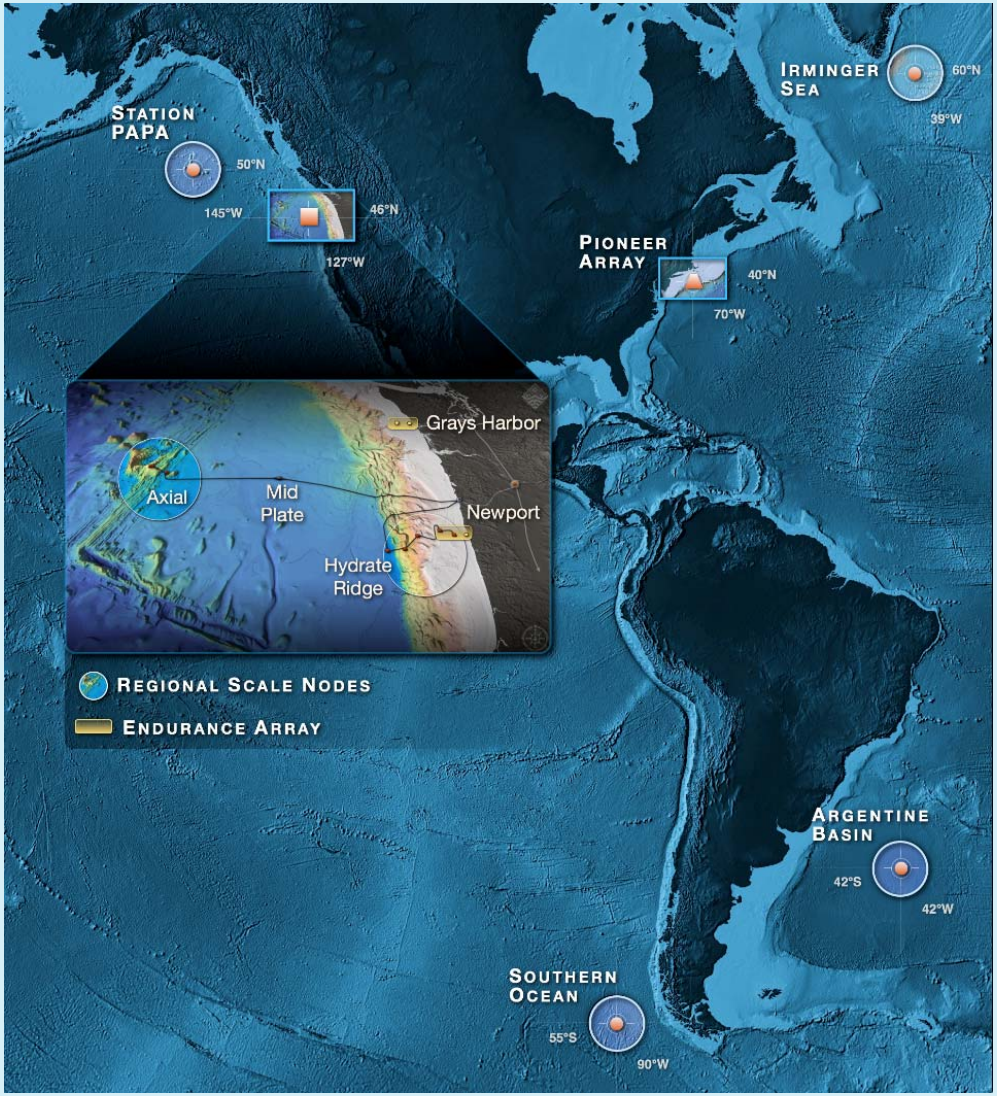
- Three Domains
  - Northeast Pacific
  - Northwest Atlantic
  - High Latitude



Center for Environmental Visualization, University of Washington

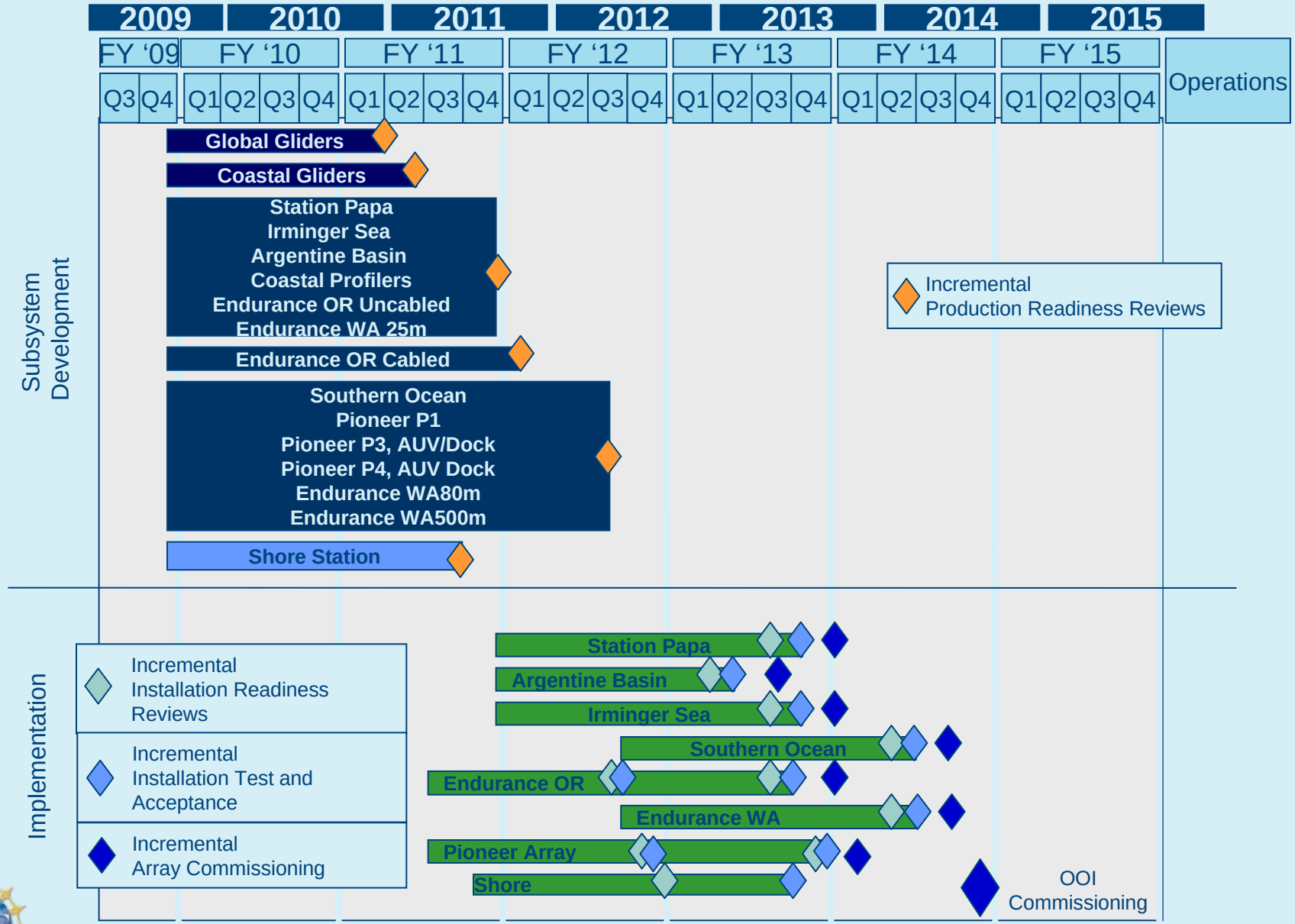
OOI Infrastructure

- Four components
  - RSN
    Regional Cabled
  - CGSN
    Coastal and Global
  - CI
    Cyberinfrastructure
  - EPE
    Education and
    Public Outreach



Center for Environmental Visualization, University of Washington

CGSN Timeline

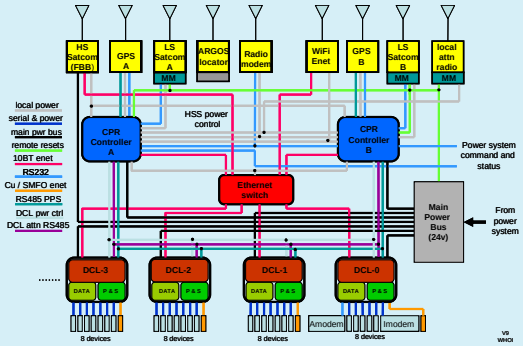


CGSN Subsystems

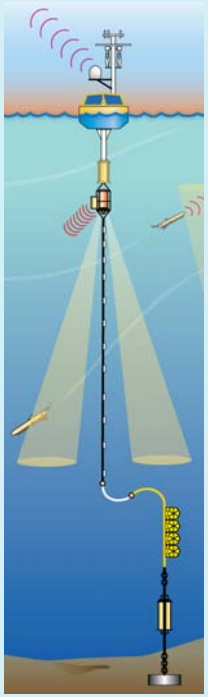
Buoys, Power, Telemetry

Sensors

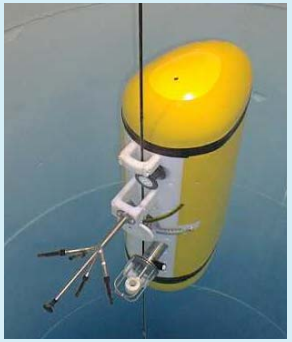
Platform Control, DCL



Moorings



Shore Station

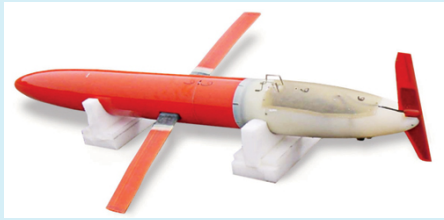


Profilers

Benthic Nodes

AUV/Dock

Gliders



Specific subsystems shown are exemplars for purposes of illustration only

OOI Coastal and Global Scale Nodes Implementing Organization, WHOI

CGSN Core Sensors

- Derived from community input (RFIs), Advisory Groups (iOSC, BRP), Trace Matrices and SUR
- 32 CGSN Sensor Types in 18 Measurement Classes

Air-sea fluxes (3)	Turbulent velocity (1)	Nitrate (1)
CO2 flux (2)	Dissolved oxygen (2)	Nutrient 4 Chan (1)
Surface waves (1)	pH (1)	ZP sonar (2)
Temp/cond/press (5)	PAR (1)	Digital still camera (1)
Bottom Pressure (1)	Spectral irradiance (1)	Hydrophone (1)
Mean currents (point and profile) (5)	Optical attenuation and absorption (1)	Chl-a, CDOM, and turbidity (2)

(x) = number of sensor types in measurement class

User Access

- Open data sharing via OOI Cyberinfrastructure
- User control of core infrastructure via proposal
  - Vary core sampling (within limits)
  - Use core infrastructure as basis for process study
  - Shipboard sampling in association with array servicing
- User added sensors via proposal
  - Stand-alone: acoustic link
  - Mooring line: ethernet, serial or inductive link
  - Seafloor: MFN, BEP or cabled node
  - Other

Transforming Ocean Observing

- Observing Requirements:
  - Simultaneous observations resolving short time scales and multiple spatial scales
  - From air-sea interface to sea floor
  - Sustained over months to years
  - Using multidisciplinary sensor suites
  - With real-time data flow
  - Enabling adaptability to conditions and events

Transforming Ocean Observing

- Enabling Technology
  - Simultaneous observations resolving short time scales and multiple spatial scales
    - Autonomous profilers, AUVs, gliders
  - From air-sea interface to sea floor
    - Surface mooring paired with profiler equipped mooring
  - Sustained over months to years
    - Power generating buoys, AUV docking stations
  - Using multidisciplinary sensor suites
    - Bio-optical sensors, nutrient sensors, pCO2 sensors
  - With real-time data flow
    - EOM cables, satellite telemetry, cyberinfrastructure
  - Enabling adaptability to conditions and events
    - Programmable platforms, cyberinfrastructure

Technology Challenges

- Gliders – duration and payload
- AUVs – duration, payload and docking
- Profilers – surface piercing, sustained operation
- Autonomous power systems – 250 W target
- Biofouling – mitigation strategies
- Telemetry throughput – low power, mobile platforms