

The ORION Global Scale Observatory

**Dan Frye and Don Peters
Woods Hole Oceanographic
Institution**

<http://www.orionprogram.org/>

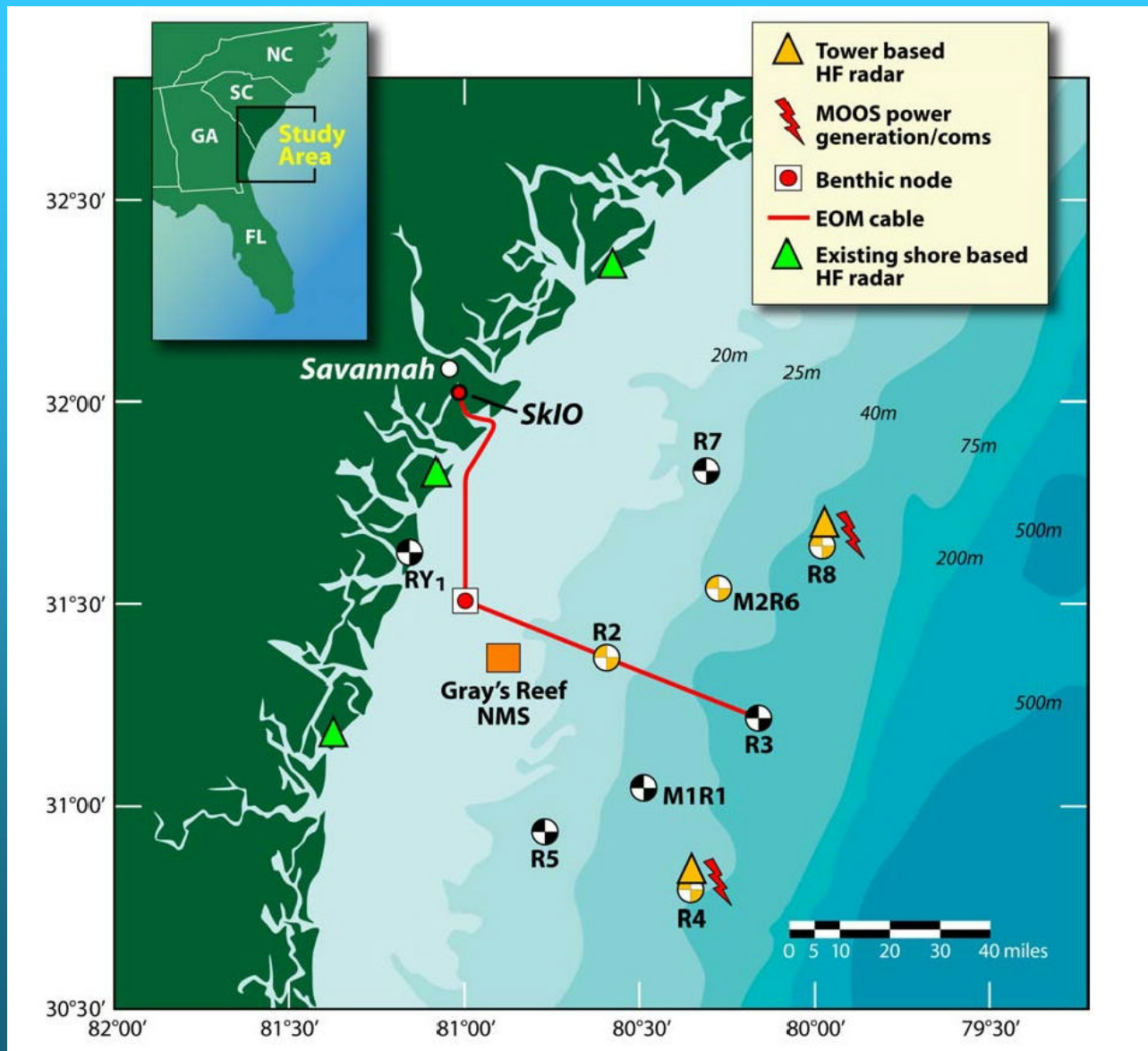
NSF ORION Ocean Observatories Initiative (OOI)

- **\$309.5M in construction and installation funding over 6 years**
- **\$50M in annual operation and maintenance funding**
- **Coastal Scale Observatory (CSO)**
- **Regional Cabled Observatory (RCO)**
- **Global Scale Observatory (GSO)**

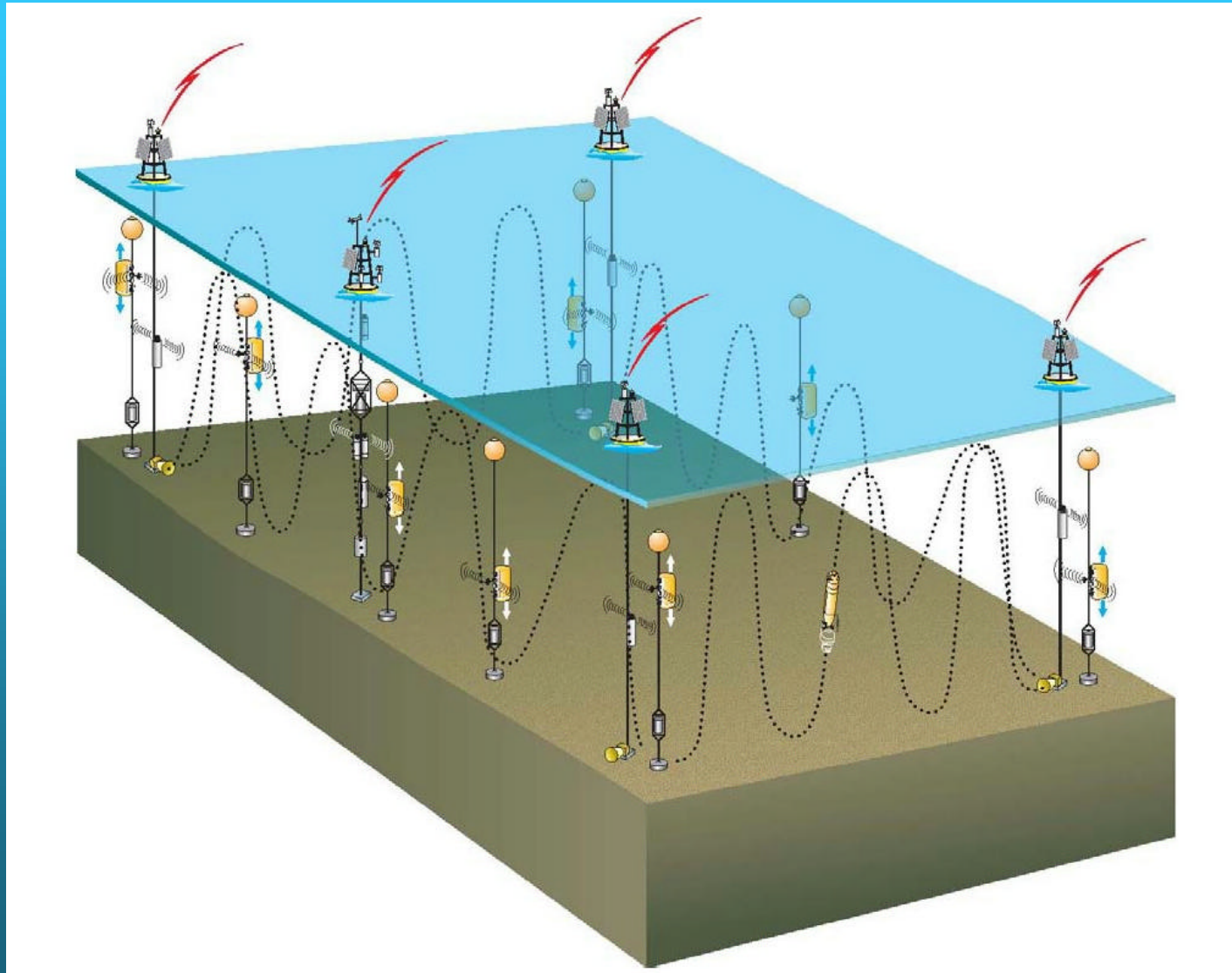
Coastal Scale Observatory

- **Endurance Array-** Permanent array of cabled nodes, moorings, profilers and gliders
- **Pioneer Array-** Moveable array of moorings, profilers, seafloor sensors, AUVs and gliders
- **East Coast and West Coast sites**

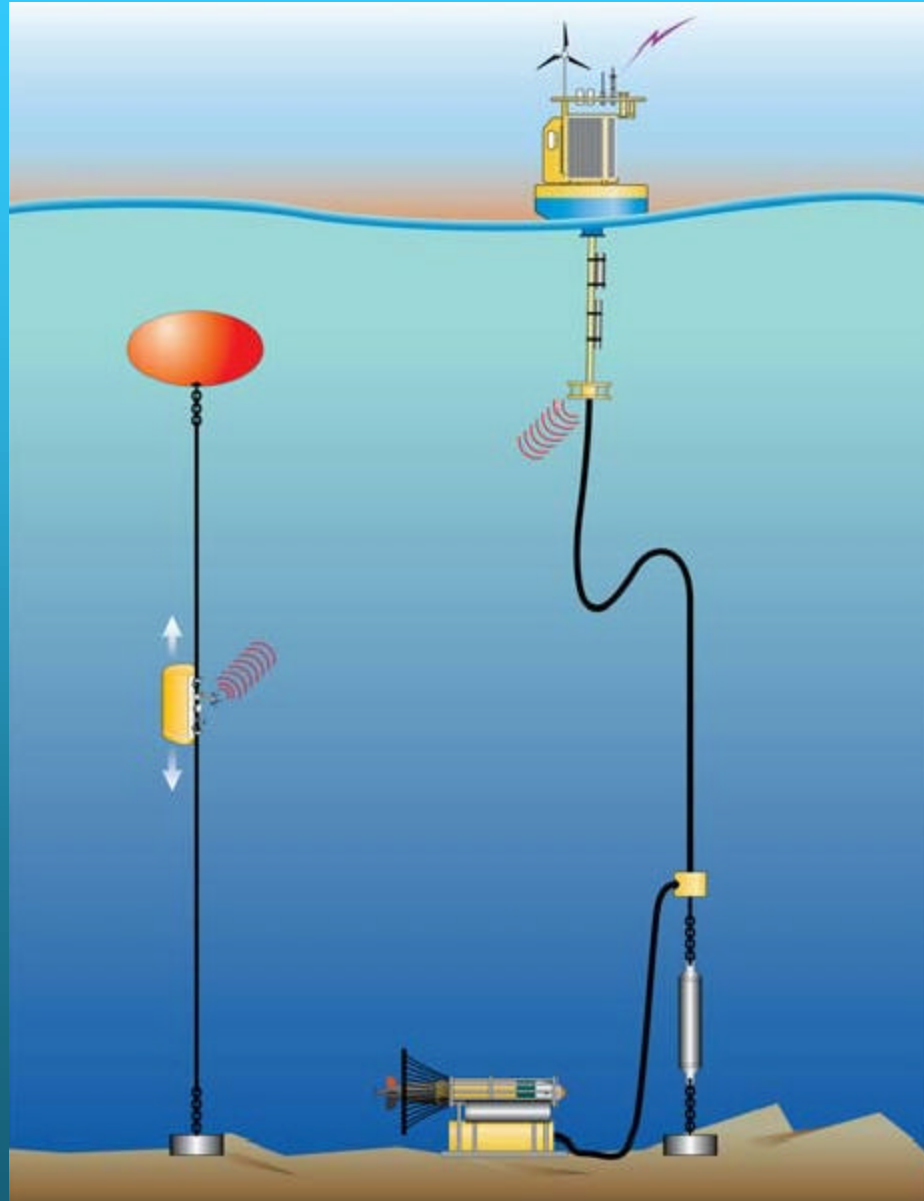
Endurance Array - South Atlantic Bight (SAB)



Pioneer Array - Conceptual Diagram



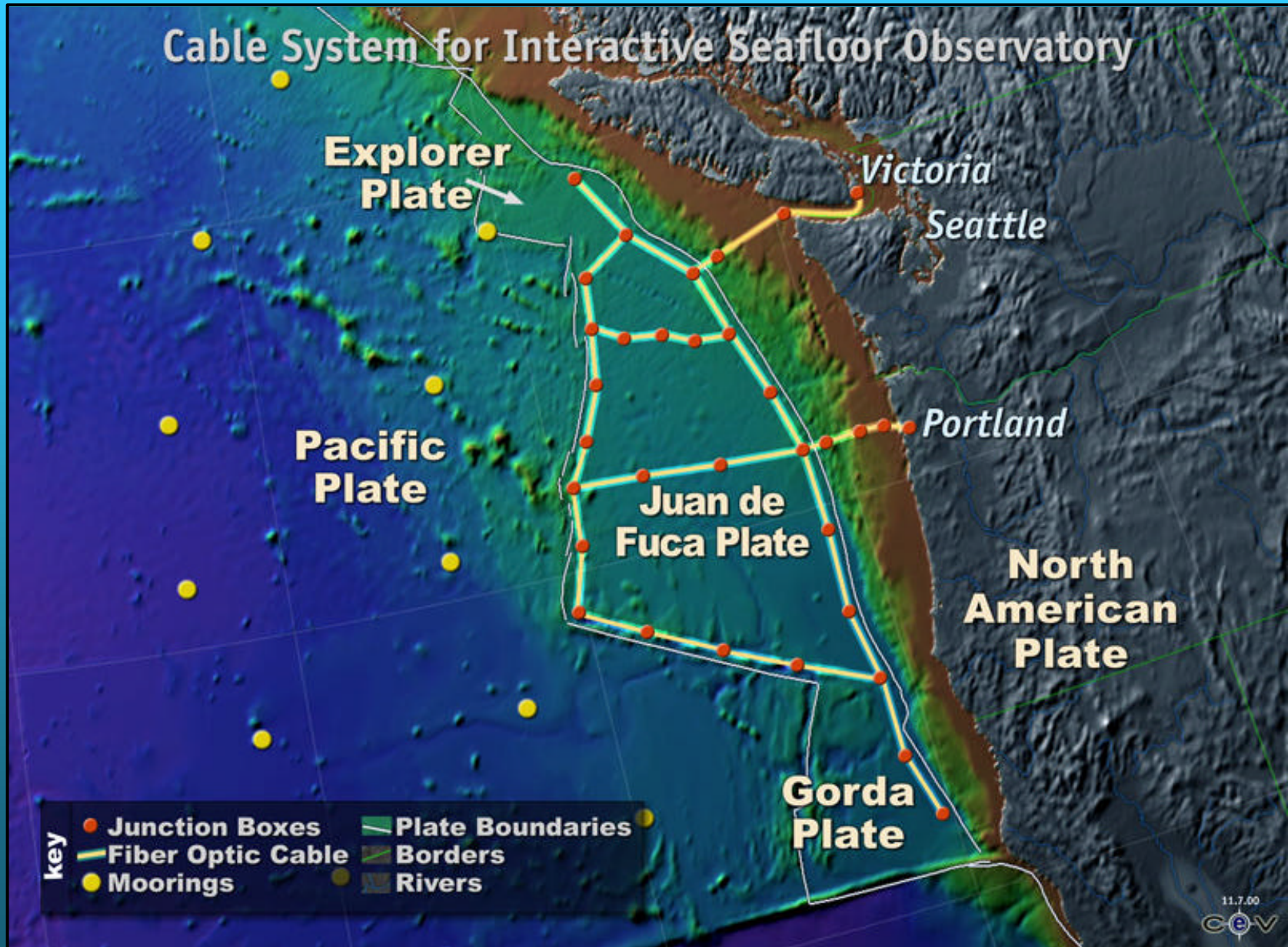
Pioneer Array - Mooring Types

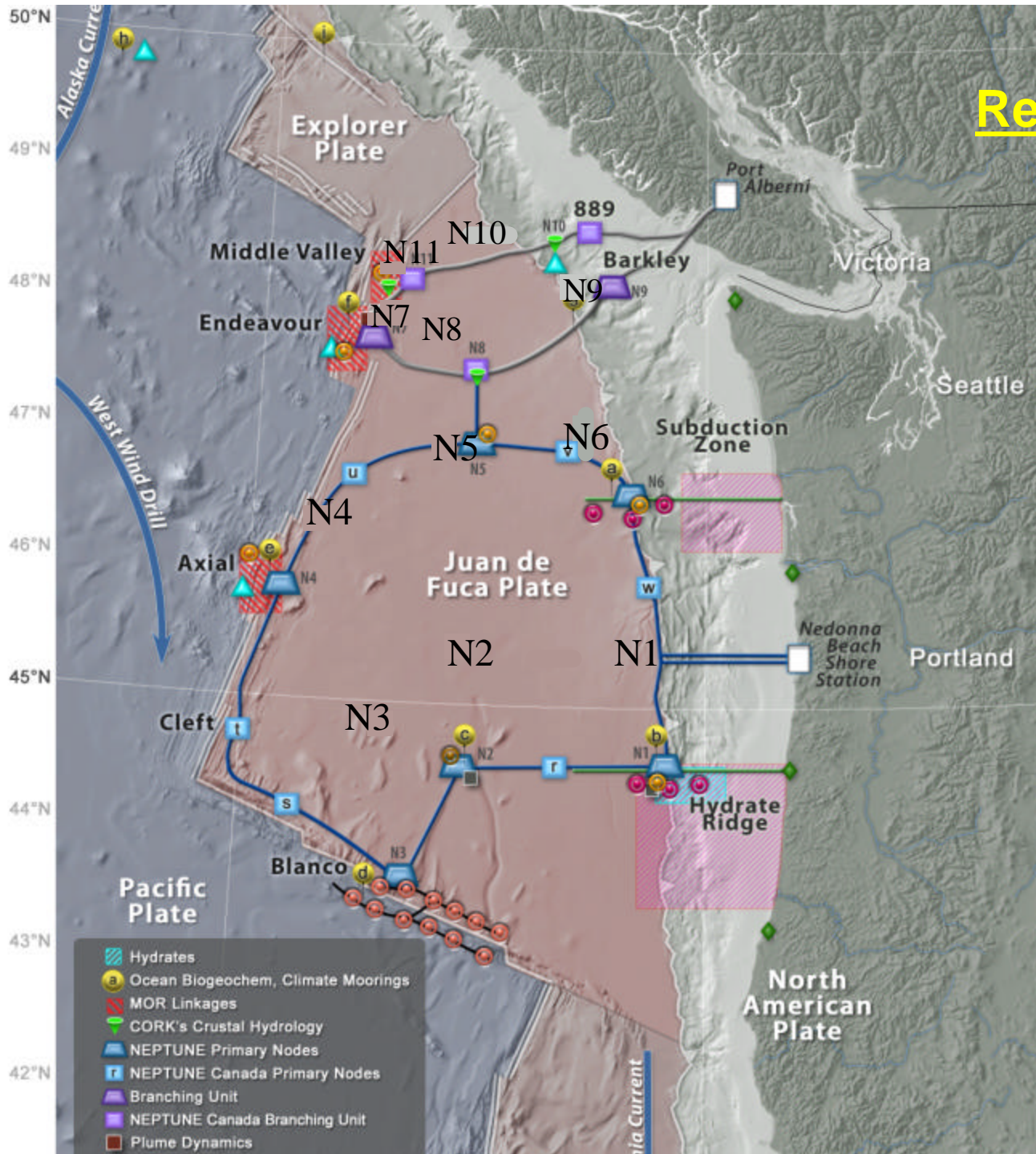


Regional Cabled Observatory

- **Northeast Pacific Site (Juan de Fuca Plate)**
- **Seafloor Cable Backbone – Full Plate Coverage**
- **Multiple Science Nodes**
- **Branching Nodes for Future Expansion**
- **Water Column Moorings**

Regional Cabled Observatory – Neptune Concept





Regional Observatory (Neptune)

1750 km Backbone

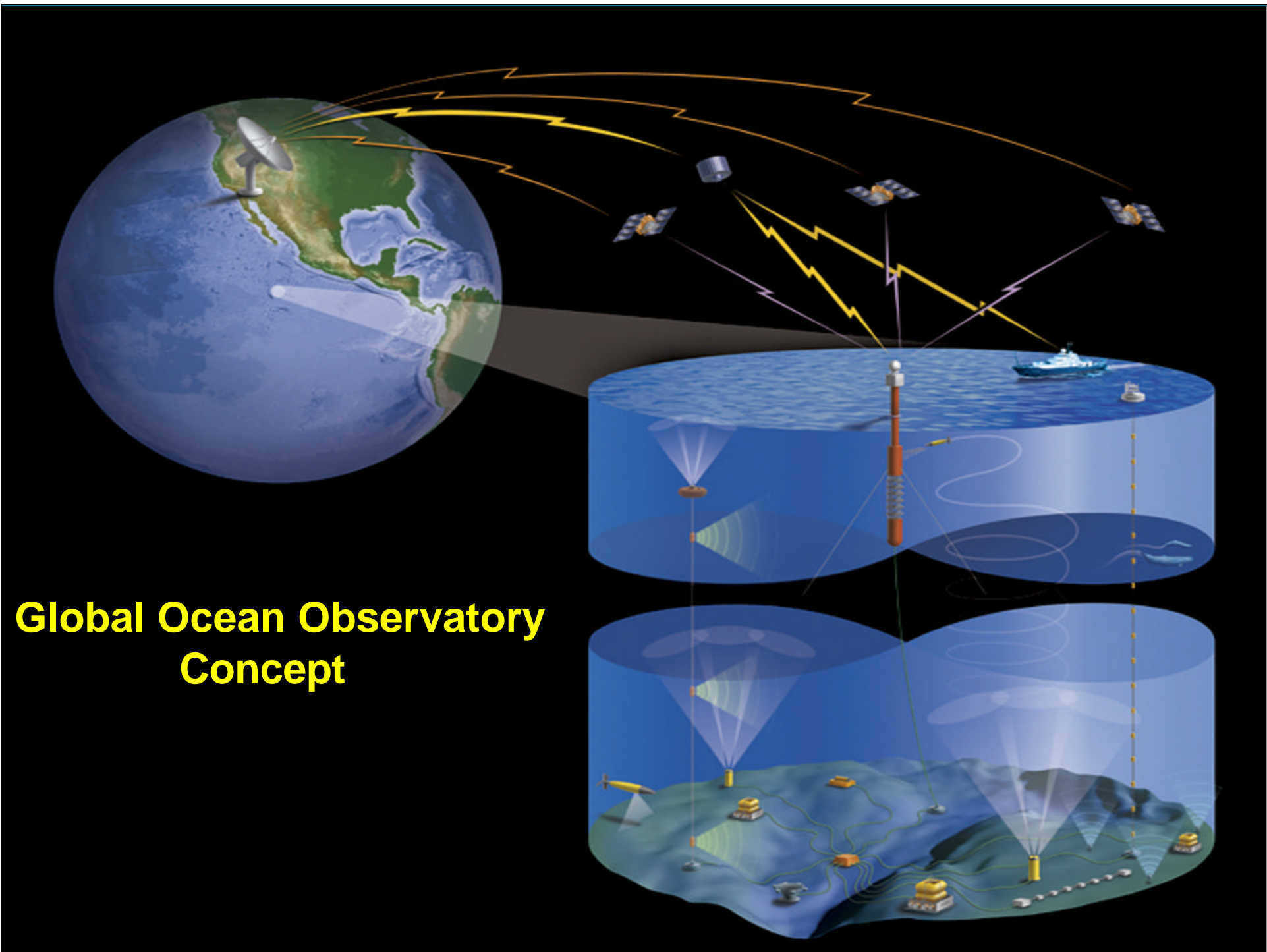
5 Science Nodes

6 Branching Units

**8 Water column
moorings**

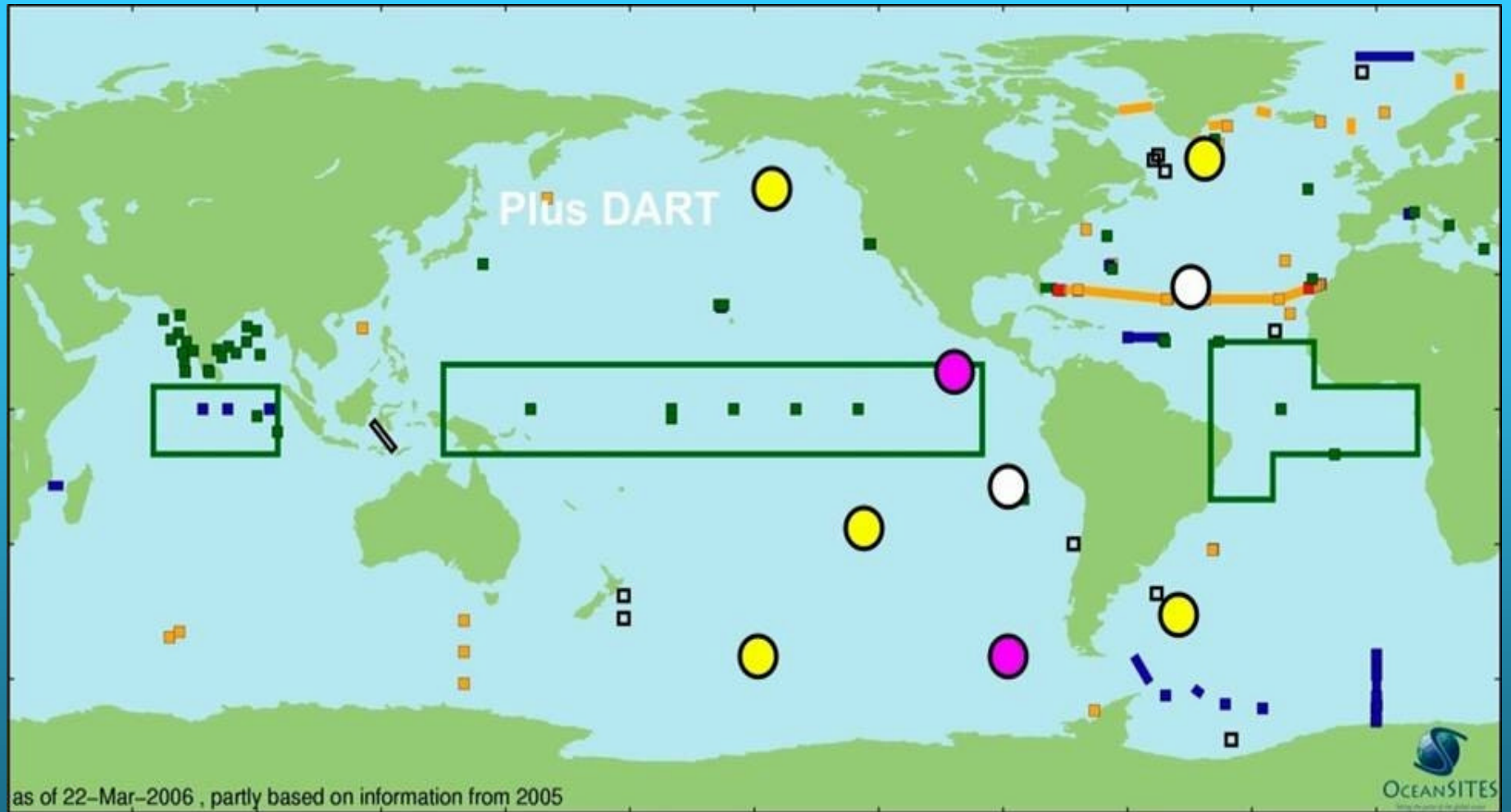
Global Scale Observatory

- **Sites of Important Scientific Interest**
- **Remote Sites**
- **Sparsely Studied Sites**
- **Varying Undersea and Satellite Telemetry Challenges**
- **Buoy-Based Power Generation**



**Global Ocean Observatory
Concept**

Proposed Global Array



all data public

- | | |
|--|---|
| ■ partially realtime, data available | ■ delayed mode only, data available |
| ■ partially realtime, data not yet available | ■ delayed mode only, data not yet available |
| ■ TAO / TRITON, PIRATA, Indian Ocean Array | □ data policy to be determined |

Global Site Selection

- **High Latitudes**
- **High/Low Productivity**
- **Water Formation**
- **High Carbon Exchange**
- **High Gas or Momentum Flux**
- **Seismic or Tectonic Activity**
- **Storm Genesis**
- **Aerosol or Dust Deposition**

Global Array Technologies

- **Acoustically Linked Discus Buoys**
 - Iridium Telemetry
 - Solar and Wind Power Generation
 - Conventional Mooring Technology
 - ROV Not Required for Servicing
 - Battery Powered Sensors
 - Acoustic Modems Integrated to Each Sensor or Sensor Node

A photograph of a yellow and blue surface buoy floating in the ocean. The buoy has a yellow upper section and a blue lower section. It is equipped with various sensors and antennas on top, including a large antenna array. In the background, a large ship is visible on the horizon under a blue sky with some clouds.

Acoustically Linked Surface Buoy

Global Array Technologies

- **Discus Buoy with EOM Connection to the Seafloor**
 - **Seafloor Network with Sensor Nodes**
 - **Solar and Wind Power Generation**
 - **Iridium Telemetry**
 - **ROV Servicing of Sensors and Nodes**



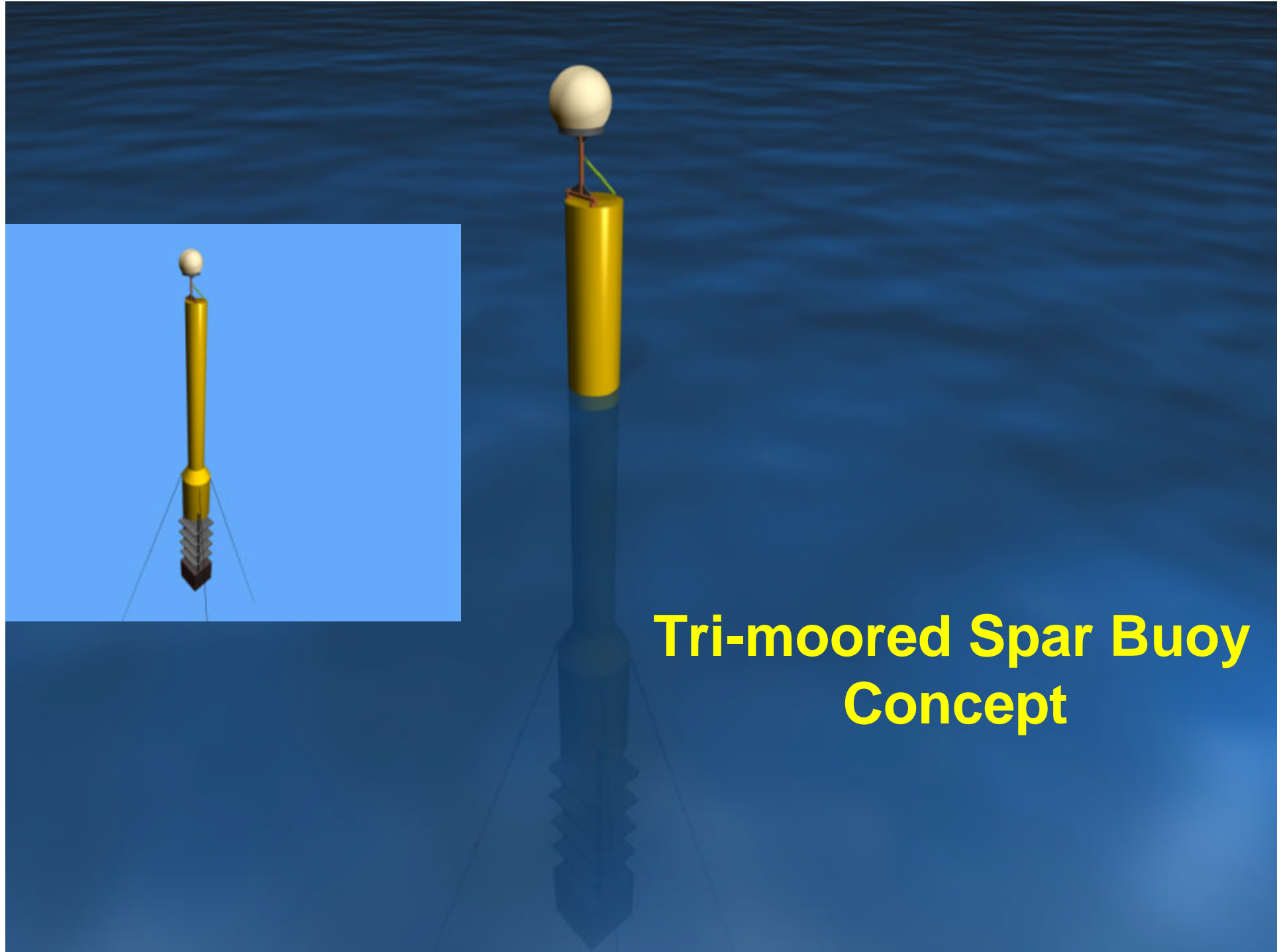
EOM Cable

EOM Test Mooring Buoy



Global Array Technologies

- **Tri-Moored Spar Buoy with Seafloor Network**
 - High Power and Bandwidth Delivered to the Seafloor
 - Diesel Power Generation
 - C-Band Telemetry – Low Platform Motion
 - 10 Year Mooring Service Interval
 - ROV for Seafloor Network Servicing



Tri-moored Spar Buoy Concept

Technical Challenges

- **High Latitude Mooring Designs**
- **Long Life Sensors**
- **On Buoy Power Generation**
- **High Bandwidth Satellite Communications**
- **Maintenance of Seafloor Networks**
- **Full Water Column Profiling Systems**
- **High Bandwidth Acoustic Communications**
- **Reliable EOM Cable Designs**

In Conclusion

- **Conceptual Network Design (CND) posted on Orion website**
- **RFP for the RCO is out-proposals deadline was Sept. 29, 2006**
- **RFPs for the GSO and CSO are imminent**
- **Implementing Organizations should be in place by May 2007**
- **Installation phase should begin in 2008**