U.S. National Science Foundation Ocean Research Facilities Update

IRSO Meeting October 21-23, 2015

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Sea Change

- Sea Change Recommendations:
  - Immediate (FY17) Cost Reductions:
    - ARF - 5%
    - IODP – 10%
    - OOI – 20%
  - Long Term (FY18 –FY 22):
    - An additional 10-20%
    - No more than two RCRVs

- Bottom Line: OCE will be implementing Sea Change Recommendations and has already achieved ARF and IODP cost reductions.

- The Sea Change science prioritization is closely aligned with OCE's research mission

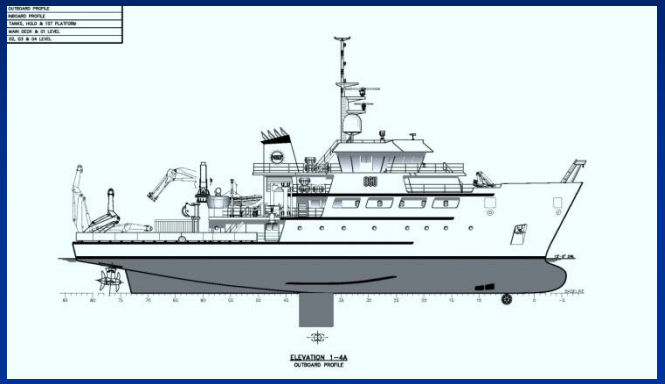
R/V *SIKULIAQ*

- R/V *SIKULIAQ* is a 261 foot ice-capable research vessel, designed for polar and subpolar scientific research. Capable of breaking ice up to 2.5 feet thick, and outfitted with state-of-the-art equipment.
- The ship was delivered and accepted in June 2014.
- Successfully completed all inspections, science equipment sea-trials and ice trials.
- Began transition into science operations 1 Oct 2014.
- Available for global charters (https://www.sfos.uaf.edu/sikuliaq/)


SIKULIAQ

Regional Class Research Vessel (RCRV)

October 2015



- Phase I Award, Design Refresh (Oregon State University) – January 2013
- Preliminary Design Review (PDR) – August 5-7, 2014
- 2000 LWT, 181 feet, twin azimuthing drives, retractable center board, dual bow thrusters, double-articulating A-frame, U-Tube stabilization
- 14 scientist berths
- Final Design Review (FDR) – October 2016
- Input from UNOLS, science community, National Academy of Science on number of vessels required for Academic Research Fleet "right-sizing"
- If funded, up to two vessels, construction 2017-20, delivery 2020-22

Regional Class Research Vessel (RCRV)

Transformative Coastal Zone Research (National Ocean Council):

- Effects of Global Climate Change/Sea Level Rise
- Ocean acidification/Coral bleaching
- Catastrophic events
- Ocean Productivity/Overharvesting of resources
- Harmful algal blooms and "dead zones"

State-of-the-Art Capabilities for Next-Generation Oceanography

- *Dynamic Positioning*
- *Sea Keeping*
- *Large/Clear aft deck*
- *Low Underwater Noise Signature*
- *Regulatory compliance and "Green Ship"*
- *Virtual Science Participation ("Telepresence")*
- *Advanced Science Equipment Handling Systems*

RCRV: Overview

- Ships are essential to support Ocean Science research
- The Academic Research Fleet is aging, with 7 ships scheduled for retirement between 2014 and 2020
- Fleet will be "right-sized" from 21 ships in 2010 to ~16 vessels by 2021
- NSF proposes construction of 2 Regional Class Research Vessels (RCRV) as an MREFC project
- PDR Recommended advancement to Final Design Phase
- MREFC Request (FY17 – FY19): $255.5M

RCRV: Science Justification

Sea Change, 2015–2025 Decadal Survey of Ocean Sciences: science priorities

- ✓ Sea level change
- ✓ Coastal and estuarine oceans
- ✓ Ocean and climate variability
- ✓ Biodiversity and marine ecosystems
- ✓ Marine food webs

- ❖ Ocean basin formation and evolution
- ❖ Geohazards
- ❖ Subseafloor environment

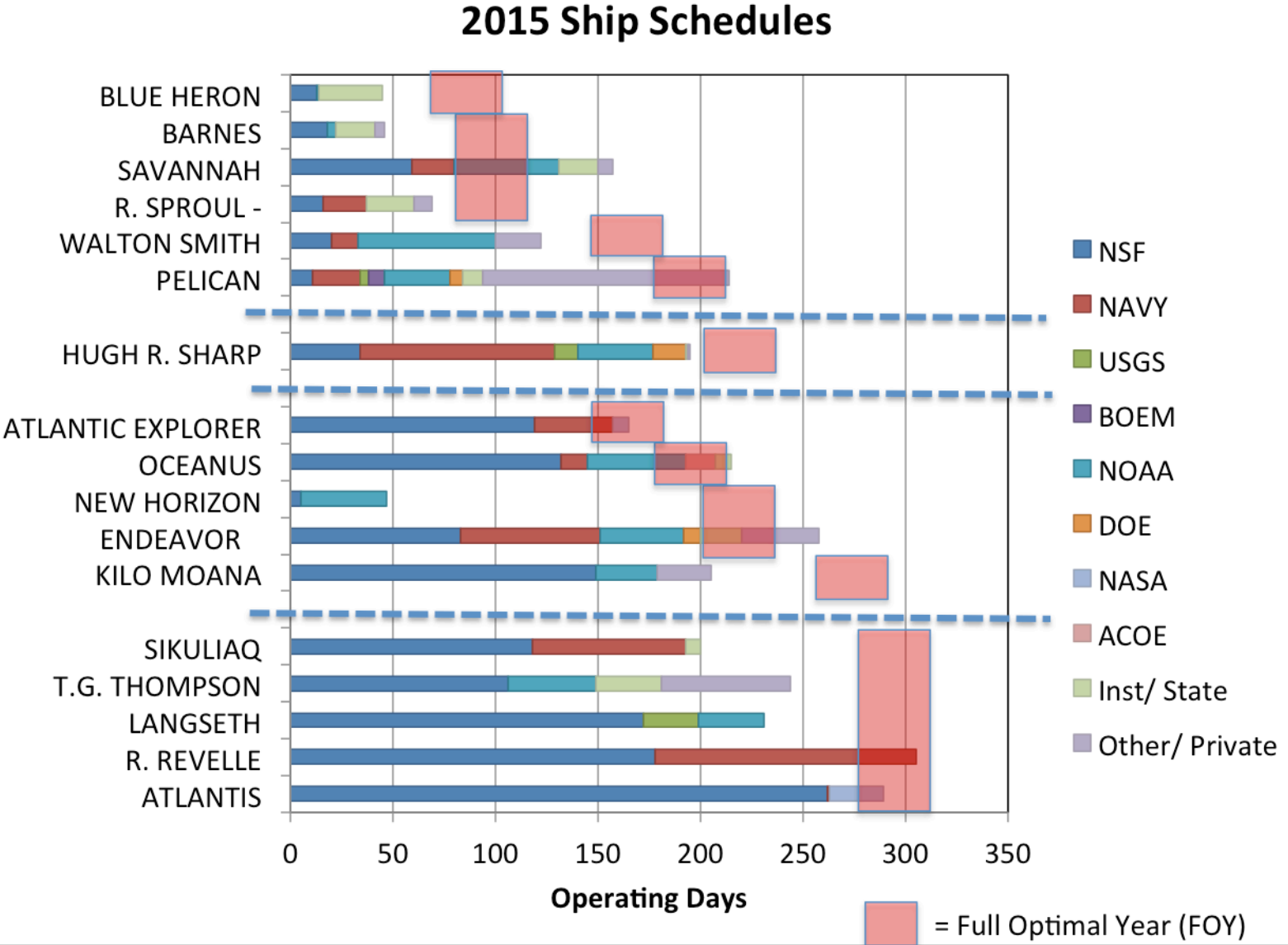
Sea Change Priorities

Decadal Survey of Ocean Sciences, Sea Change:

Table 3-2 Alignment of current NSF-funded ocean research infrastructure to the eight decadal science priorities. RCRV added

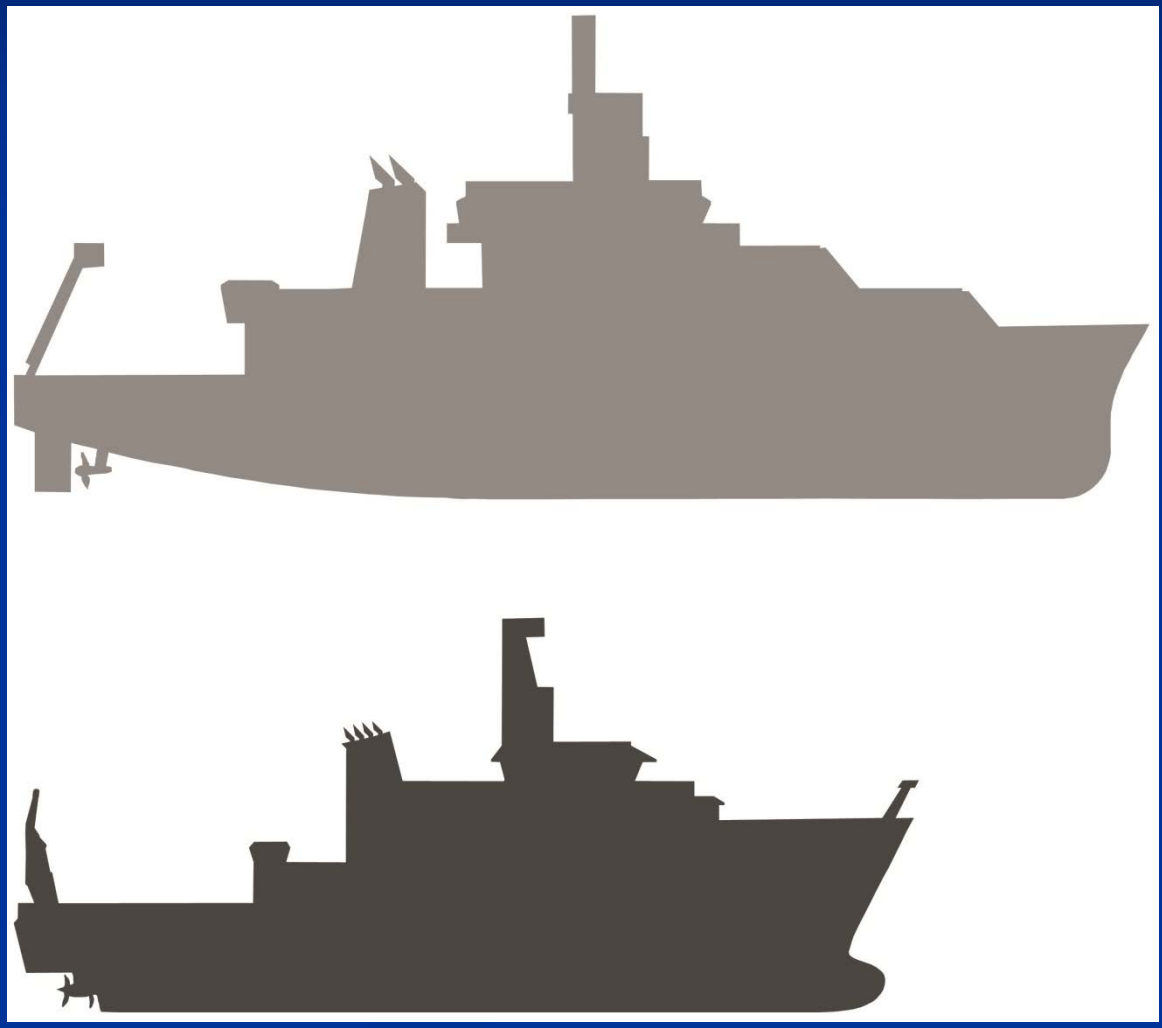
		1. Sea level change	2. Coastal and estuarine oceans	3. Ocean and Climate Variability	4 Biodiversity and Marine Ecosystems	5. Marine Food Webs	6 Ocean Basins	7. Geohazards	8. Subseafloor Environment
Fleet and Other Ships	Global/Ocean	C	I	C	C/I	C/I	C	C	C
	Regional /Coas tal	I	C	C/I	C	C			
	RCRV	✓	✓	✓	✓	✓	✓	✓	✓
	3-D Seismic Shi p						C/I	C	I
	Ice -Capable	C/I	I	C	C/I	C/I	I		
IODP	*JOIDES Resolution*	I		I			C	C	C
OOI	Coastal	I	I	I					
	Global			I					
	Cabled						I	I	I
Vehicles	*Alvin*				I	I			I
	ROVs						I	I	C
	AUVs		I		I	I	I		
	Gliders	I	I	I	I				
Other	OBSs						I	C	
	Field Stations/Mari ne Labs	I	C	I	C	C/I			

Ship Utilization



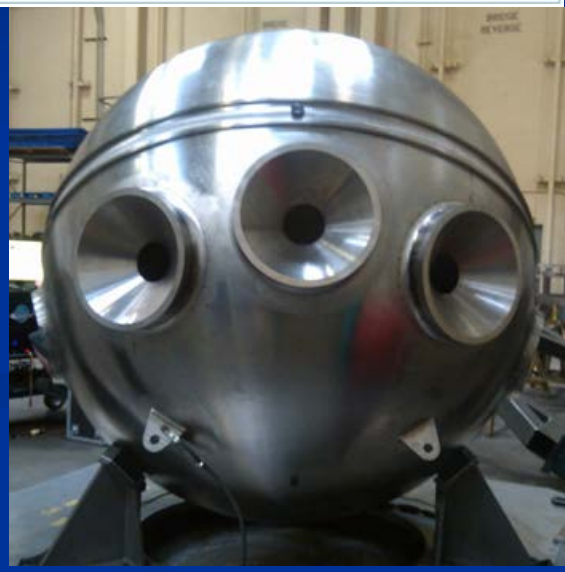
Comparison of Ocean Class to RCRV

- Ocean Class (OCRV)
  - 238 ft.
  - ~3000 tons displacement
- RCRV
  - 193 ft.
  - ~1500 tons displacement



HOV *Alvin*

October 2015



- Re-certified by U.S. Navy for 4500-m operations following deep certification dives in December 2014
- Successful Science Verification and Pilot Training dives preceded first science cruise
- New interior ergonomics and vehicle performance meet or exceed Scientist and Pilot expectations

Ocean Observatories Initiative (OOI)

OOI Science Requires Resolution of High Frequency Forcing (minutes-hours)
In Distant and/or Extreme Environments for Sustained Periods (years-decades)

Four Global high latitude sites

Station Papa
Irminger Sea
Argentine Basin
Southern Ocean

Two Coastal Arrays

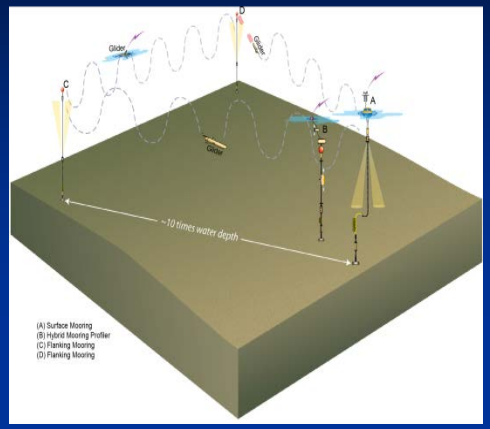
Endurance Array
Pioneer Array

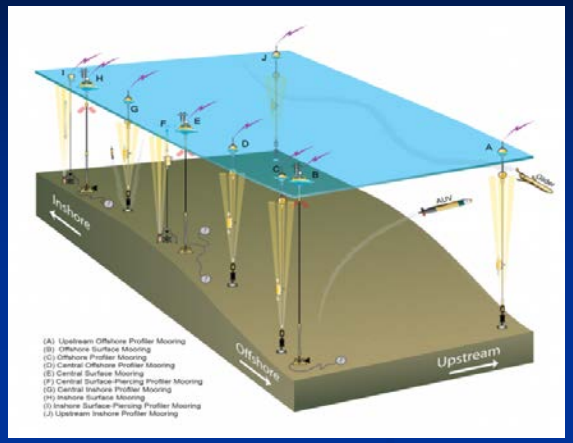
Cabled Array

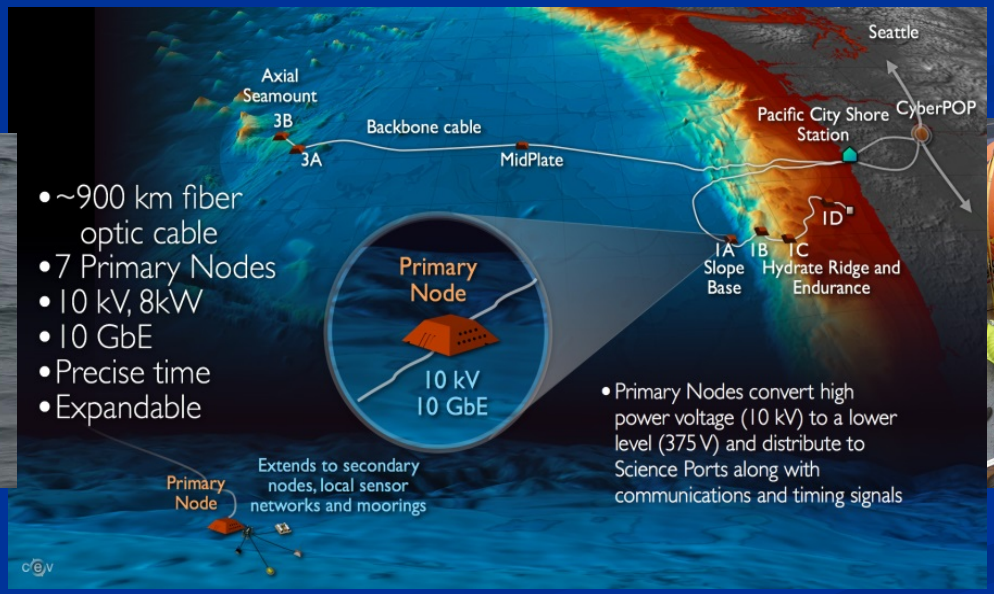
Meso-scale,
Plate Scale network

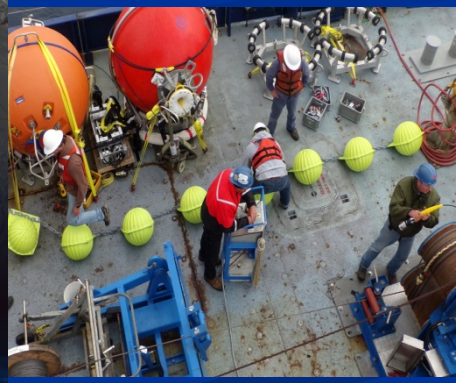
The locations and type of infrastructure drive engineering design, deployment, and maintenance profiles

OOI
53 MOORINGS & Over 800 INSTRUMENTS



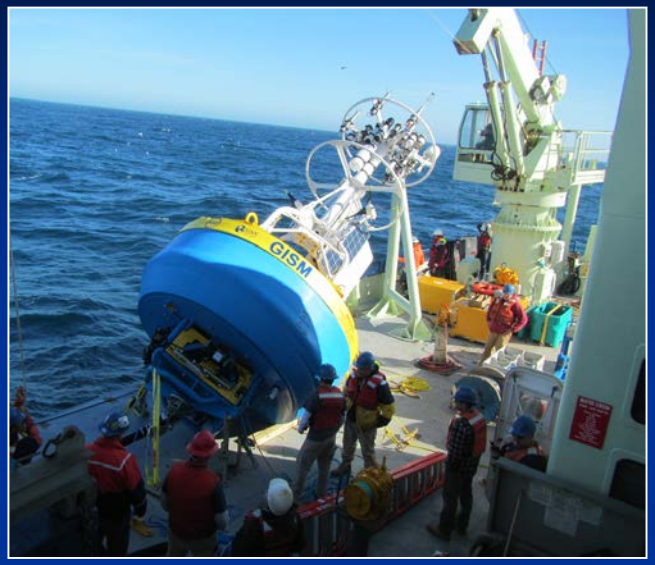






OOI
Deployment Status

Cabled Array: 900km to Shore Station



4 Global Sites Deployed:
Station Papa – North Pacific
Irminger Sea
Southern Ocean
Argentine Basin

Coastal Arrays Deployed:
Endurance Array – Oregon Line
Endurance Array – Washington Line
Pioneer Array

Co-location of CI and Data Management:
Rutgers University delivering CI, Science Coordination, data management and Education

Transition to Operations: November 2015

The International Ocean Discovery Program

Exploring The Earth Under The Sea

International Ocean Discovery Program (IODP)

- *Three primary platforms*

- *26 participating countries*

Chikyu

JOIDES Resolution

Mission Specific Platforms

- *JOIDES Resolution – Global ranging, all-purpose*
- *Chikyu – Deep drilling capability*
- *Mission Specific – High latitude or very shallow water*

JOIDES Resolution Areas of Operation – Long-term Plan