The OOI Coastal Workshop: OOI Net Status Overview

Manish Parashar, Scott Glenn & Oscar Schofield
Rutgers University Cyberinfrastucture (CI)

www.oceanobservatories.org

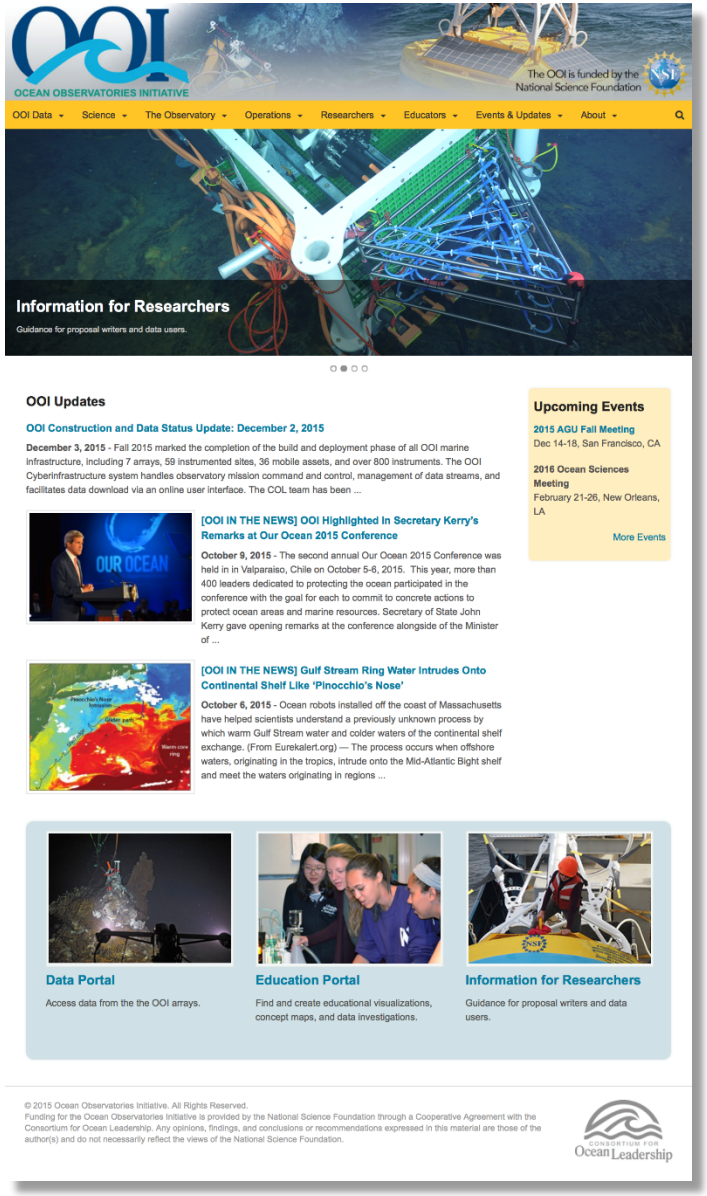
Summary Up Front

- Much has been accomplished
  - Significant assets have been deployed at sea
  - All data coming ashore is being stored
  - OOI Net with Asset Management is deployed on the Production Server!
- Access points to the vast number of data products are growing
  - OceanObservatories.org website updated & continues to evolve
  - Graphical User Interface (GUI) with plotting enabled & continues to evolve
  - Essential Ocean Variables (EOVs) are being downloaded & stored for easy access
- Data Access will accelerate
  - Software Team is in place with a rapid feedback environment established
  - Data Evaluation Team is in place and seasoned
  - We seek community input – mechanisms are in place
  - We welcome community contributions – software, data, scientific synthesis

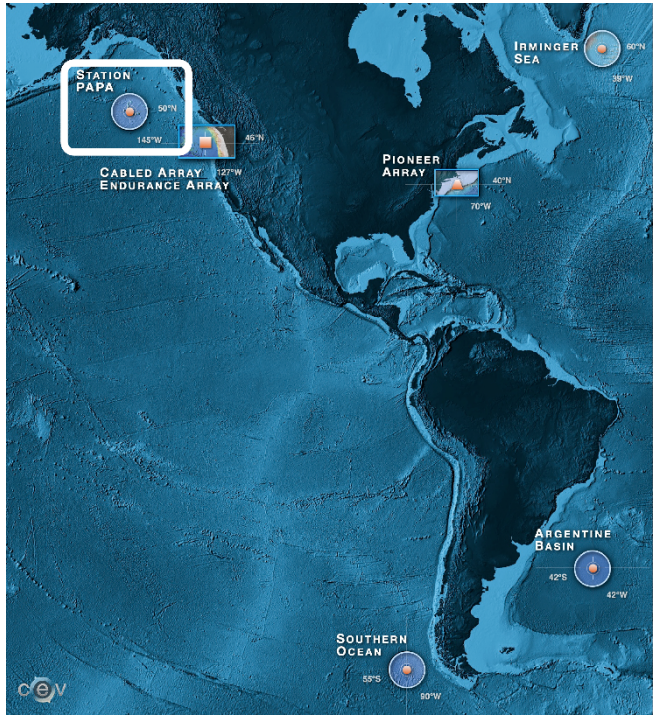
What has been deployed at sea?

- 4 Global Arrays
- Cabled Array
- Coastal Endurance Array
- Coastal Pioneer Array

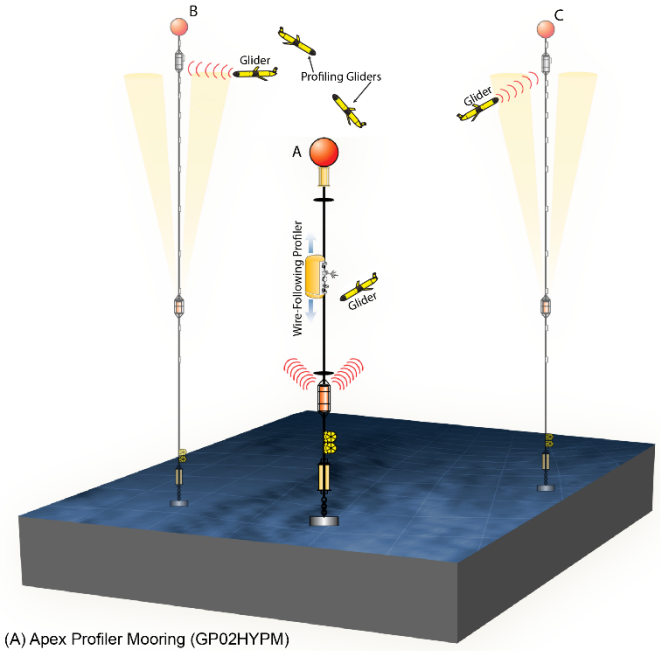
- Information at www.oceanobservatories.org



Global Arrays

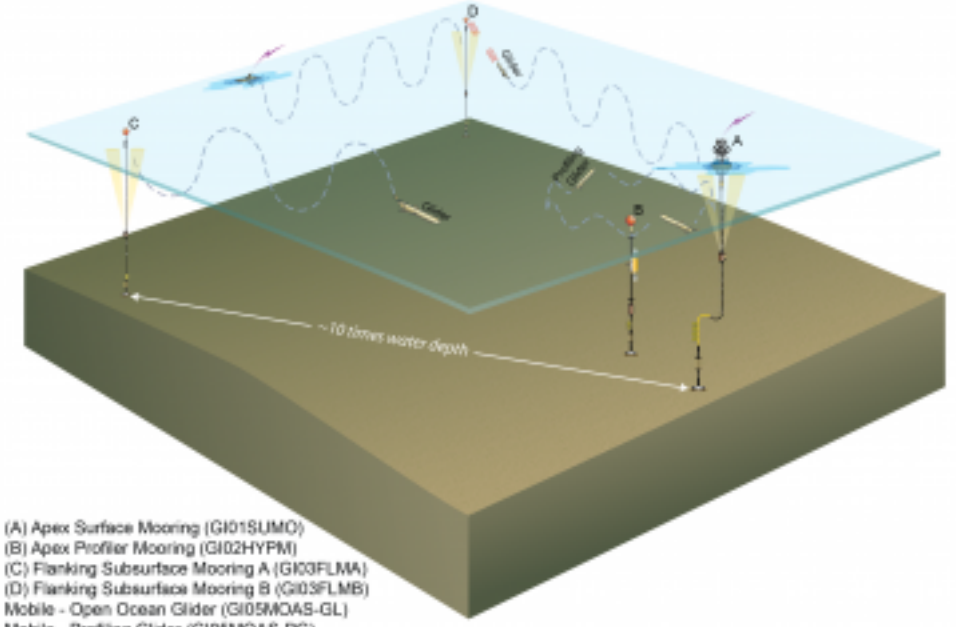


Global Station Papa



(A) Apex Profiler Mooring (GP02HYPM)
(B) Flanking Subsurface Mooring A (GP03FLMA)
(C) Flanking Subsurface Mooring B (GP03FLMB)
Mobile - Open Ocean Glider (GP05MOAS-GL)
Mobile - Profiling Glider (GP05MOAS-PG)

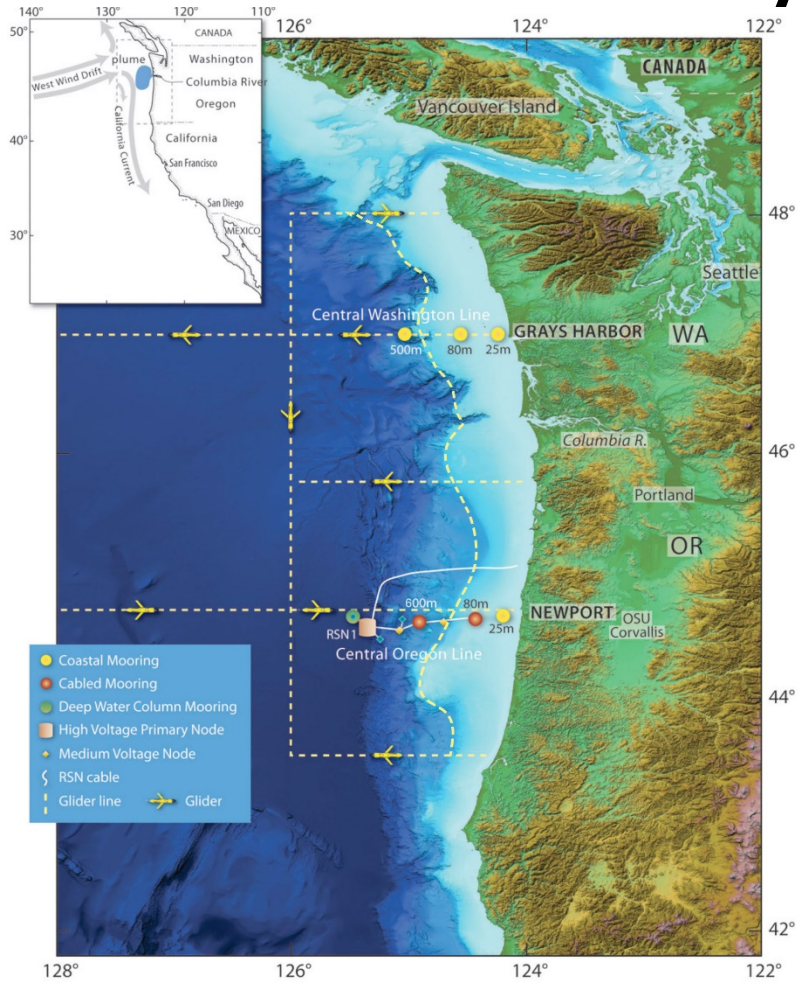
Global Irminger Sea Array

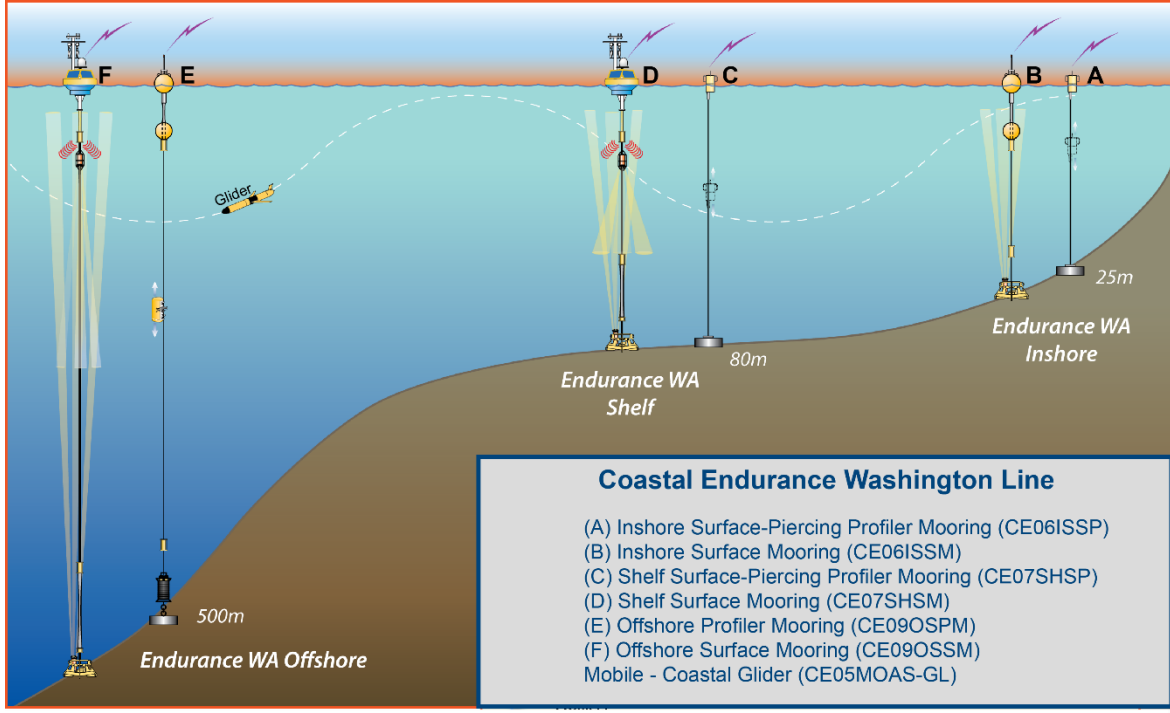


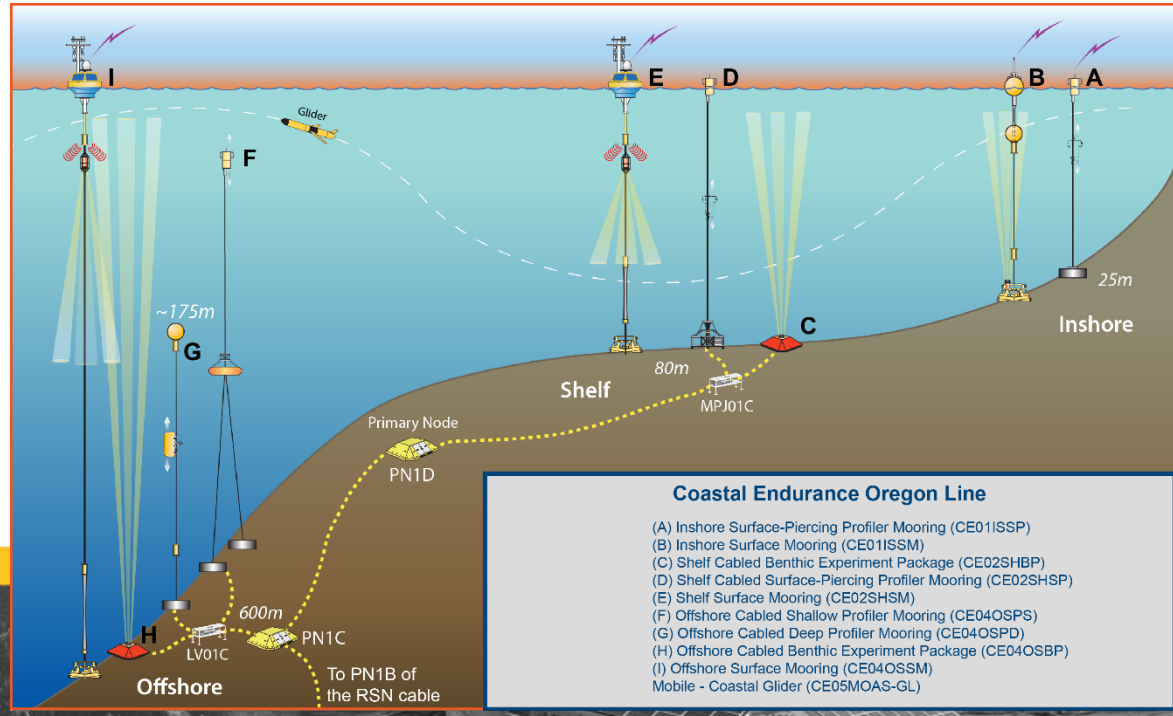
(A) Apex Surface Mooring (GI01SUMO)
(B) Apex Profiler Mooring (GI02HYPM)
(C) Flanking Subsurface Mooring A (GI03FLMA)
(D) Flanking Subsurface Mooring B (GI03FLMB)
Mobile - Open Ocean Glider (GI05MOAS-GL)
Mobile - Profiling Glider (GI05MOAS-PG)

Cabled Array

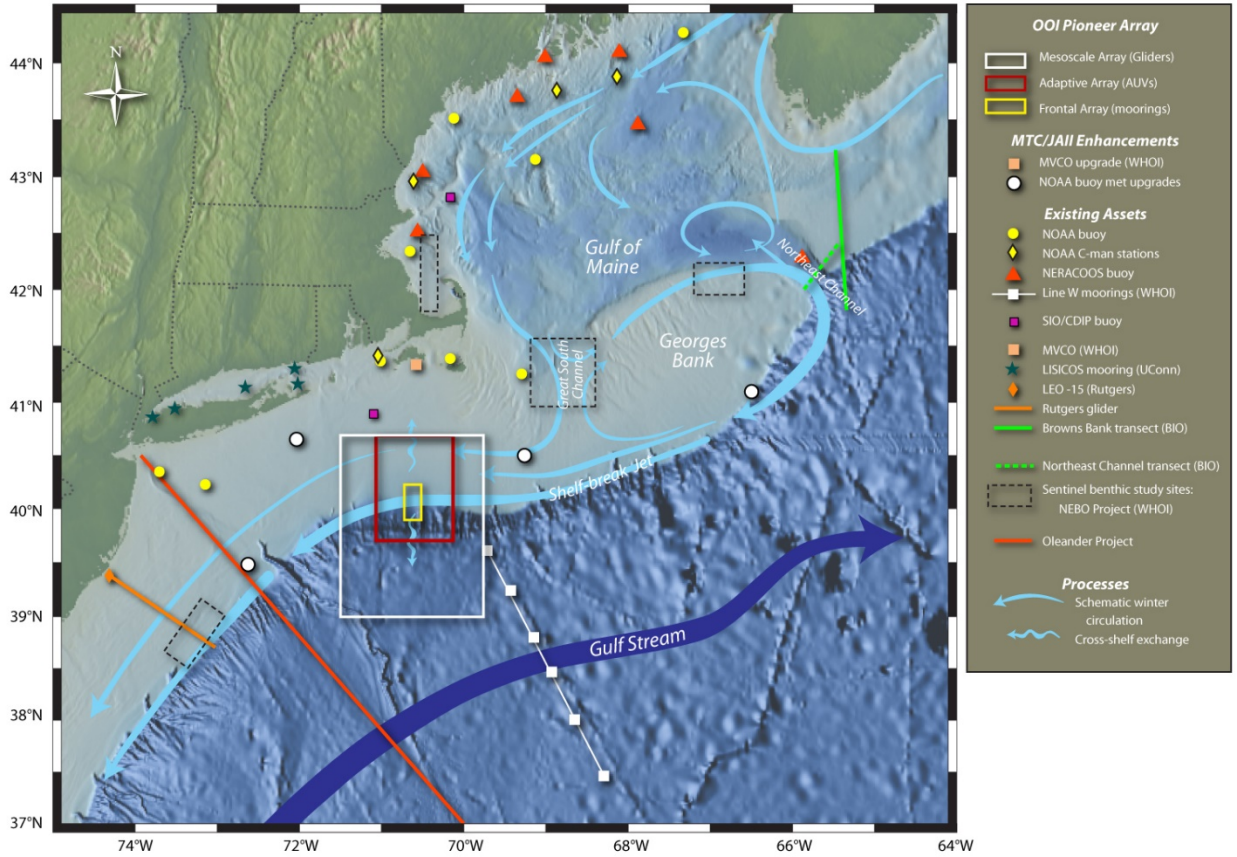
Endurance Array

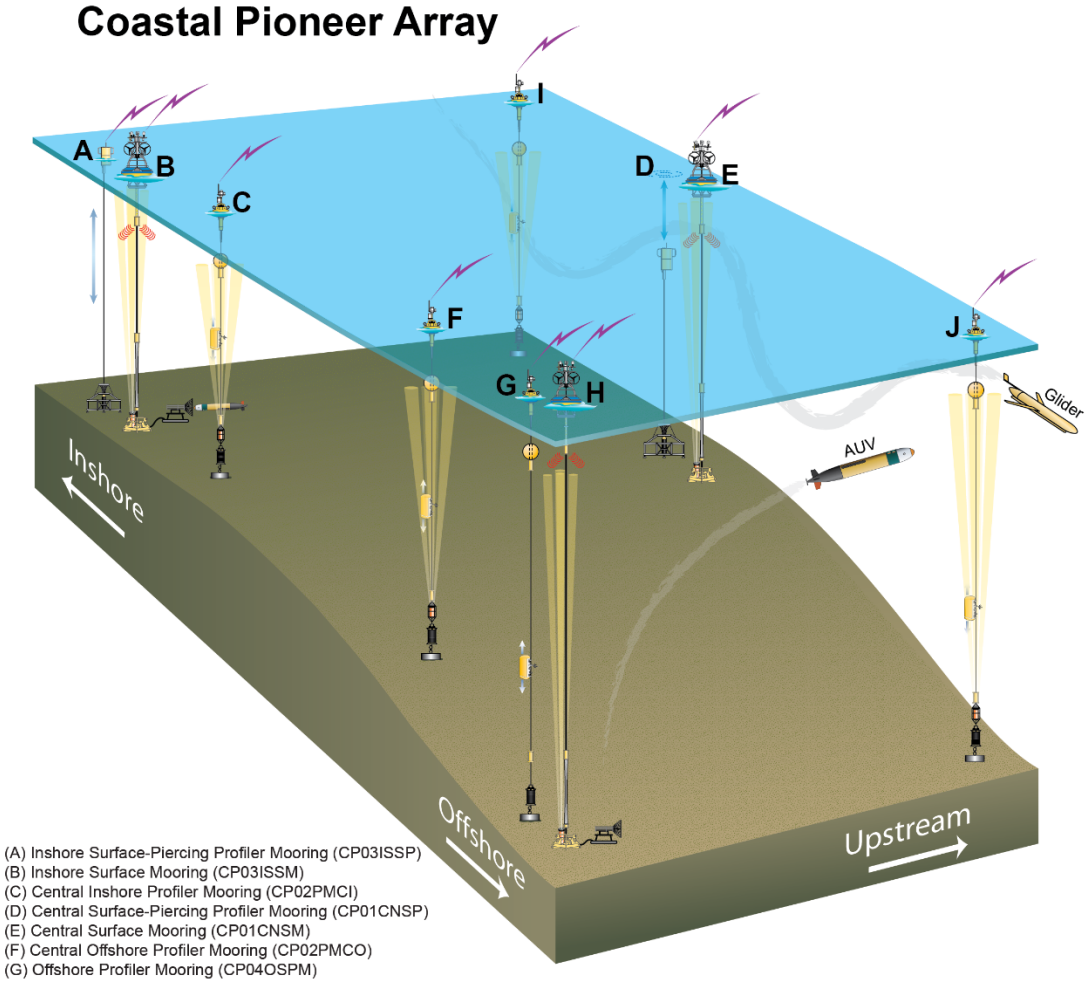






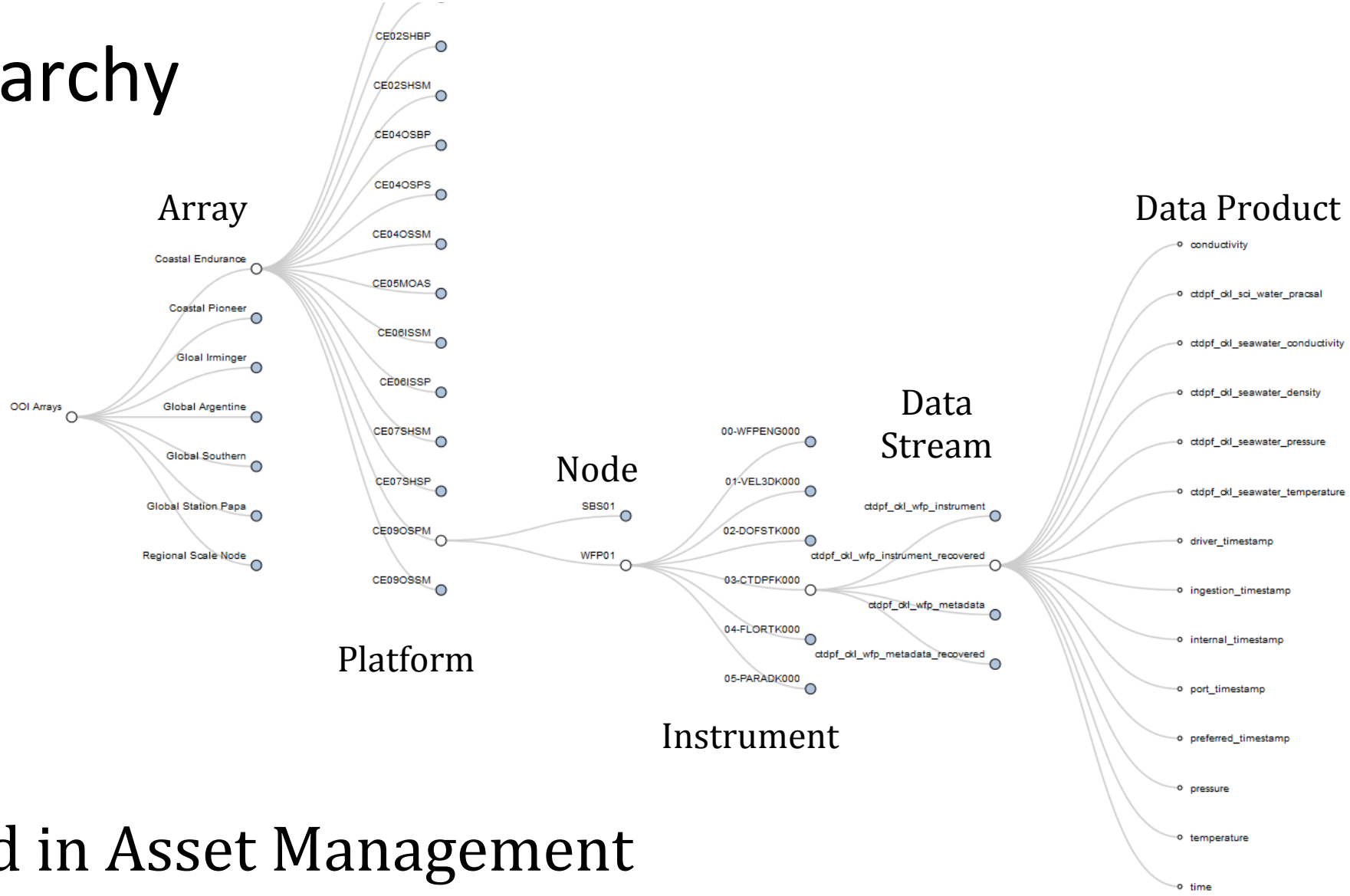
Pioneer Array





(A) Inshore Surface-Piercing Profiler Mooring (CP03ISSP)
(B) Inshore Surface Mooring (CP03ISSM)
(C) Central Inshore Profiler Mooring (CP02PMCI)
(D) Central Surface-Piercing Profiler Mooring (CP01CNSP)
(E) Central Surface Mooring (CP01CNSM)
(F) Central Offshore Profiler Mooring (CP02PMCO)
(G) Offshore Profiler Mooring (CP04OSPM)
(H) Offshore Surface Mooring (CP04OSSM)
(I) Upstream Inshore Profiler Mooring (CP02PMUI)
(J) Upstream Offshore Profiler Mooring (CP02PMUO)
Mobile - AUV (CP02MOAS-AV)
Mobile - Coastal Glider (CP02MOAS-GL)

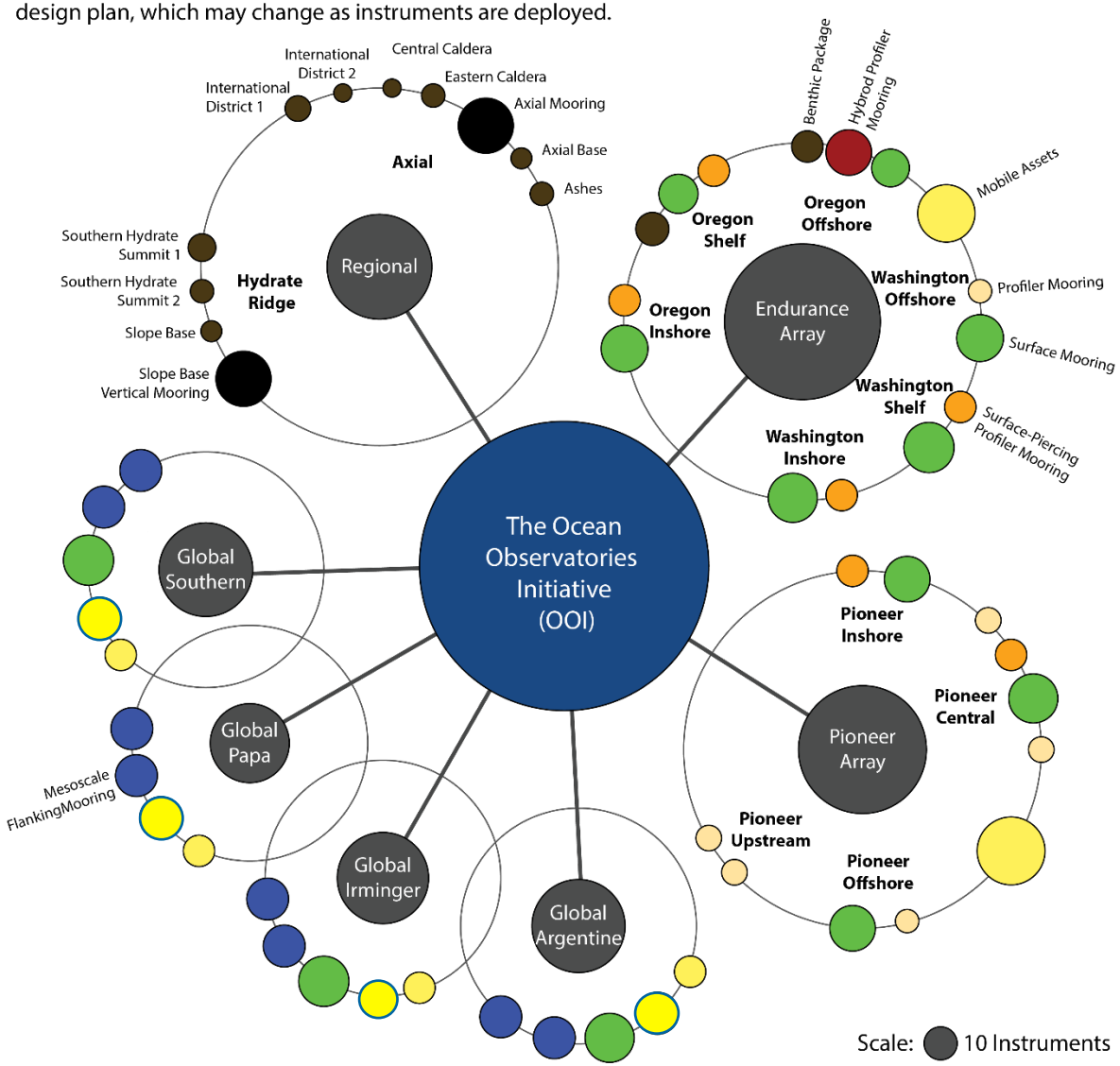
Data Hierarchy



All tracked in Asset Management

Arrays and Sites

Each circle is sized by the number of instruments that will be deployed in each array (black circles) and site (colored circles) within the OOI. This figure reflects the initial design plan, which may change as instruments are deployed.



7 Arrays

50 Sites
Moorings, Profilers, Nodes

33 Mobile Assets
Gliders, AUVs

856 Instruments

2848 Science Data Products

>100K Science/Engineering Data Products

Pioneer Site & Mobile Asset Deployment Times

	A	B	C	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY
1				1 = Deployed - Red 2 = DATA Rsync - Yellow 3 = Data Rsync with Ingest and Cal files available - Green 4 = Ingest and Cal files Tested - 5 = Data ingested - Blue														1 = Deployed - Red 2 = DATA Rsync - Yellow 3 = Data Rsync with Ingest and Cal files available - Green 3.5 = Data an dCAl sheets available ready for CAL sheet ingest on test server 4 = Ingest and Cal files Tested - 5 = Data ingested - Blue												
2						2014																							
3	Type	Ref Desig		Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
88	Coastal Glider	CP05MOAS-GL388	Telem												5	5	5										5	5	
89			Recov												5	5	5												
90	Coastal Glider	CP05MOAS-GL387	Telem						5	5								5	5	5							5	5	
91			Recov						5	5								5	5	5									
92	Coastal Glider	CP05MOAS-GL380	Telem												5	5	5	5						5	5	5	5		
93			Recov												5	5	5	5						5	5	5	5		
94	Coastal Glider	CP05MOAS-GL379	Telem						5	5	5											5	5	5					
95			Recov						5	5	5											1	1	1					
96	Coastal Glider	CP05MOAS-GL376	Telem												5	5	5										5	5	
97			Recov												5	5	5					1							
98	Coastal Glider	CP05MOAS-GL375	Telem																										
99			Recov																										
100	Coastal Glider	CP05MOAS-GL374	Telem						5	5	5											5	5	5					
101			Recov						5	5	5											1	1	1					
102	Coastal Glider	CP05MOAS-GL340	Telem												5	5	5					5	5	5					
103			Recov												5	5	5					1	1	1					
104	Coastal Glider	CP05MOAS-GL339	Telem																5	5	5								
105			Recov																5	5	5								
106	Coastal Glider	CP05MOAS-GL336	Telem															5	5	5									
107			Recov															5	5	5									
108	Coastal Glider	CP05MOAS-GL335	Telem												5	5	5										5	5	
109			Recov												5	5	5												
110	Coastal Surface Mooring	CP04OSSM	Telem														5	5	5	5	5	5		5	5	5	5	5	
111			Recov														1	1	1	1	1			1	1	1			
112	Coastal WFP	CP04OSPM	Telem						5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
113			Recov						5	5	5	5	5	5	1	1	1	1	1	1	1	1	1	1	1	1	1		
114	Coastal Piercing Profiler	CP03ISSP	Telem																deployment 2 missing					5	5	5	5		
115			Recov																					1	1	1	1		
116	Coastal Surface Mooring	CP03ISSM	Telem					cd													5		5	5	5	5	5		
117			Recov																		1		1	1	1	1			
118	Coastal WFP	CP02PMUO	Telem						5	5	5	5	5	5	5	5	5	5	5	5	5	Deployment 4 missing						5	
119			Recov	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5						1		
120	Coastal WFP	CP02PMUI	Telem						5	5	5	5	5	5	5	5	5	5	Deployment 4 missing				5	5	5	5	5	5	
121			Recov	5	5	5	5	5	5	5	5	5	5	5	1	1	1	1					1	1	1	1	1		
122	Coastal WFP	CP02PMCO	Telem						5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
123			Recov						5	5	5	5	5	5	1	1	1	1	1	1	1	1	1	1	1	1	1		
124	Coastal WFP	CP02PMCI	Telem						5	5	5	5	5	5	5	5							5	5	5	5	5	5	
125			Recov						5	5	5	5	5	5	1	1							1	1	1	1	1		
126	Coastal Piercing Profiler	CP01CNSP	Telem																								5		
127			Recov																								5		
128	Coastal Surface Mooring	CP01CNSM	Telem	4	4	4	4	4	4								5						5	5	5	5	5	5	
129			Recov	5	5	5	5	5	5								5	partial					1	1	1	1	1		

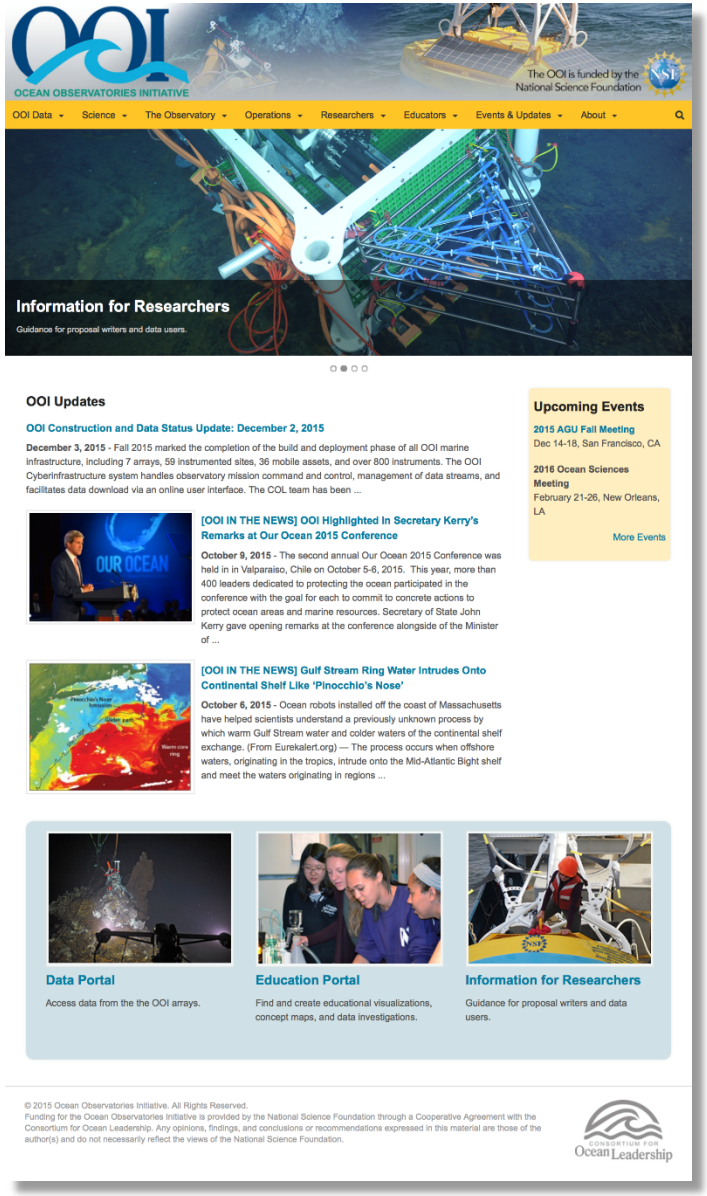
Endurance Site & Mobile Asset Deployment Times

	A	B	C	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY
1				1 = Deployed - Red 2 = DATA Rsync - Yellow 3 = Data Rsync with Ingest and Cal files available - Green 4 = Ingest and Cal files Tested - 5 = Data ingested - Blue												1 = Deployed - Red 2 = DATA Rsync - Yellow 3 = Data Rsync with Ingest and Cal files available - Green 3.5 = Data an dCAI sheets available ready for CAL sheet ingest on test server 4 = Ingest and Cal files Tested - 5 = Data ingested - Blue											
2				2014																							
3	Type	Ref Desig		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
130	Coastal Surface Mooring	CE09OSSM	Telem																5	5	5	5	5	5	5	5	
131			Recov																5	5	5	5	5	5			
132	Coastal WFP	CE09OSPM	Telem				5	5	5	5	5		5	5	5	5	5	5	5	5	5	5	5	5	5	5	
133			Recov				5	5	5	5	5		5	5	5	5	5	5	5	5	5	5	5	5	5		
134	Coastal Piercing Profiler	CE07SHSP	Telem																								
135			Recov																5	5	5	5	5	5	5		
136	Coastal Surface Mooring	CE07SHSM	Telem																5	5	5	5	5	5	5	5	
137			Recov																5	5	5	5	5	5			
138	Coastal Glider	CE05MOAS-GL386	Telem				5	5	5	5									5	5	5	5			5	5	
139			Recov				5	5	5	5									5	5	5	5					
140	Coastal Glider	CE05MOAS-GL384	Telem																5	5	5	5		5	5	5	
141			Recov																5	5	5	5					
142	Coastal Glider	CE05MOAS-GL383	Telem													5	5	5					5	5	5	5	
143			Recov													5	5	5									
144	Coastal Glider	CE05MOAS-GL382	Telem													5	5	5	5								
145			Recov													5	5	5	5								
146	Coastal Glider	CE05MOAS-GL381	Telem										5	5	5	5											
147			Recov										5	5	5	5											
148	Coastal Glider	CE05MOAS-GL327	Telem																			5	5	5		5	5
149			Recov																			5	5	5			
150	Coastal Glider	CE05MOAS-GL326	Telem																5	5	5	5			5	5	
151			Recov																5	5	5	5					
152	Coastal Glider	CE05MOAS-GL320	Telem										5	5	5												
153			Recov										5	5	5												
154	Coastal Glider	CE05MOAS-GL319	Telem				5	5	5																5	5	
155			Recov				5	5	5																		
156	Coastal Glider	CE05MOAS-GL312	Telem				5	5	5	5												5	5				
157			Recov				5	5	5	5												5	5				
158	Coastal Glider	CE05MOAS-GL311	Telem										5	5	5												
159			Recov										5	5	5												
160	Coastal Glider	CE05MOAS-GL247	Telem																								
161			Recov																								
162	Coastal Surface Mooring	CE06ISSM	Telem										5	5	5	5	5	5	5	5	5	5	5	5	5	5	
163			Recov										5	5	5	5	5	5	5	5	5	5	5	5			
164	Coastal Piercing Profiler	CE06ISSP	Telem																				5	5			
165			Recov																				5	5			
166	Coastal Surface Mooring	CE04OSSM	Telem																5	5	5	5	5	5	5	5	
167			Recov																								
168	Coastal Surface Mooring	CE02SHSM	Telem																5	5	5	5	5	5	5	5	
169			Recov																5	5	5	5	5	5			
170	Coastal Piercing Profiler	CE01ISSP	Telem													5						5	5				
171			Recov													5						5	5				
172	Coastal Surface Mooring	CE01ISSM	Telem				5	5	5	5	5		5	5	5	5	5	5	5		5	5	5	5	5	5	
173			Recov				4	4	4	4	4		5	5	5	5	5	5	5		5	5	5	5	5		

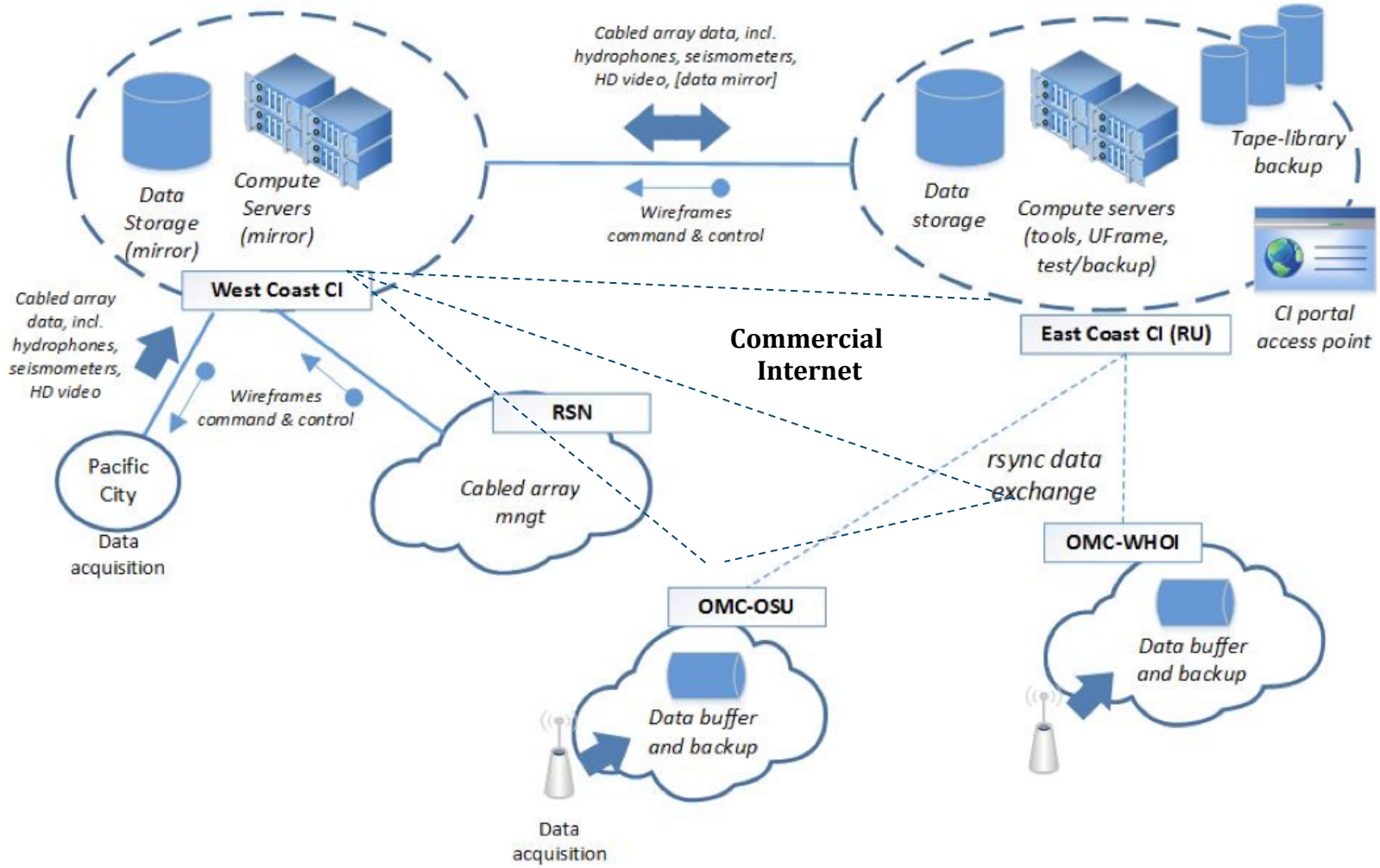
What is being deployed on land?

- Nationally Distributed Computer Network
- Rapidly evolving Service Oriented Architecture (SOA) Software for data processing, distribution & archiving

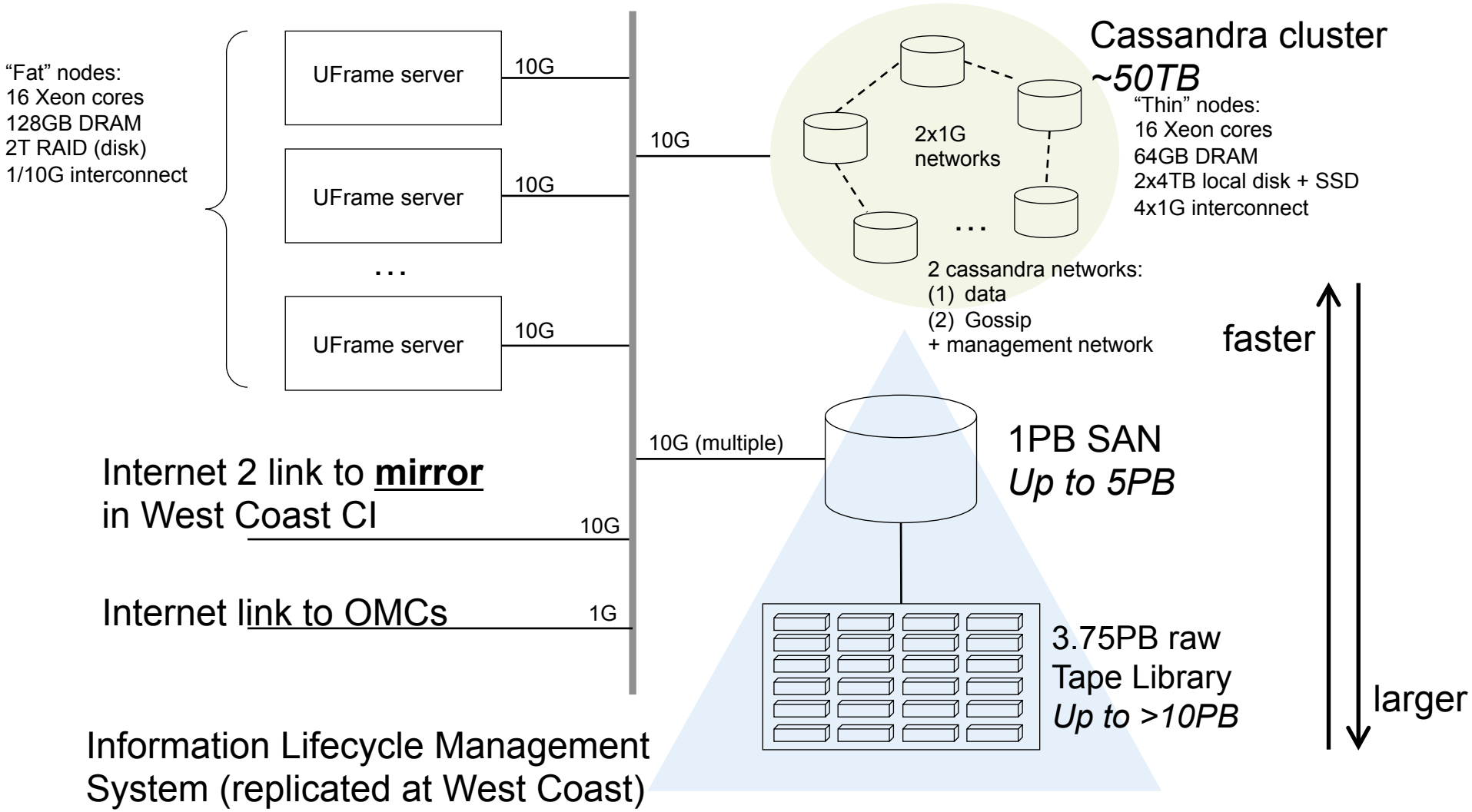
- Information at www.oceanobservatories.org



Overall CI Architecture – Functional View



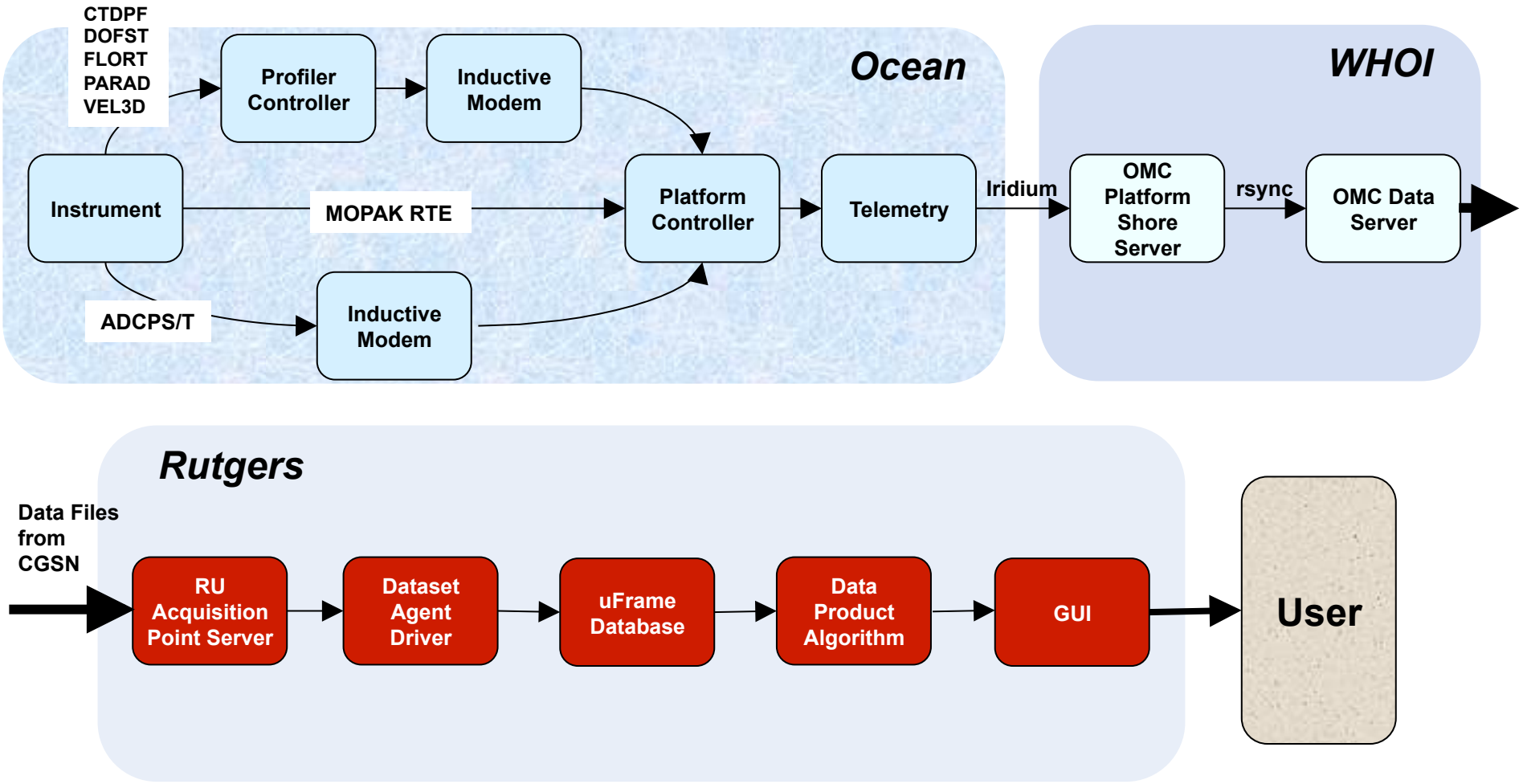
OOINet Deployment



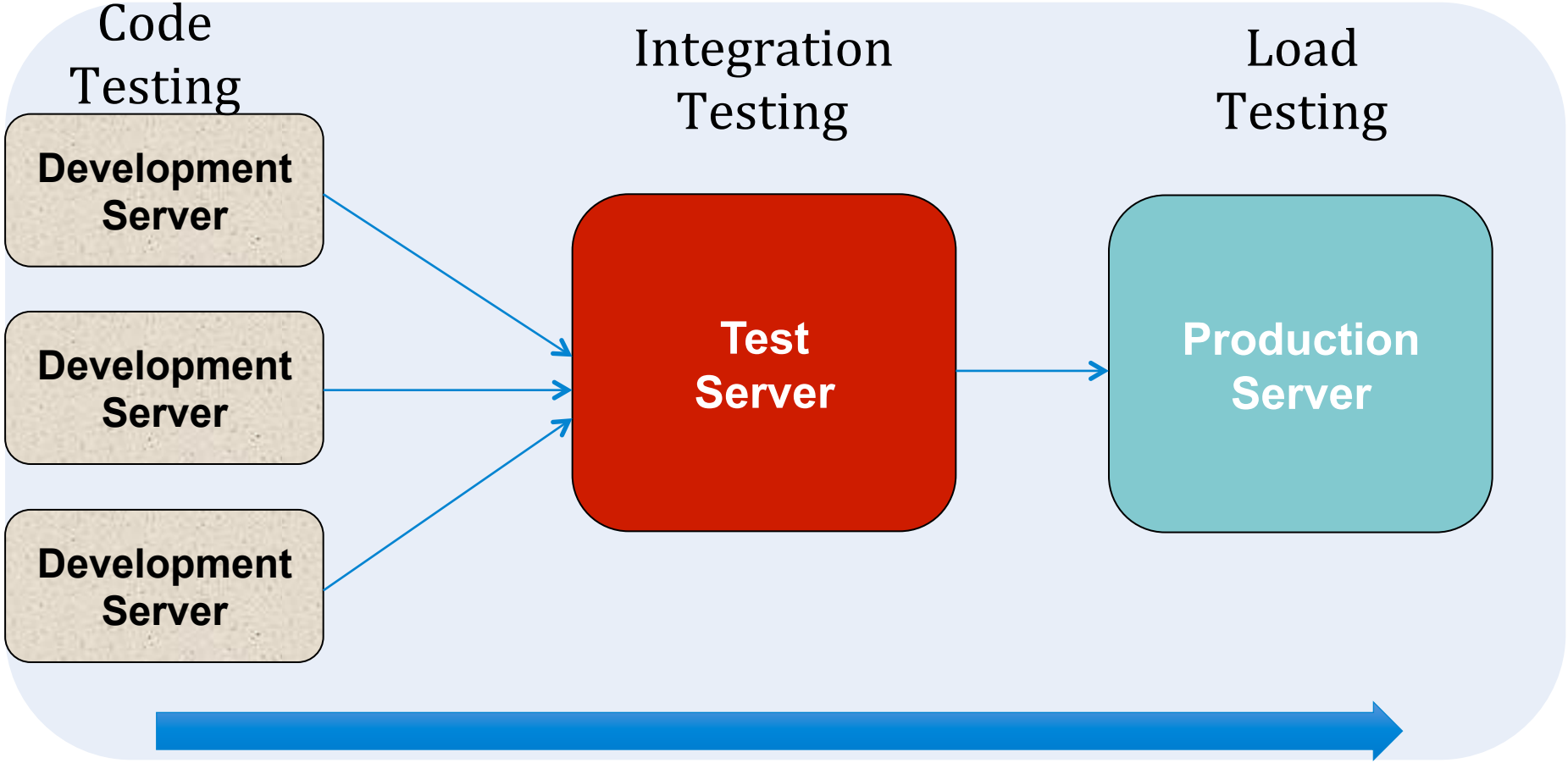
OOI-Net Software Build & Upgrade Team

- Integration Lead – COL
- Universal Framework (uFrame) SOA Core - Raytheon Omaha
- Dataset Agent Drivers – Parsers for ingest - Raytheon San Diego
- Data Product Algorithms – Oregon State University
- Graphical User Interface (GUI or UI) – Applied Science Associates
- Additional Data Delivery – Community Protocols
- Operator - Rutgers

Data Flow Example: Pioneer Profiler

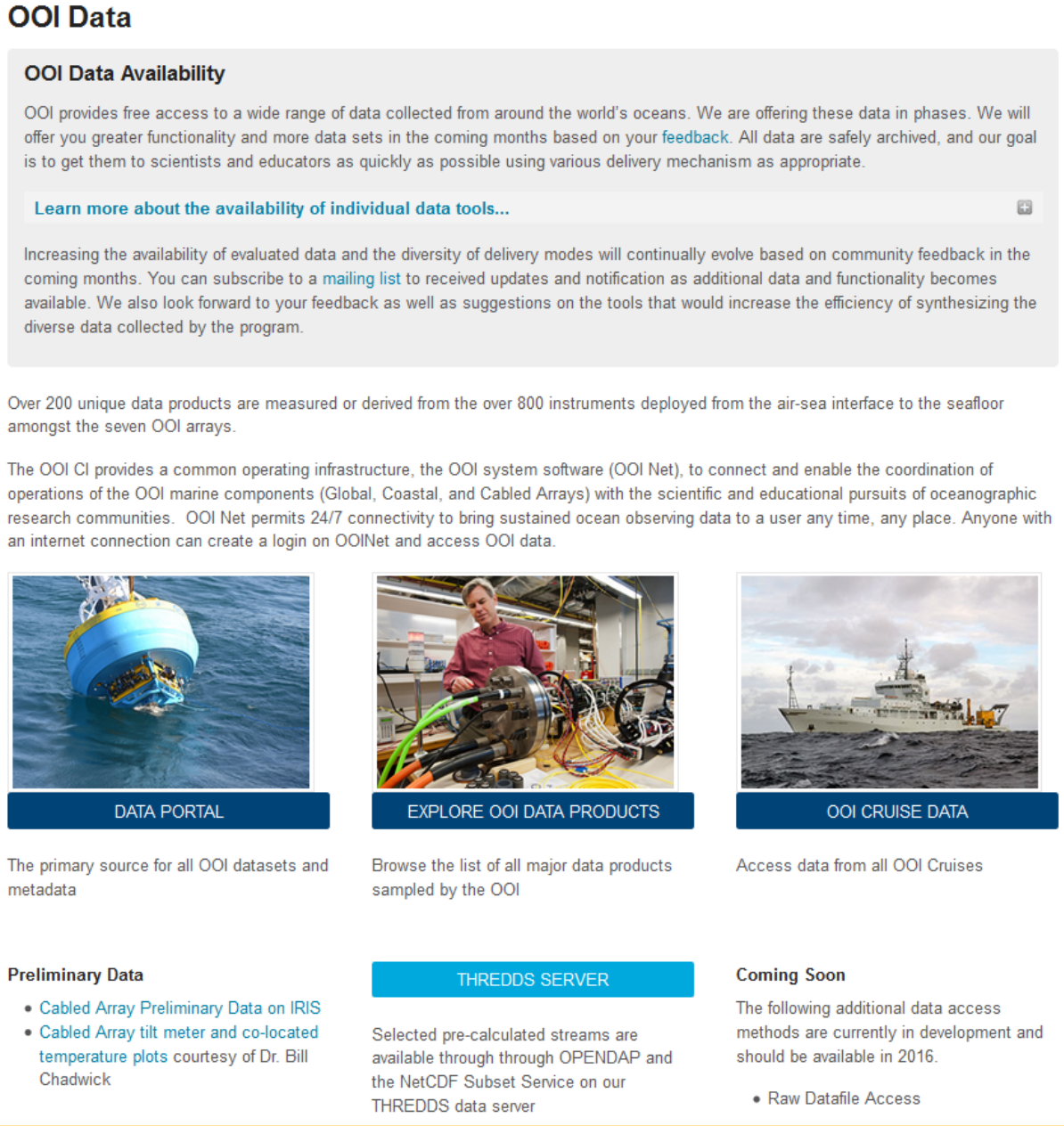


OOI Net Server Configurations



Data Access Points

- Data Portal (GUI)
- THREDDS Server
  - Access to aggregated data products in NetCDF and CSV
  - ERDDAP (Spring 2016)
- Raw data files (Spring 2016)
- Shipboard Data
- Large Format Data
  - Still Camera & HD Video
  - Seismic
  - Hydrophone
  - Bioacoustic Sonar
- Direct Pass to community organizations (ex: seismic to IRIS)



OOI Data

OOI Data Availability

OOI provides free access to a wide range of data collected from around the world's oceans. We are offering these data in phases. We will offer you greater functionality and more data sets in the coming months based on your feedback. All data are safely archived, and our goal is to get them to scientists and educators as quickly as possible using various delivery mechanism as appropriate.

Learn more about the availability of individual data tools...

Increasing the availability of evaluated data and the diversity of delivery modes will continually evolve based on community feedback in the coming months. You can subscribe to a mailing list to received updates and notification as additional data and functionality becomes available. We also look forward to your feedback as well as suggestions on the tools that would increase the efficiency of synthesizing the diverse data collected by the program.

Over 200 unique data products are measured or derived from the over 800 instruments deployed from the air-sea interface to the seafloor amongst the seven OOI arrays.

The OOI CI provides a common operating infrastructure, the OOI system software (OOI Net), to connect and enable the coordination of operations of the OOI marine components (Global, Coastal, and Cabled Arrays) with the scientific and educational pursuits of oceanographic research communities. OOI Net permits 24/7 connectivity to bring sustained ocean observing data to a user any time, any place. Anyone with an internet connection can create a login on OOINet and access OOI data.

DATA PORTAL

The primary source for all OOI datasets and metadata

EXPLORE OOI DATA PRODUCTS

Browse the list of all major data products sampled by the OOI

OOI CRUISE DATA

Access data from all OOI Cruises

Preliminary Data

- Cabled Array Preliminary Data on IRIS
- Cabled Array tilt meter and co-located temperature plots courtesy of Dr. Bill Chadwick

THREDDS SERVER

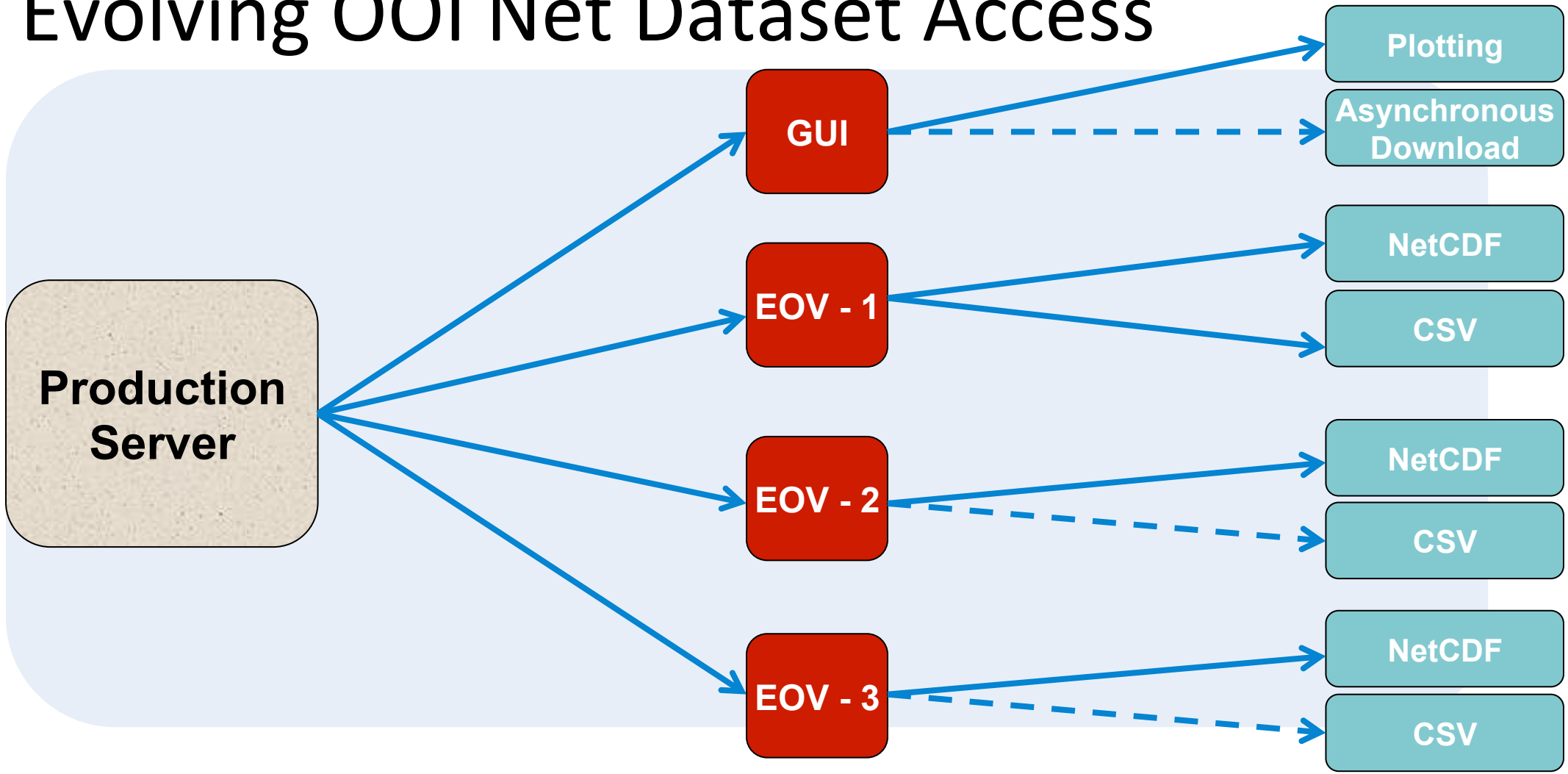
Selected pre-calculated streams are available through through OPENDAP and the NetCDF Subset Service on our THREDDS data server

Coming Soon

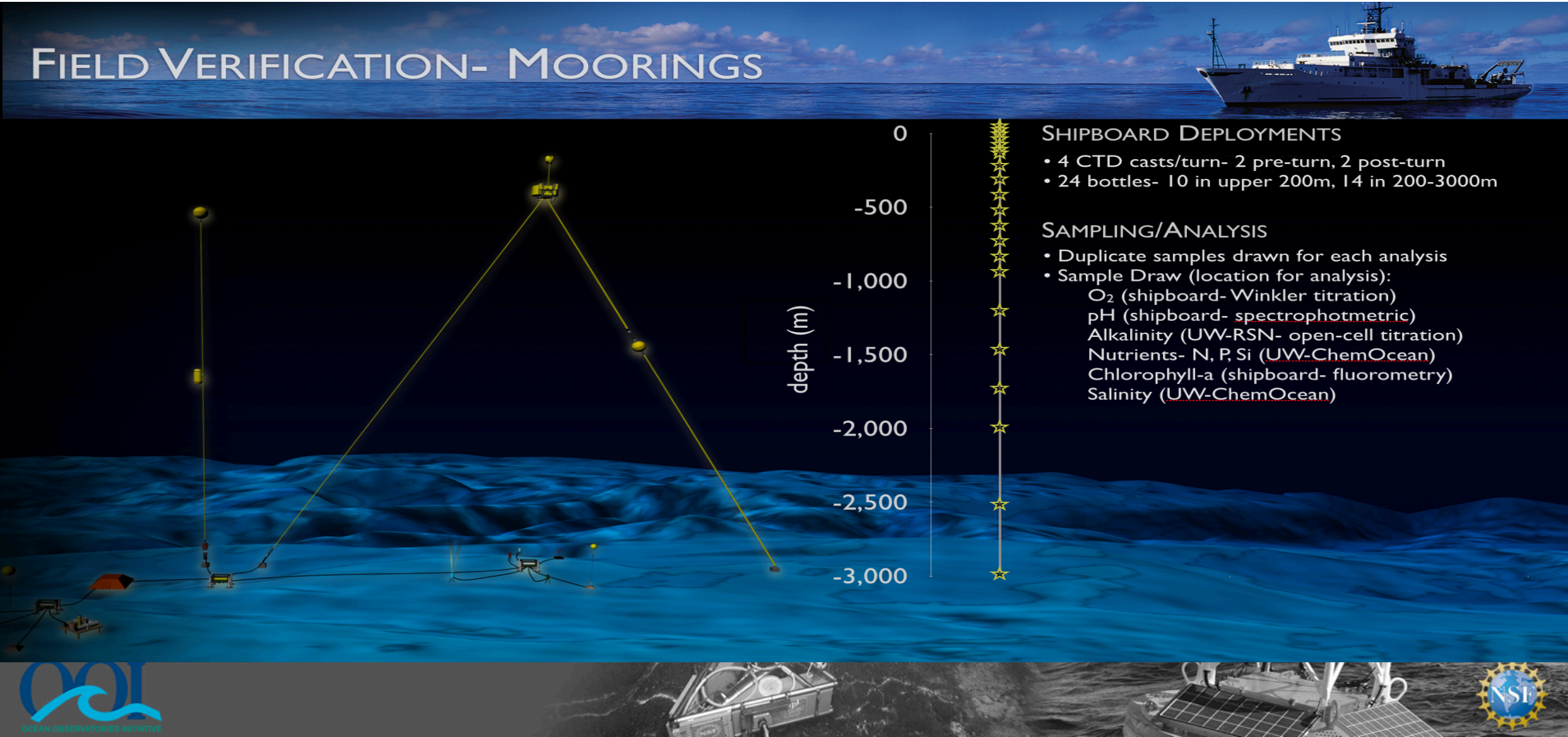
The following additional data access methods are currently in development and should be available in 2016.

- Raw Datafile Access

Evolving OOI Net Dataset Access



Ship and Shore-based sensor verification



At-sea Data QA procedures

Pre- & Post-deployment procedures

Deployment documentation

- Pre-deployment checklists *[CP02PMUI-00001_checklist.pdf]*
- Mooring deployment logs *[CP02PMUI-00001_deployment-log.pdf]*

Post-deployment assessments

- Adjacent CTD cast(s) (temp,sal,oxy,chl,turb) *[see quick look report]*
- Shipboard systems (met, surface t-sal, ADCP) *[SCS_WSPD.gif, SCS_WDIR.gif]*
- Water samples and lab analysis (sal,oxy,chl,etc*) [Pioneer1_salinity_oxygen.xlsx]*
- Quick-look report *[3204-00023_Poineer_1_Quick_Look_Cruise_Report.pdf]*
- Lessons learned *[internal working documents]*

Data QC

Automated QC Algorithms

- Global Range Test
- Local Range Test
- Spike Test
- Gradient Test
- Trend Test
- Stuck Value Test

Manual QC Tests

- Quick Looks
- Deep Dives
- Alert Diagnoses

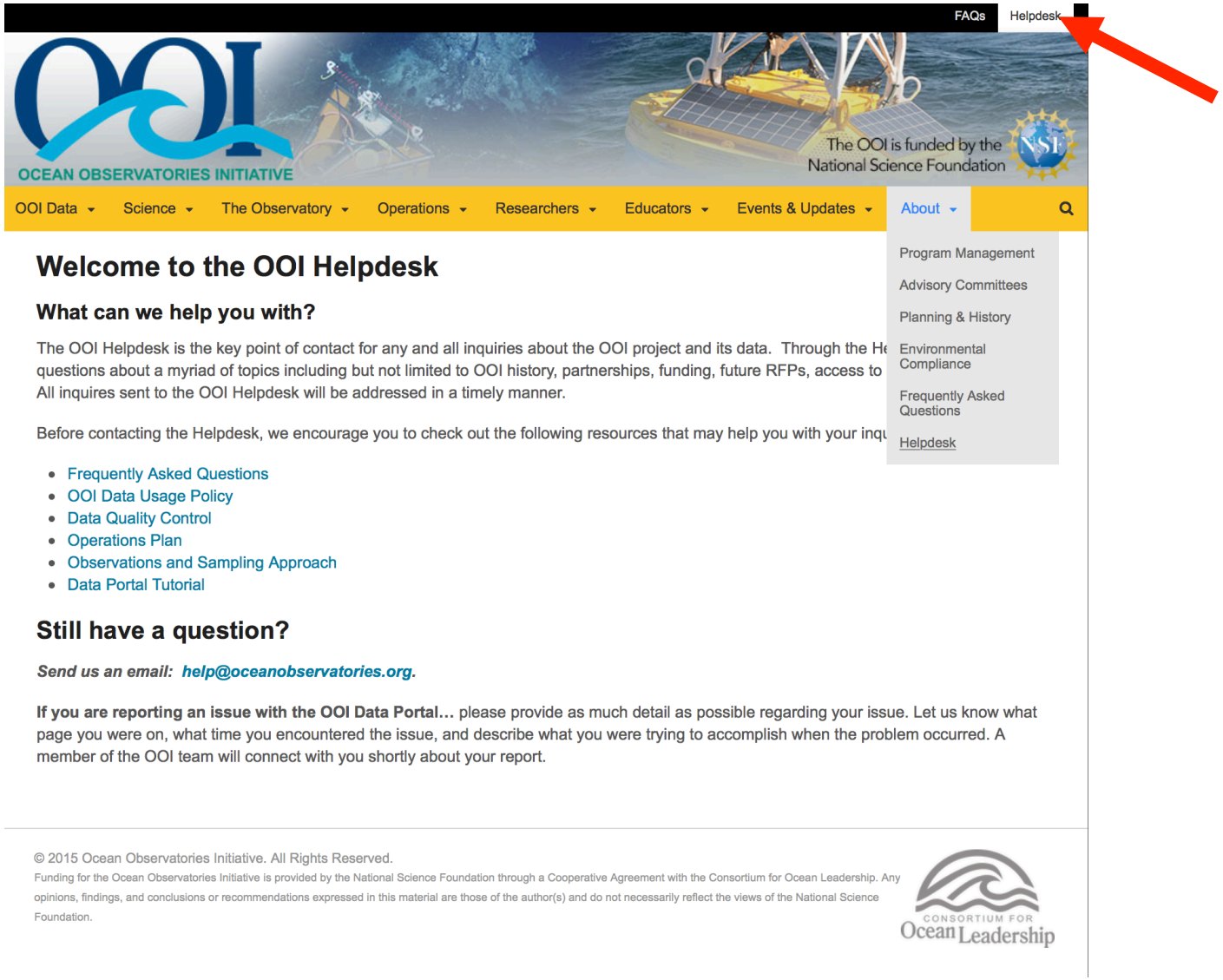
Data QC aligned with accepted community standards

ARGO QC Test	OOI QC Test
1. Platform ID*	1. Data is sorted by reference designator so this needs to be correct for the data to go into the file
2. Impossible date*	2. Time series check in quick look plots. An automated algorithm has been suggested
3. Impossible location*	3. Quick look maps generated for glider/mooring locations to determine close approach times for mobile and fixed assets are already being used for this
4. Position on land*	4. Same as 3
5. Impossible speed*	5. Same as 3. Could be automated
6. Global range test*	6. Already part of automated QC algorithms
7. Regional parameter range*	7. Already part of automated QC algorithms
8. Pressure increasing	8. Less relevant. Profilers move both directions and can be impacted by turbulence or shallow water waves
9. Spike test	9. Already part of automated QC algorithms
10. Top – bottom spike - obsolete	10. Obsolete
11. Gradient test	11. Already part of automated QC algorithms
12. Digit rollover	12. Digital rollover? Not sure what this is
13. Stuck value	13. Already part of automated QC algorithms
14. Density inversion	14. Hope to implement this as part of automated QC as level 2 products are produced
15. Grey list	15. Grey list? Not sure what this is
16. Gross salinity or temperature drift	16. Part of the multi-time scale quick look plot examination
17. Visual QC – not mandatory in real time	17. Weekly visual QC is mandatory
18. Frozen profile	18. Part of out of range test or stuck value test
19. Pressure not great than Deepest_Pressure = 10%	19. Pressure outliers identified in quick looks

Helpdesk

Questions about data, data access, and instrumentation:

help@oceanobservatories.org



Summary Review

- Much has been accomplished
  - Significant assets have been deployed at sea
  - All data coming ashore is being stored
  - OOI Net with Asset Management is deployed on the Production Server!
- Access points to the vast number of data products are growing
  - OceanObservatories.org website updated & continues to evolve
  - Graphical User Interface (GUI) with plotting enabled & continues to evolve
  - Essential Ocean Variables (EOVs) are being downloaded & stored for easy access
- Data Access will accelerate
  - Software Team is in place with a rapid feedback environment established
  - Data Evaluation Team is in place and seasoned
  - We seek community input – mechanisms are in place
  - We welcome community contributions – software, data, scientific synthesis