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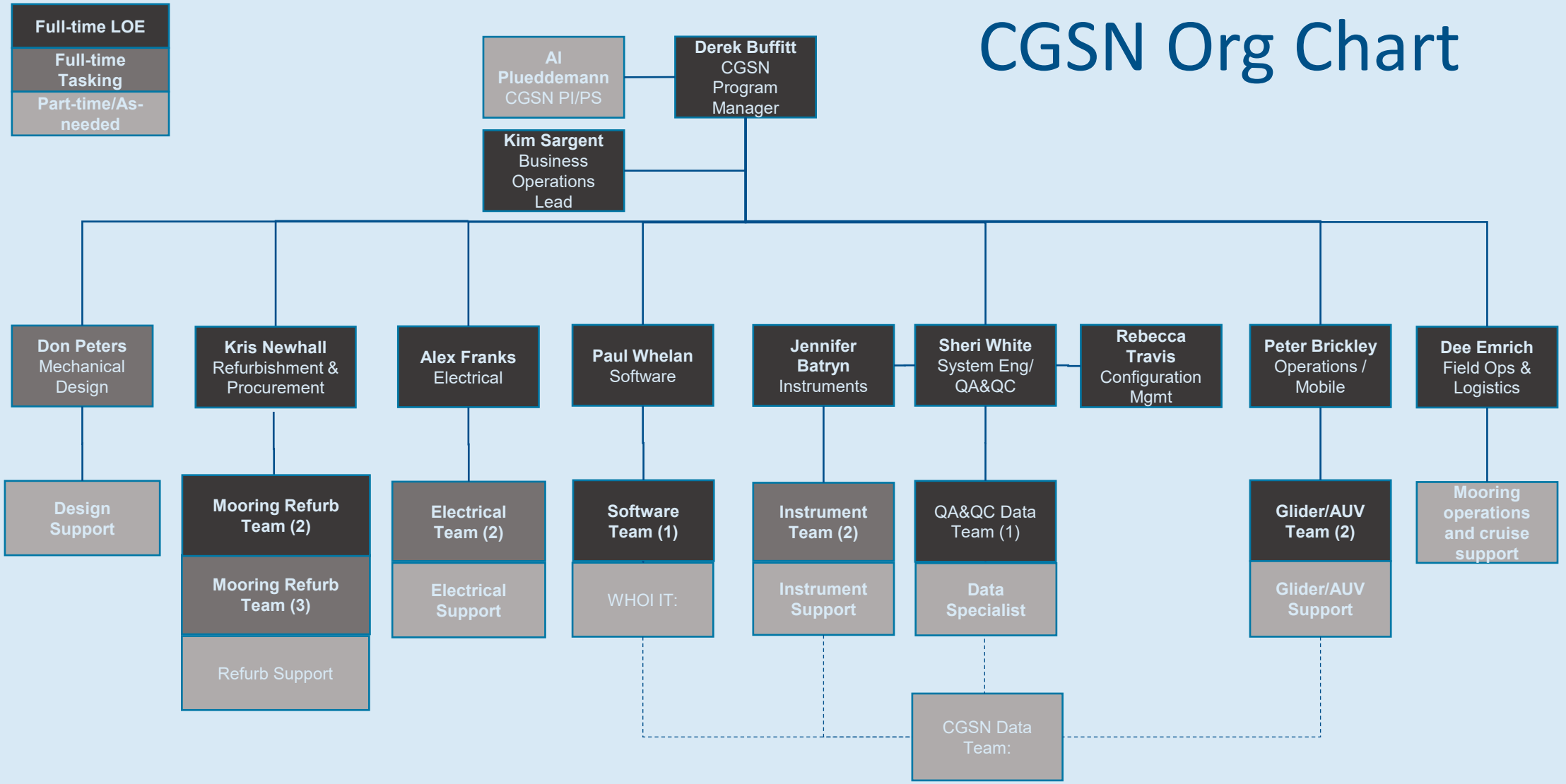
CGSN Arrays: Operational status, technical developments, and community science

Al Plueddemann, Derek Buffitt and the CGSN Team

OOIFB meeting, 6-8 May 2025

CGSN Org Chart



16 full-time staff, ~ 25 FTE overall

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Operations

Maintaining data flow from the OOI Arrays

CGSN Operations Overview

- CGSN field season, April – August, three array-service cruises:
  - Pioneer (complete), 28 Mar – 20 Apr
  - Papa: 19 May – 4 Jun.
  - Irminger: 18 Jul – 8 Aug

- CGSN baseline: 17 moorings, 10 glider lines, 2 AUV lines and ~350 instruments.

- Mooring infrastructure >80% operational

- Moored instruments >80% operational

CGSN Status by Array

Pioneer

- **Fall Pioneer canceled** - Armstrong propulsion repair
- **Spring Pioneer completed** 10 moorings turned, 4 gliders on site, dual AUV mission completed

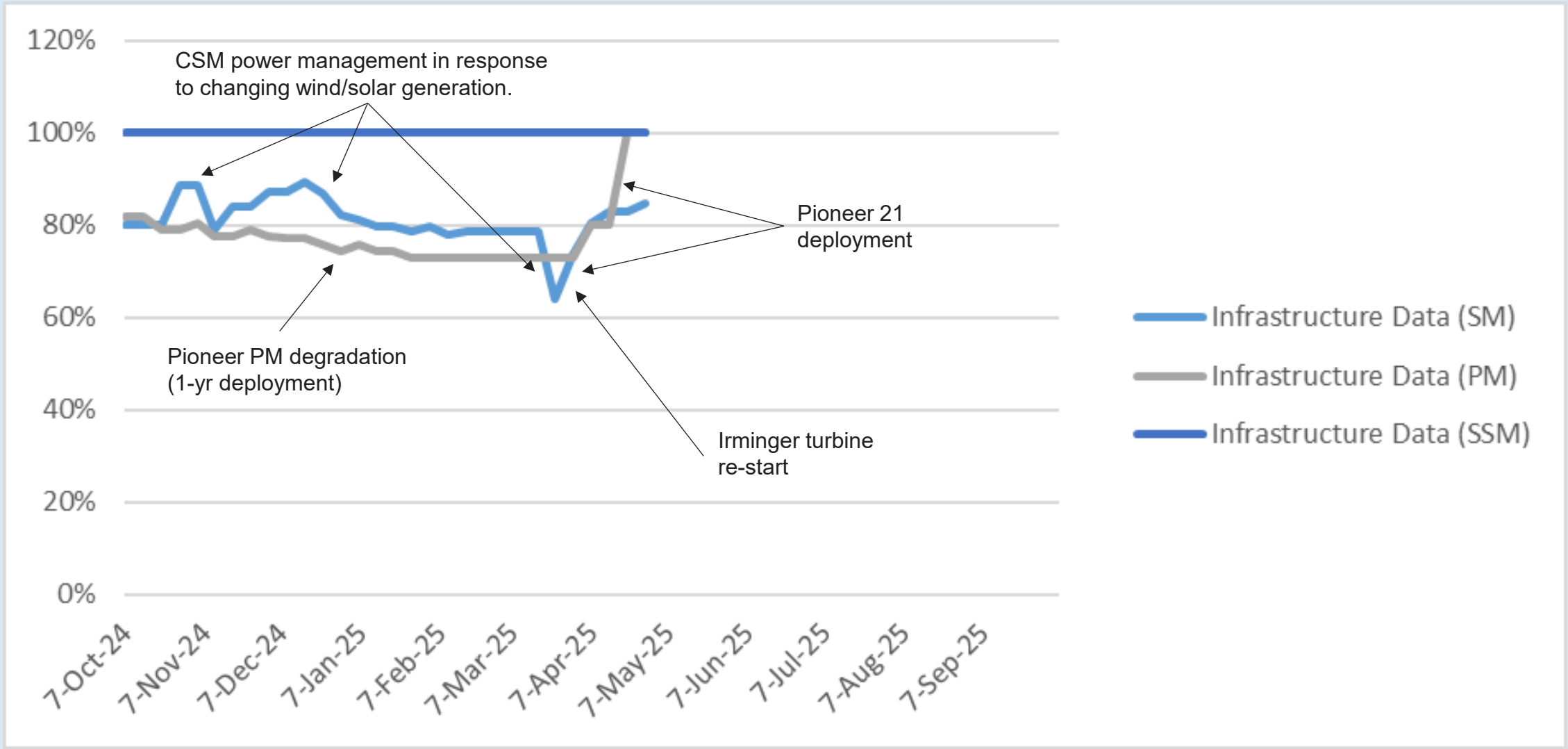
Papa

- **Papa 12 scheduled (May/June)**
- Science party departs for Seward AK next week
- Ancillary operations include PMEL surface mooring, UW/APL waverider mooring

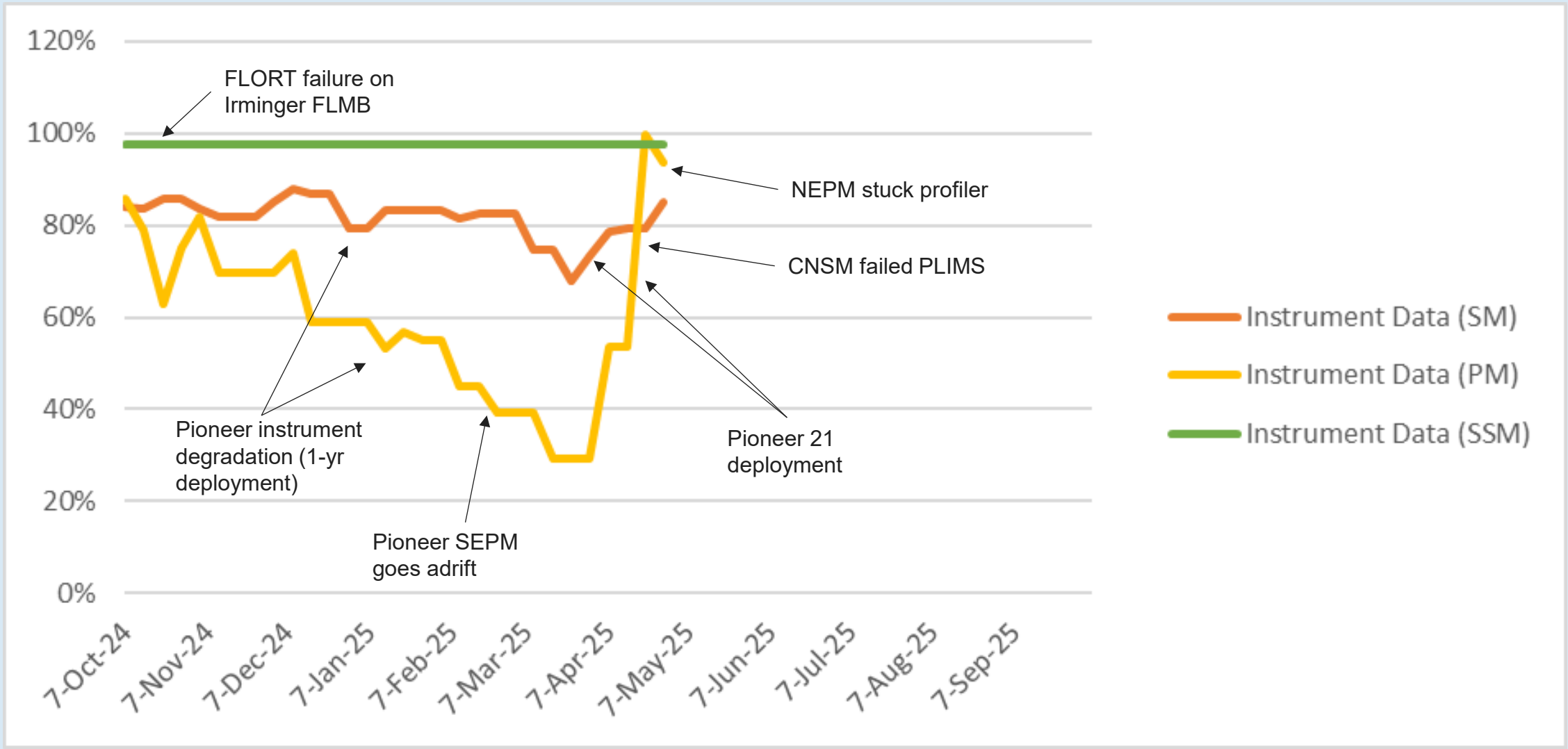
Irminger

- **Irminger 12 scheduled (July/Aug)**
- 2 x gliders in transit for recovery by alternate cruise
- Schedule uncertainty (Revelle propulsion repairs)

CGSN Mooring Status: Infrastructure

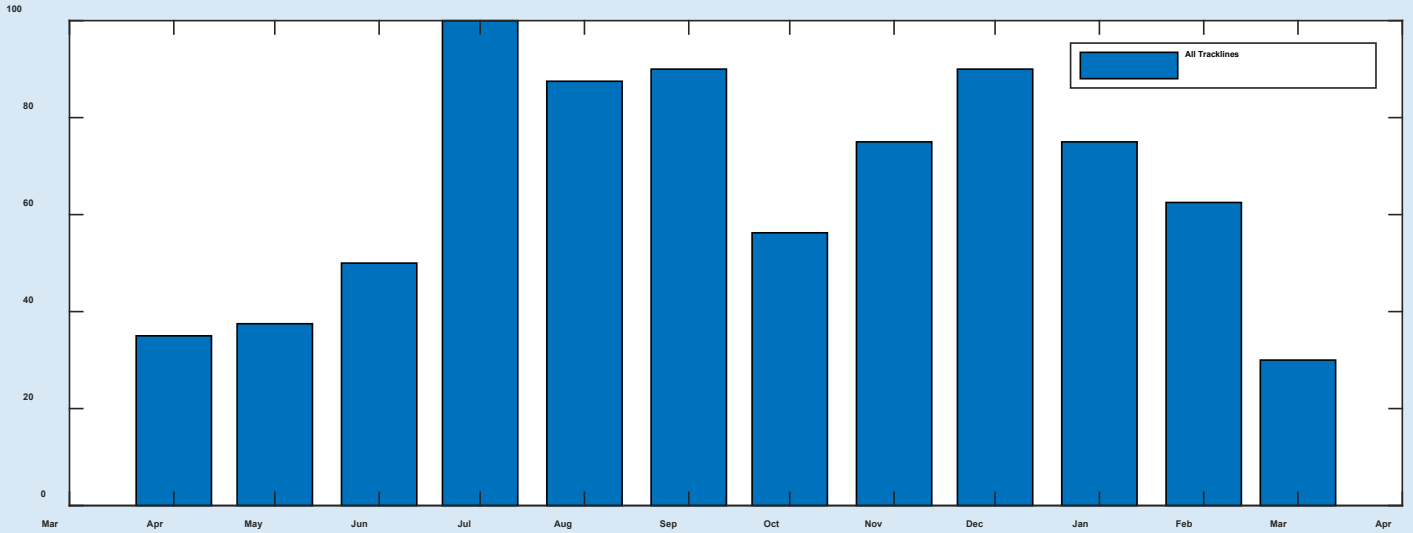


CGSN Mooring Status: Data Return



CGSN Glider Status: Pioneer MAB Statistics

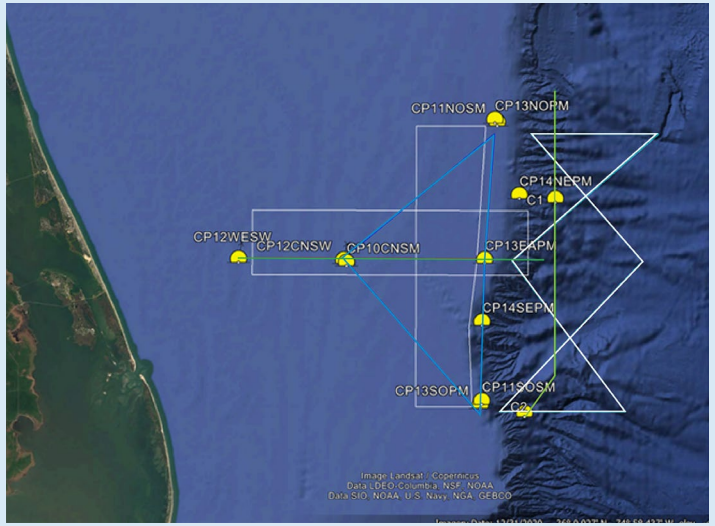
- Typically achieve 50-90% of the baseline in a given month*
  - High success for Moored Array and Offshore Mesoscale lines (80-90%)
  - Good success for Offshore Flux line (50-90%)
  - Cross-Shelf line very challenging to maintain



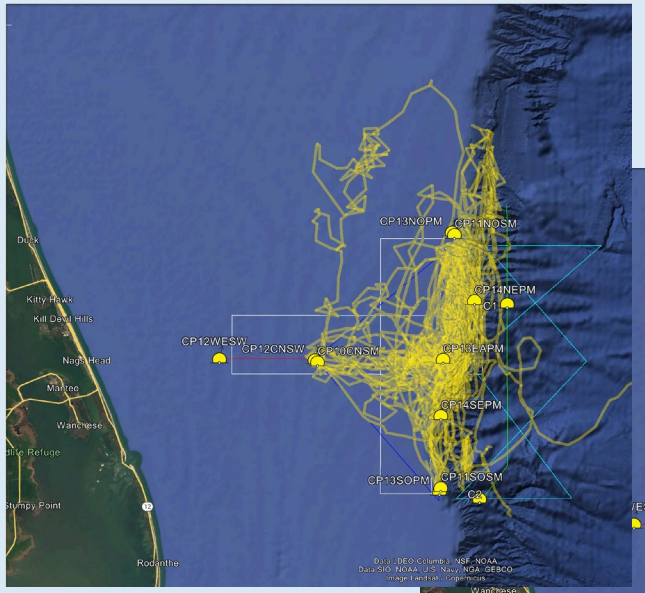
* Only counting “Science Days”, when instruments are operating

CGSN Glider Status: MAB Glider Line Occupancy

- Challenges:
  - Compact track lines
  - Shallow water
  - Depth transition
  - Strong currents
  - Density changes

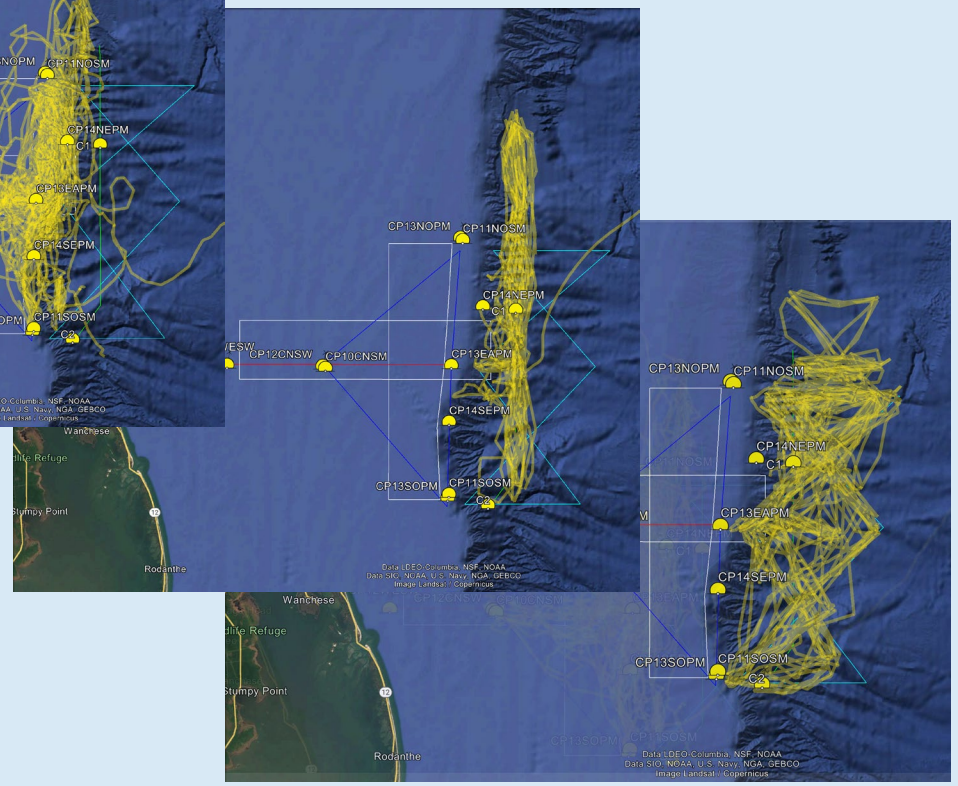


Glider and AUV track lines



Cross-Shelf and Moored Array Lines

Offshore Flux Line



Offshore Mesoscale Line

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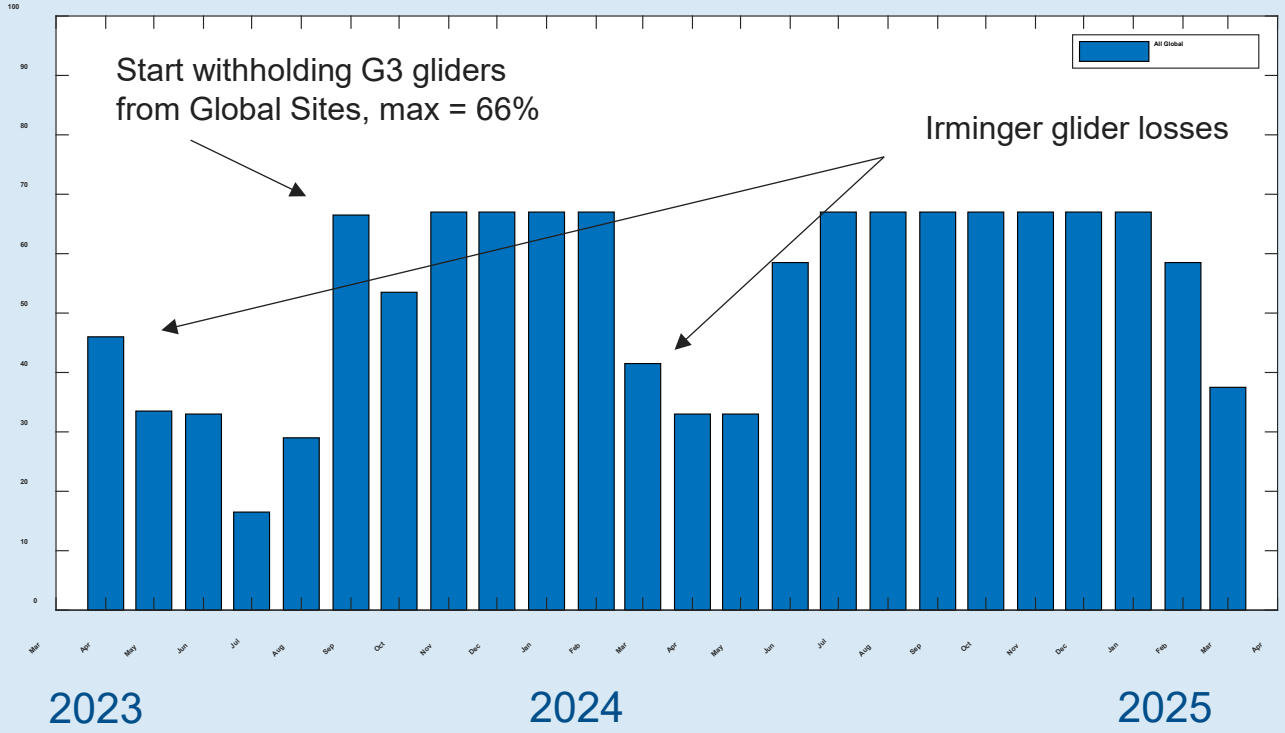
CGSN Glider Status: Global Site Statistics

- Typically achieving 40-60% of the baseline*
  - May-July: last 25% of Global deployment interval**
  - Irminger gliders lost: Mar 2023, Mar 2024



* Only counting “Science Days”, when instruments are operating

** Cruise schedules may result in 14 mo deployments for gliders with <= 12 mo duration

Technical Developments

Interpreted broadly. Includes: operations, mechanical and electrical design, instrument performance, vendor interactions, data science, data specialist and data ambassador

Technical Developments

Operations

- MAB glider ops w/Reed Meredith
- Global glider tests with Eric Hess
- AUV ops on R/V Virginia (SOO-LARS)
- Buoyant stretch hose deployment
- New wind turbine mount
- Tech refresh for solar panels

Instruments and data

- METBK wind speed assessment
- SPKIR in-air assessment
- ZPLSC sample interval timing
- PRESF sampling and telemetry
- ECO-V2 testing on Papa

Data Science

- Framework for adding DOIs to website
- Citation guidance for Platform DOIs
- Reorg of Community Tools & Data Sets
- Reorg of Raw Data Repo

Data Specialist/Data Ambassador

- OceanSITES, OceanOps, OceanGliders
- Engaging the BGC community
- Established Data Specialist office hours
- Collaboration w/Ocean Data Labs
- Attended METS-RCN meeting
- IFCB workshop planning
- AI/ML accessible ocean data WG

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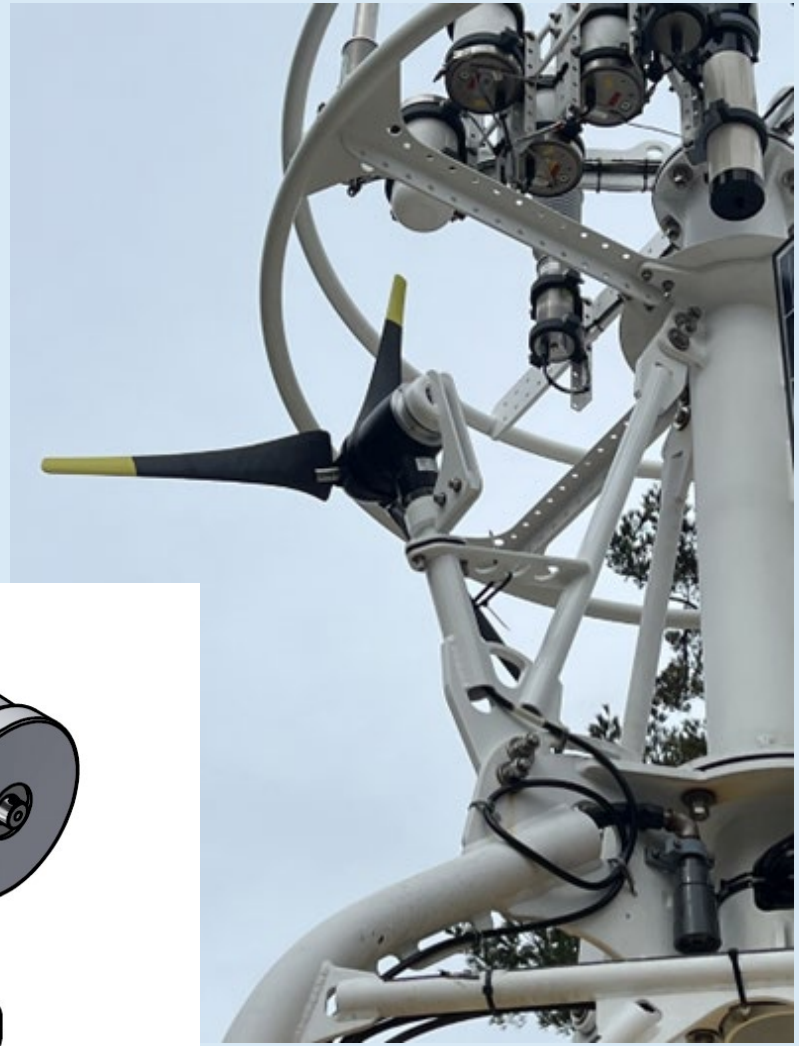
Operational Highlight

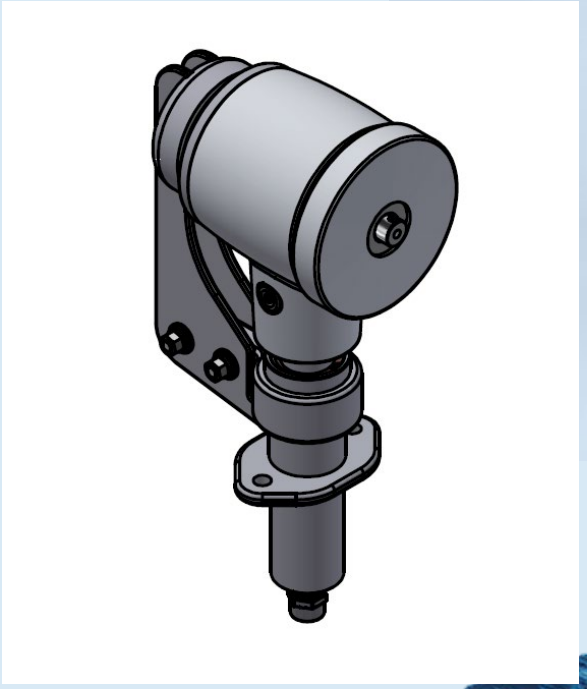
Upgraded Wind Turbine Mount

Damaged blades cause vibration leading to mount failure.

New mount increases stability and incorporates vibration dampening.

Test unit deployed on Pioneer, deployments planned for EA and Irminger





Instruments and Data Highlight

Seafloor Pressure Sensor (Pioneer MAB)

OOI Requirements: resolve LF (tidal) fluctuations

- SBE sensor: sample at 1 Hz, report average

Tech Refresh for Pioneer MAB

- Community request for HF data (infragravity waves)
- RBR sensor: sample at 2 Hz, but no averaging

CGSN development

- Acquire 2 Hz data from sensor
- Store and process on DCL
- Telemeter averaged data

SBE-26

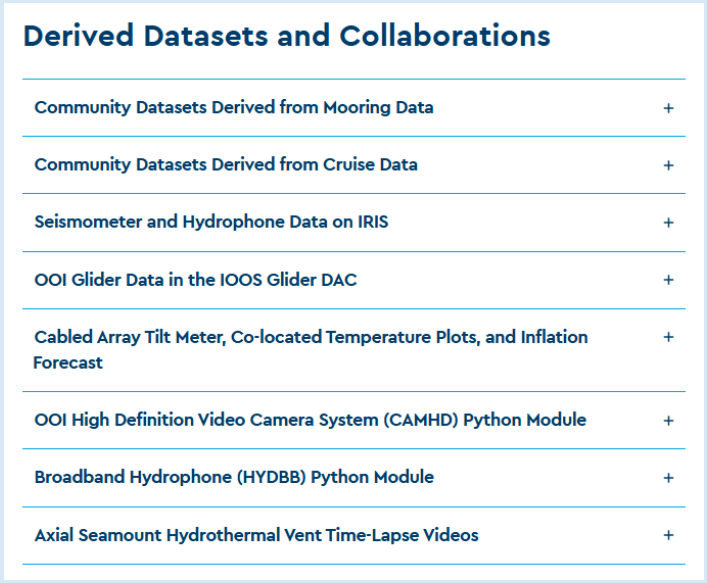
RBR

Data Science Highlight

Community Tools and Datasets

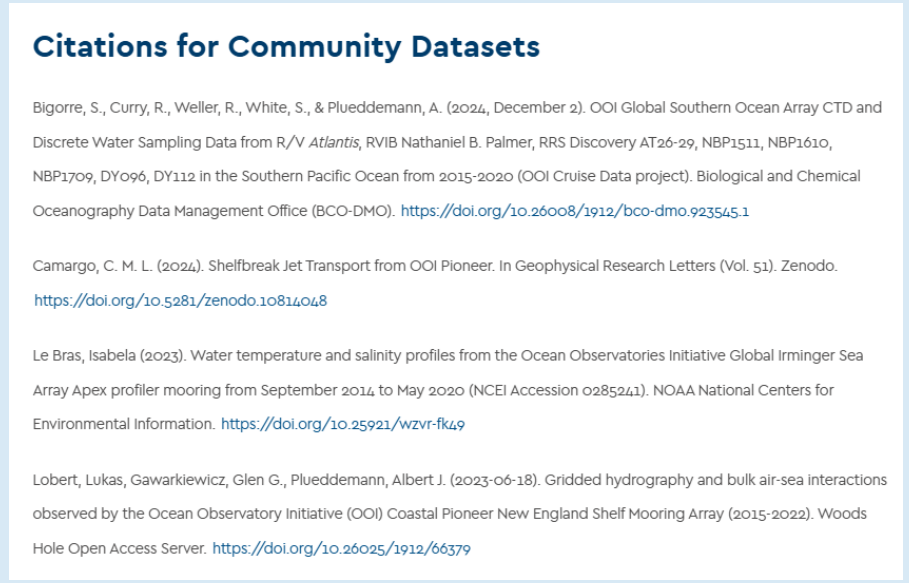
Before:

- Hard to find, confused organization



After:

- One level down from main page
- Organized as citations with DOI
- Includes request to contribute



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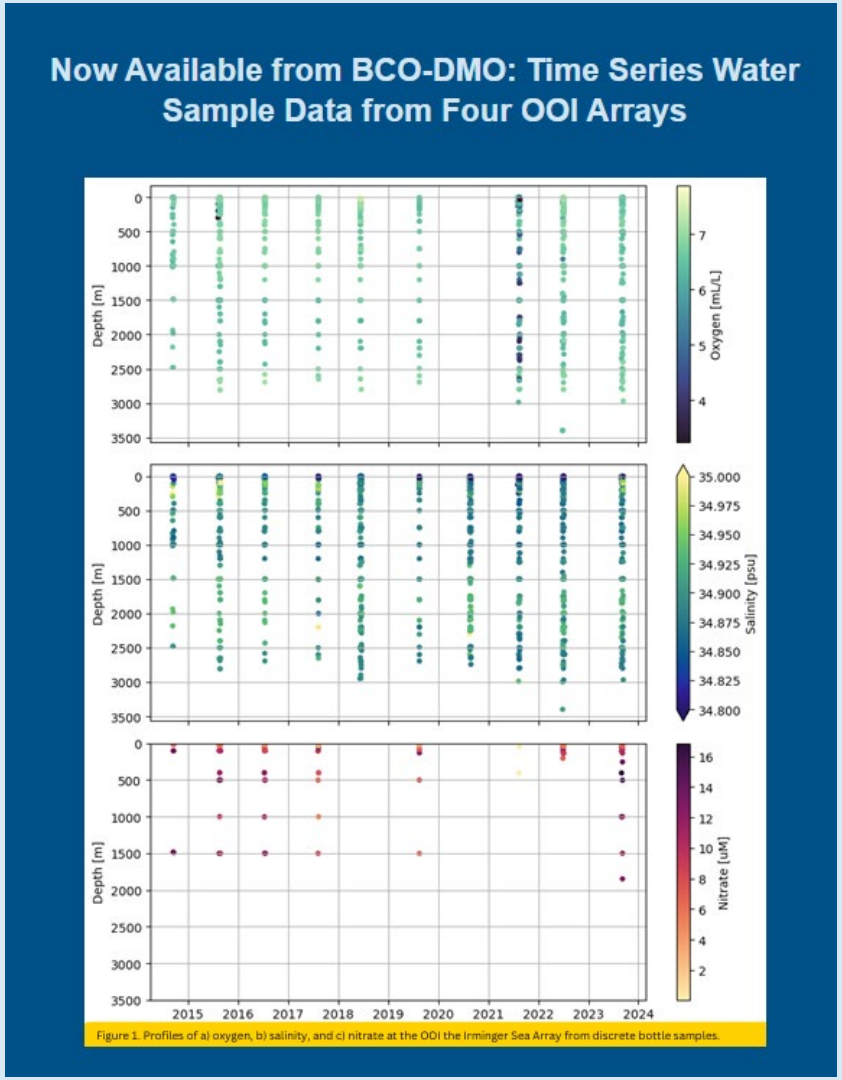
Data Specialist Highlight

Engaging the BGC Community

After 10 years, OOI shipboard bottle samples are a meaningful BGC time series

How to engage the BGC community?

- OOI data to BCO-DMO
- OOI participation in OCB workshop
- Demo: GitHub code and plots highlighting 10 years of Irminger Sea BGC samples
- Joint distribution of highlight article



Vendor Interactions

Standing meetings

- Seabird
- Teledyne
- Sunburst
- Nortek
- Aanderaa
- ASL
- Pro-Oceanus

Topic-based meetings

- Xeos (AIS)
- RBR (PRESF)
- SBE (CDOM, multiple meetings)
- Nortek (ADCPU)
- TWR (glider Iridium)
- Kadant (stretch hose)
- Salem-Republic (stretch hose)
- Nortek (compass cal)
- TWR (glider DVL)

Community Science

Breadth of disciplines and researchers; novel applications

Enabling Science: Examples from 2024 papers

Lead Author	Topic	Enabled by
Birchill et al. (UK)	Iron transport pathways	Southern Ocean site
Kohlman et al. (UW)	Marine heat wave	Papa subsurface moorings
Cuevas (BC)	Carbon flux (MS Thesis)	Irminger profiler mooring
De Jong et al. (NIOZ)	Wind and deep convection	Irminger profiler mooring
Nickford et al. (URI)	CO2 flux from Saildrones	Pioneer air-sea fluxes
Stevens et al. (WHOI)	Plankton community structure	Pioneer LTER sampling
Camargo et al. (WHOI)	Sea level rise	Pioneer velocity profiles
Coe et al. (DOE)	WEC design	Pioneer surface moorings

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Questions?