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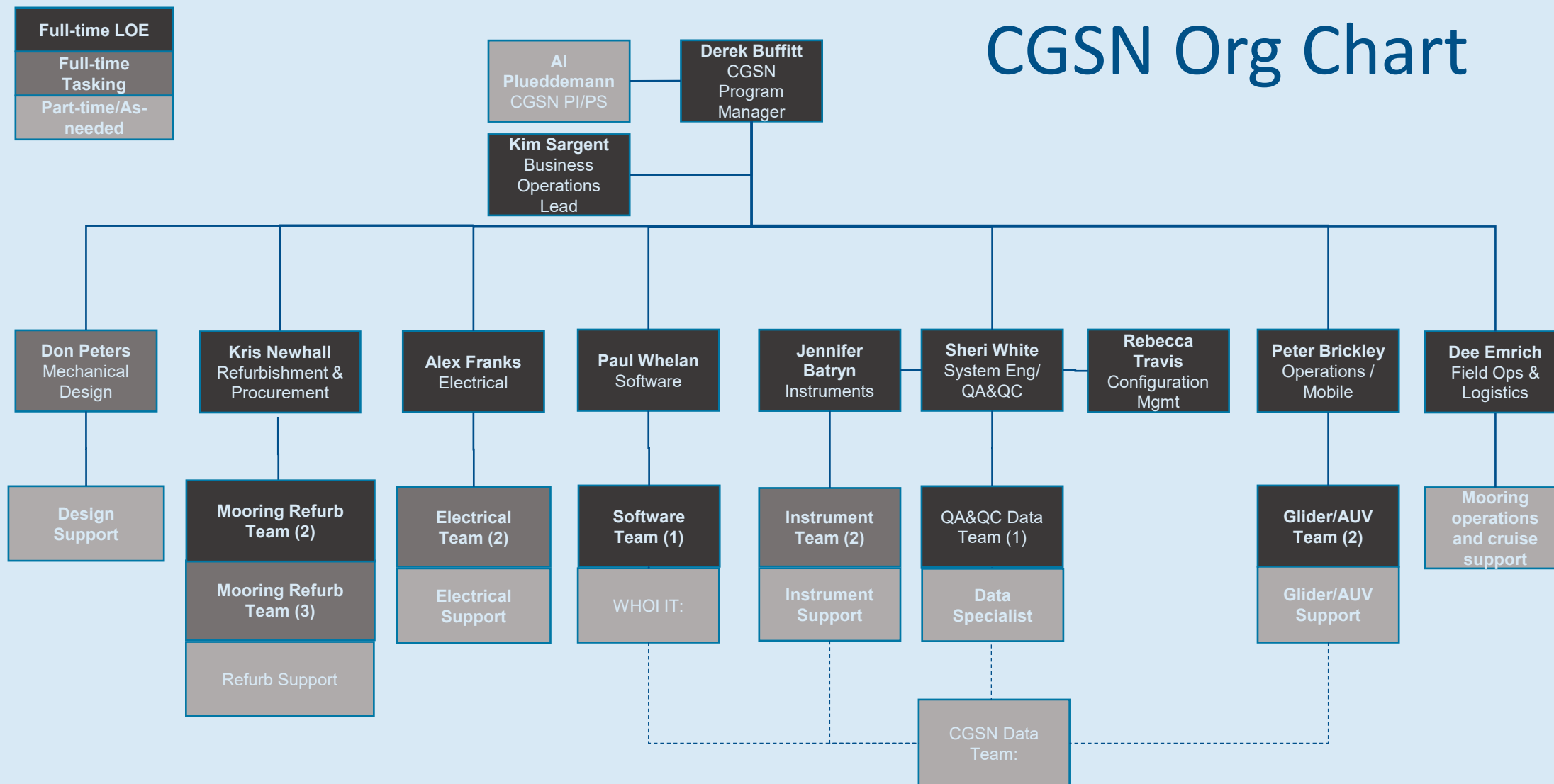
# CGSN Arrays: Operational status, technical developments, and community science

Al Plueddemann, Derek Buffitt and the CGSN Team  
OOIFB meeting, 6-8 May 2025





# CGSN Org Chart



16 full-time staff, ~ 25 FTE overall



# Operations

Maintaining data flow from the OOI Arrays



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# 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

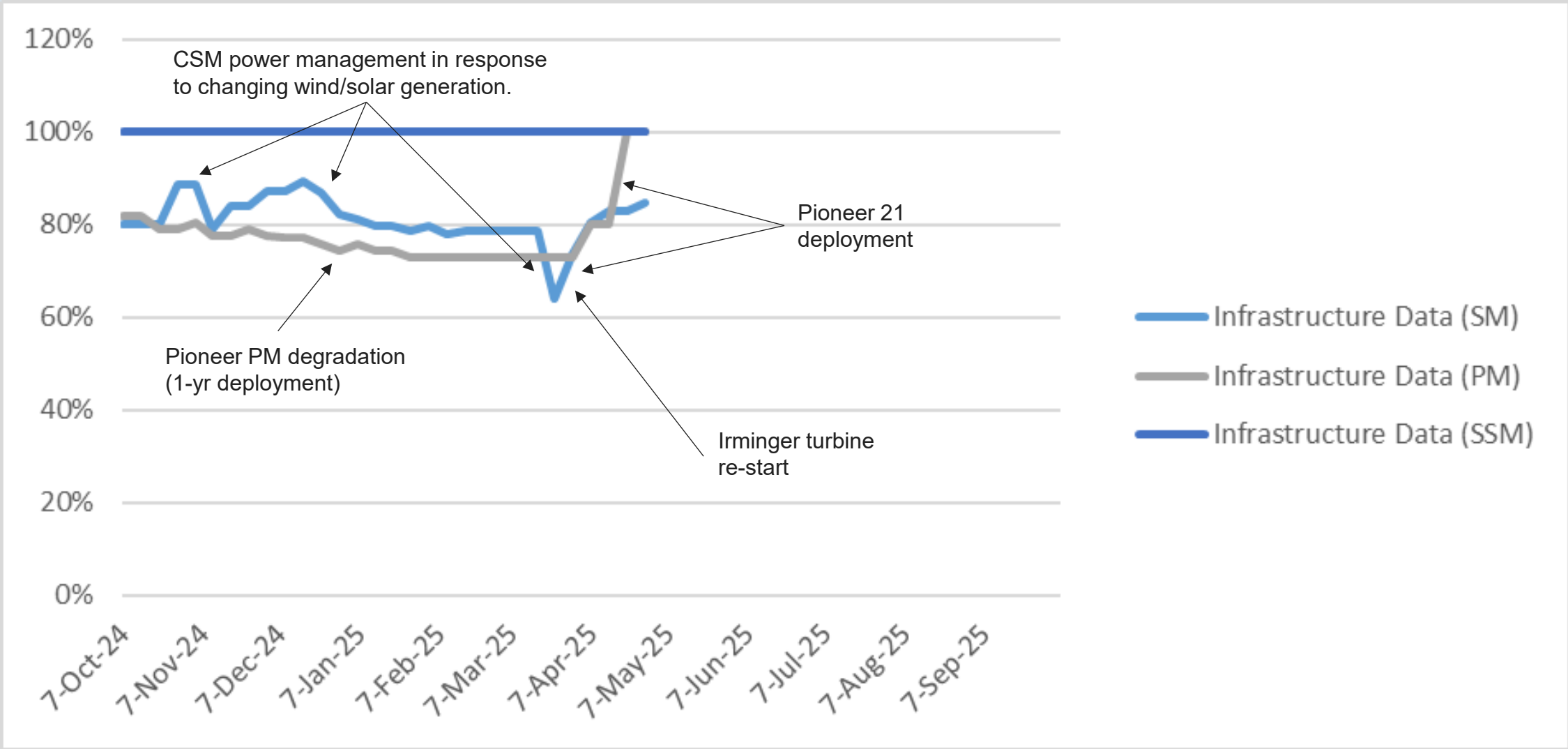
- **Papa 12 scheduled (May/June)**
- Science party departs for Seward AK next week
- Ancillary operations include PMEL surface mooring, UW/APL waverider mooring

## Irminger

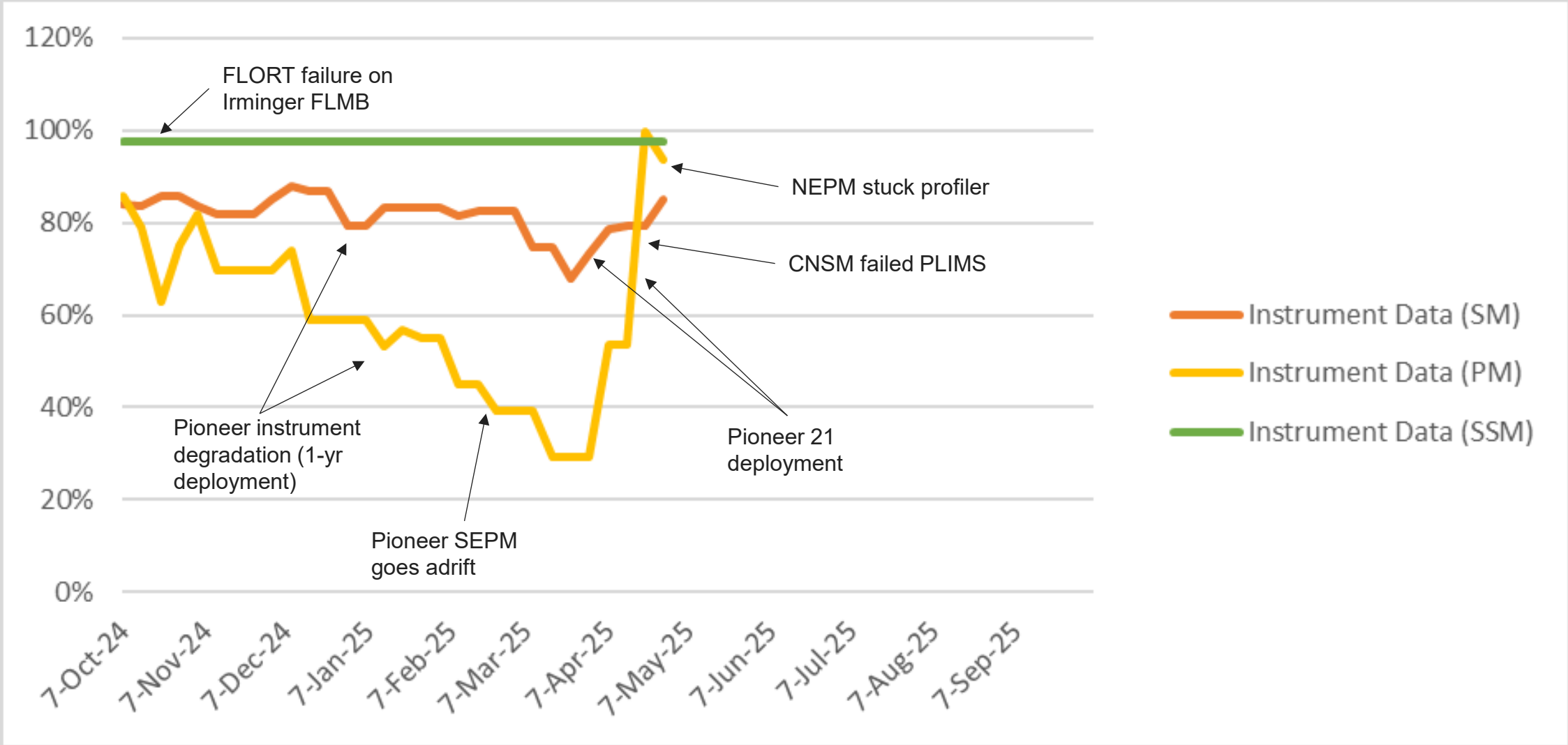
- **Irminger 12 scheduled (July/Aug)**
- 2 x gliders in transit for recovery by alternate cruise
- Schedule uncertainty (Revelle propulsion repairs)



# CGSN Mooring Status: Infrastructure

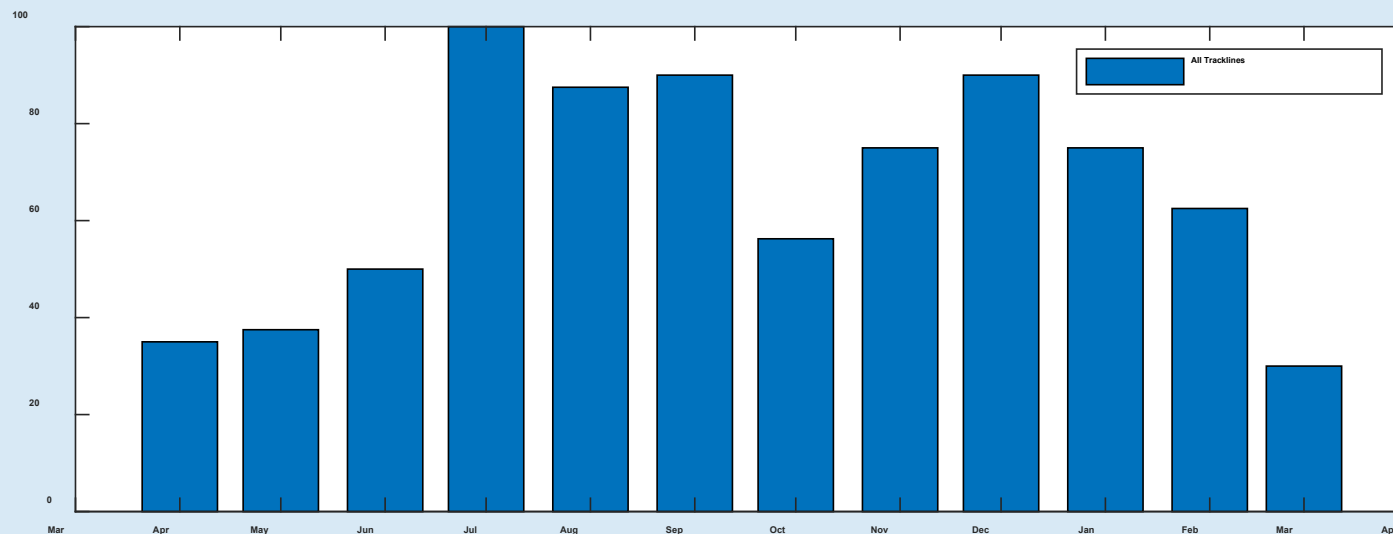


# CGSN Mooring Status: Data Return



# CGSN Glider Status: Pioneer MAB Statistics

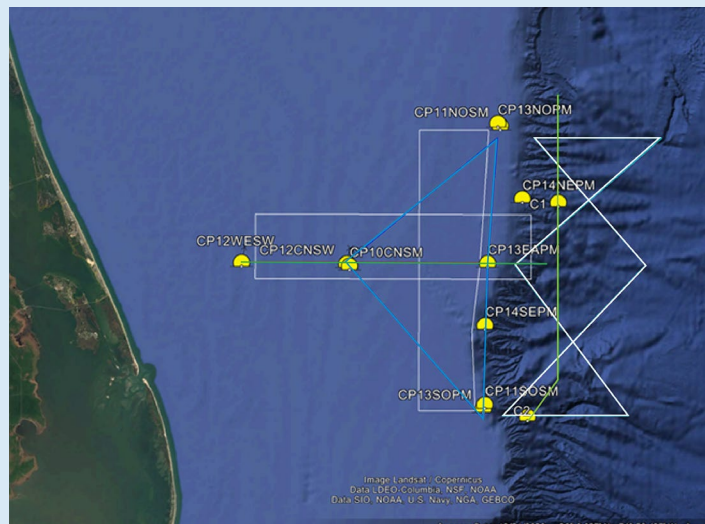
- Typically achieve 50-90% of the baseline in a given month\*
  - High success for Moored Array and Offshore Mesoscale lines (80-90%)
  - Good success for Offshore Flux line (50-90%)
  - Cross-Shelf line very challenging to maintain



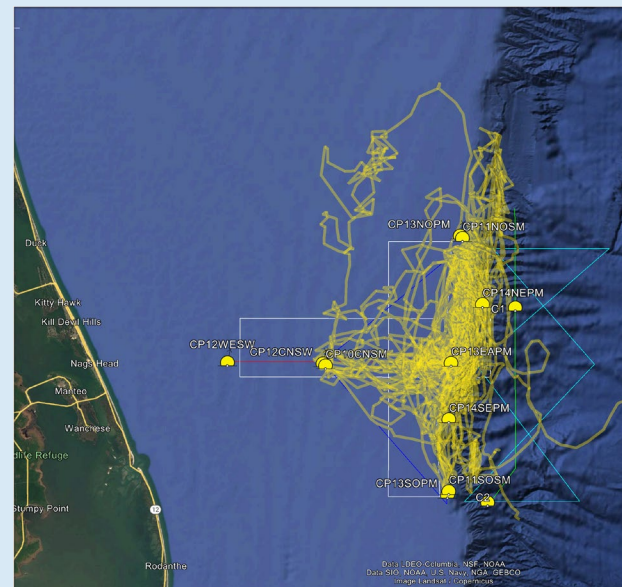
\* Only counting “Science Days”, when instruments are operating

# CGSN Glider Status: MAB Glider Line Occupancy

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

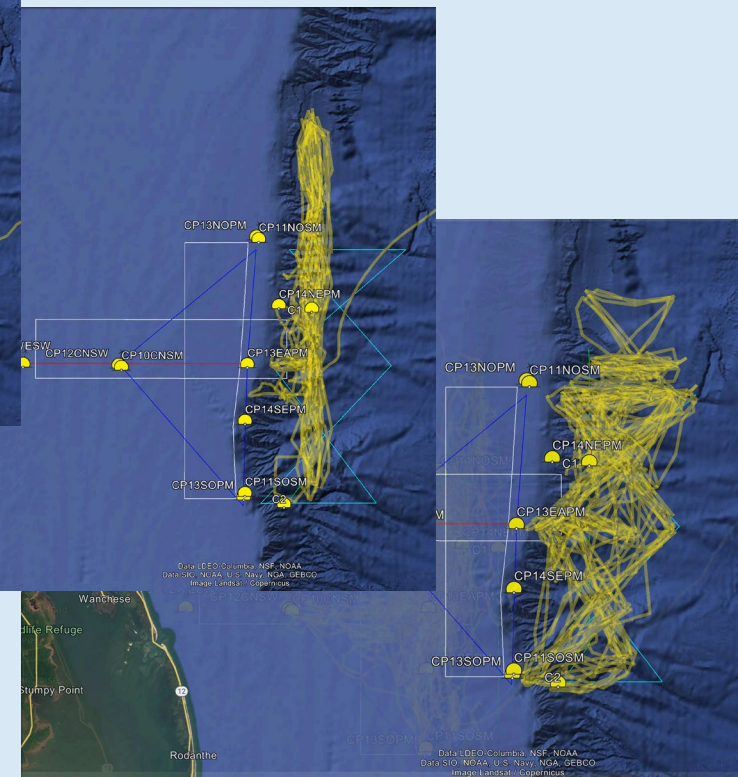


Glider and AUV track lines



Cross-Shelf and Moored Array Lines

Offshore Flux Line

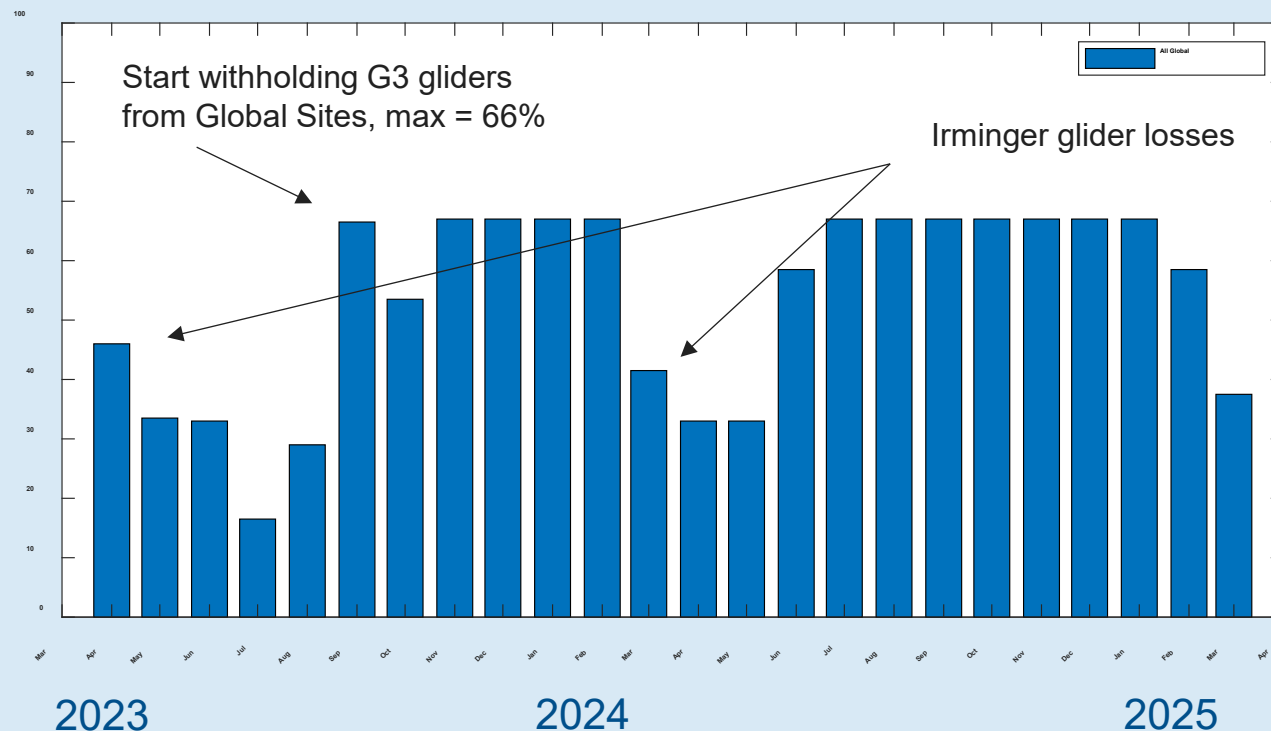


Offshore Mesoscale Line



# 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  $\leq 12$  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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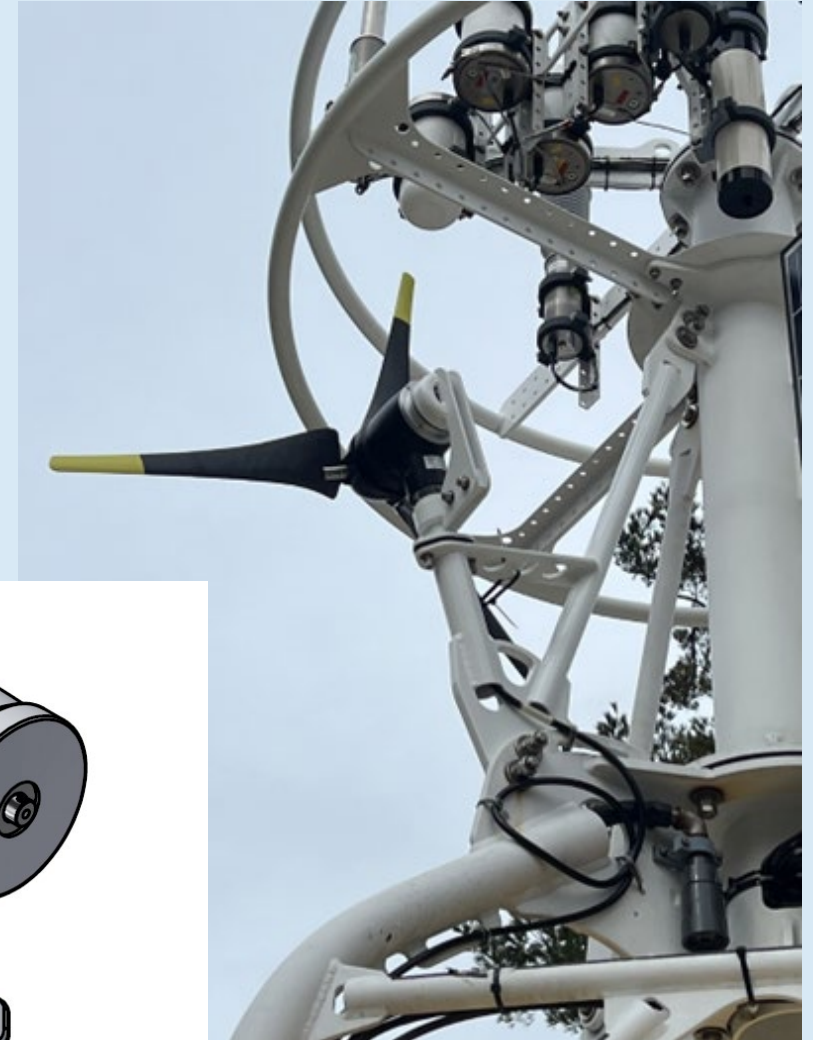
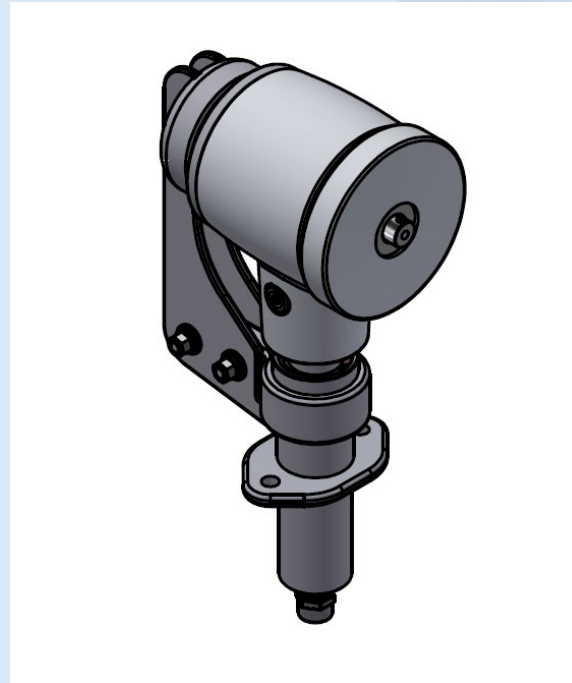
# Operational Highlight

## 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

### Derived Datasets and Collaborations

Community Datasets Derived from Mooring Data	+
Community Datasets Derived from Cruise Data	+
Seismometer and Hydrophone Data on IRIS	+
OOI Glider Data in the IOOS Glider DAC	+
Cabled Array Tilt Meter, Co-located Temperature Plots, and Inflation Forecast	+
OOI High Definition Video Camera System (CAMHD) Python Module	+
Broadband Hydrophone (HYDBB) Python Module	+
Axial Seamount Hydrothermal Vent Time-Lapse Videos	+

After:

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

### Citations for Community Datasets

Bigorre, S., Curry, R., Weller, R., White, S., & Plueddemann, A. (2024, December 2). OOI Global Southern Ocean Array CTD and Discrete Water Sampling Data from R/V *Atlantis*, RVIB Nathaniel B. Palmer, RRS Discovery AT26-29, NBP1511, NBP1610, NBP1709, DY096, DY112 in the Southern Pacific Ocean from 2015-2020 (OOI Cruise Data project). Biological and Chemical Oceanography Data Management Office (BCO-DMO). <https://doi.org/10.26008/1912/bco-dmo.923545.1>

Camargo, C. M. L. (2024). Shelfbreak Jet Transport from OOI Pioneer. In Geophysical Research Letters (Vol. 51). Zenodo. <https://doi.org/10.5281/zenodo.10814048>

Le Bras, Isabela (2023). Water temperature and salinity profiles from the Ocean Observatories Initiative Global Irminger Sea Array Apex profiler mooring from September 2014 to May 2020 (NCEI Accession 0285241). NOAA National Centers for Environmental Information. <https://doi.org/10.25921/wzvr-fk49>

Lober, Lukas, Gawarkiewicz, Glen G., Plueddemann, Albert J. (2023-06-18). Gridded hydrography and bulk air-sea interactions observed by the Ocean Observatory Initiative (OOI) Coastal Pioneer New England Shelf Mooring Array (2015-2022). Woods Hole Open Access Server. <https://doi.org/10.26025/1912/66379>



# 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

Now Available from BCO-DMO: Time Series Water Sample Data from Four OOI Arrays

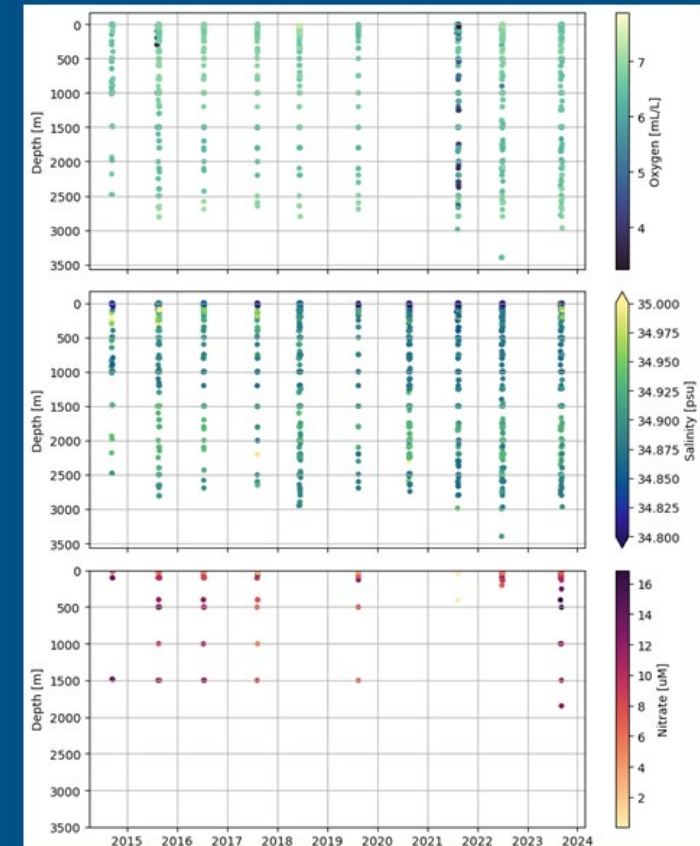


Figure 1. Profiles of a) oxygen, b) salinity, and c) nitrate at the OOI the Irminger Sea Array from discrete bottle samples.

# 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



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# 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?

