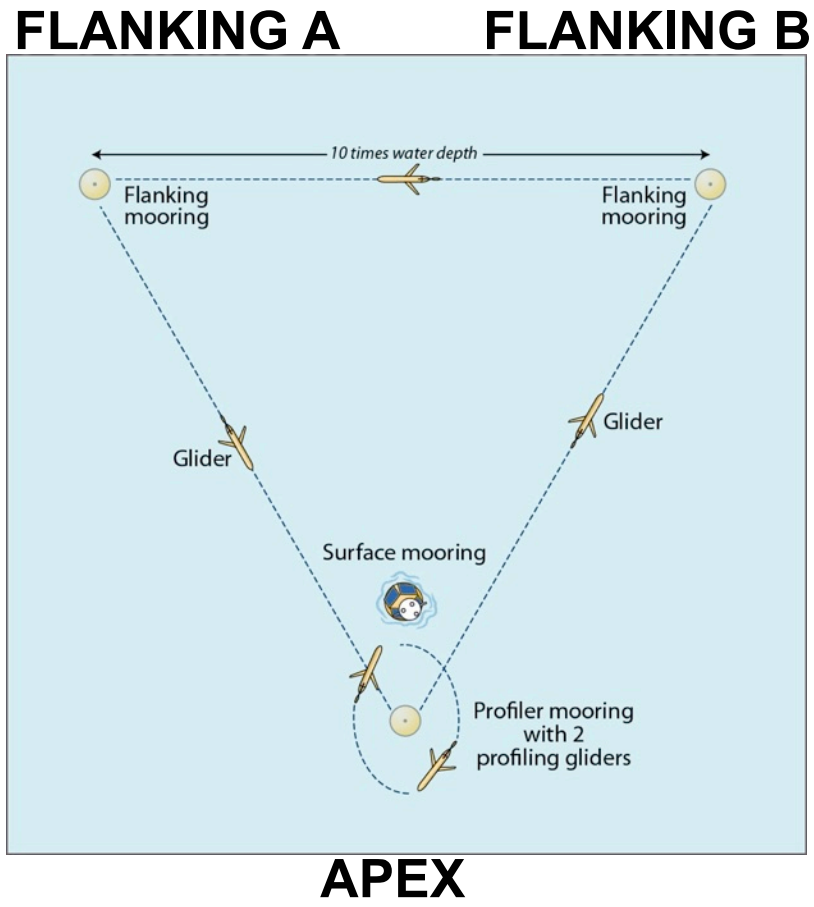
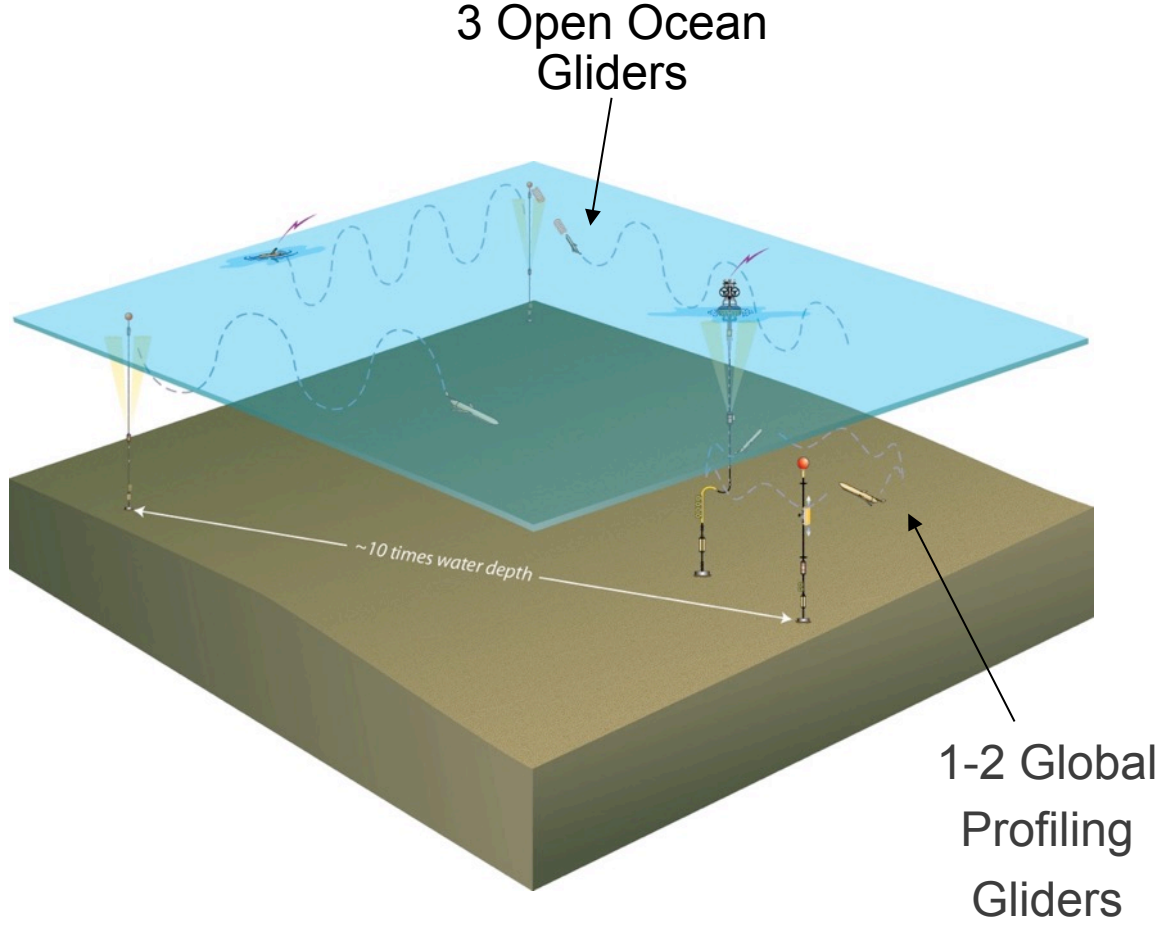
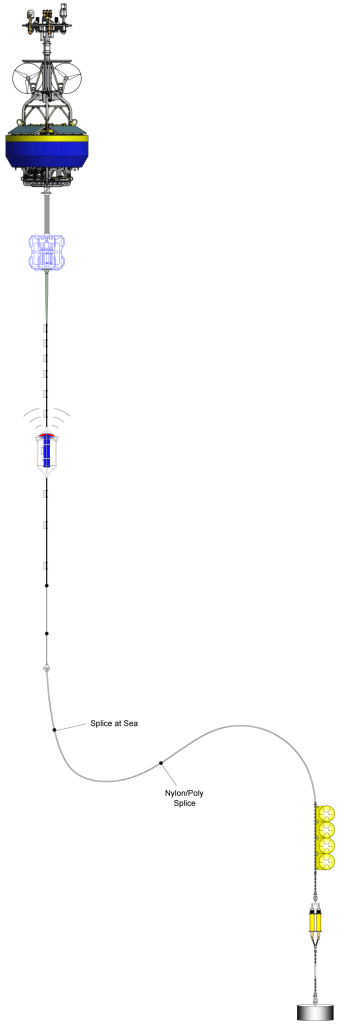
Global Array Configuration





http://oceanobservatories.org/array/global-argentine-basin/

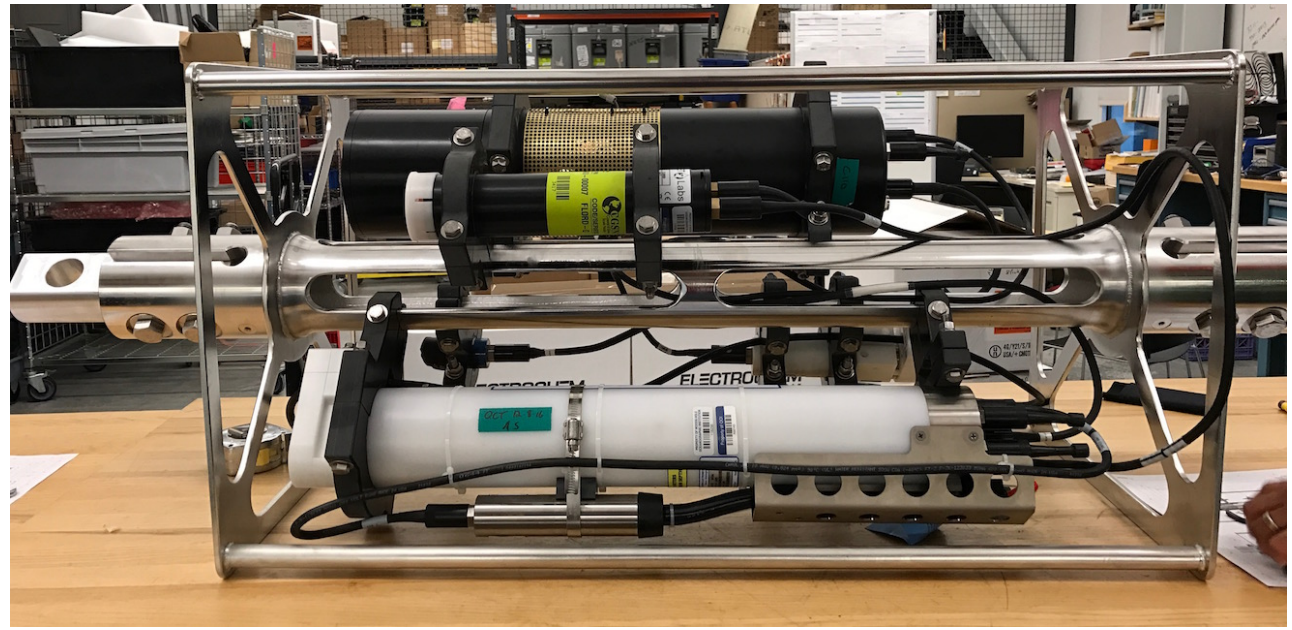
Global Surface Mooring



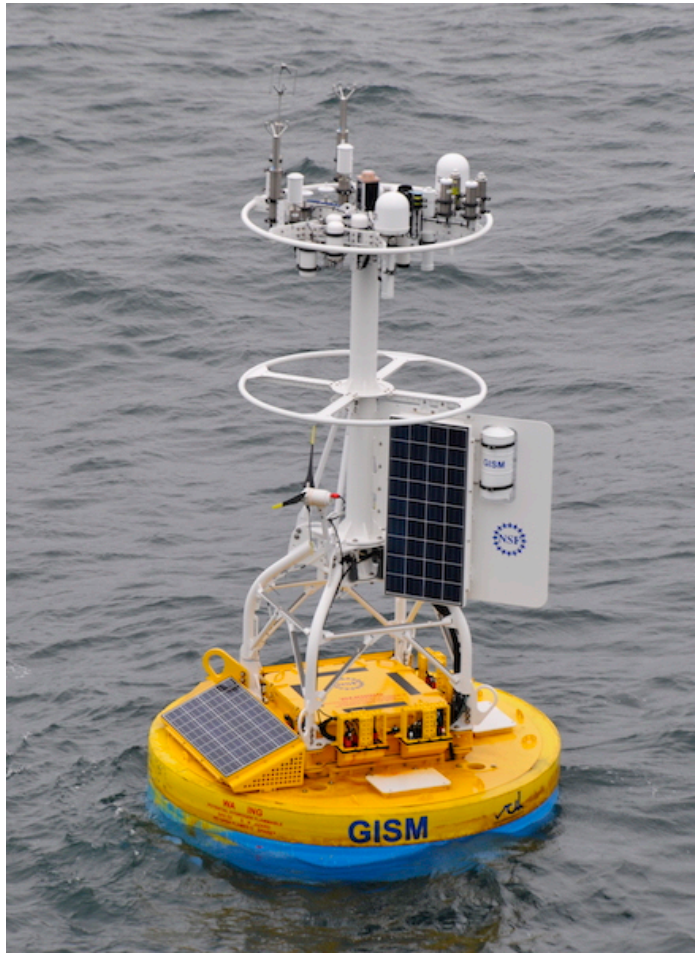
Sub-System	Global Surafce Mooring Configuration
Surface Buoy	Global Surface Buoy
Platform Control	CPM/DCL Controller
Telemetry	Fleet BroadBand (2), Iridium 9522 (2), Iridium SBD (2), Freewave (2), Wi-Fi, inductive modem, acoustic modem
Power System	Wind Turbines (2), Solar Panels (4), Rechargeable Batteries
Mooring Riser	EM Chain, NSIF, Inductive Wire, Inline Frames, Acoustic Release, Anchor
Instruments *(43 total)*	**Buoy:** METBK (2), FDCHP, SPKIR, PCO2A, WAVSS, OPTAA, FLORT, NUTNR, DOSTA **NSIF:** CTDBP, VELPT, FLORT, DOSTA, OPTAA, NUTNR, PCO2W, SPKIR **Inductive Wire:** CTDMO (10), CTDBP (3), DOSTA (3), FLORD (3), PCO2W (3), PHSEN (2), ADCPS

Global Surface Mooring

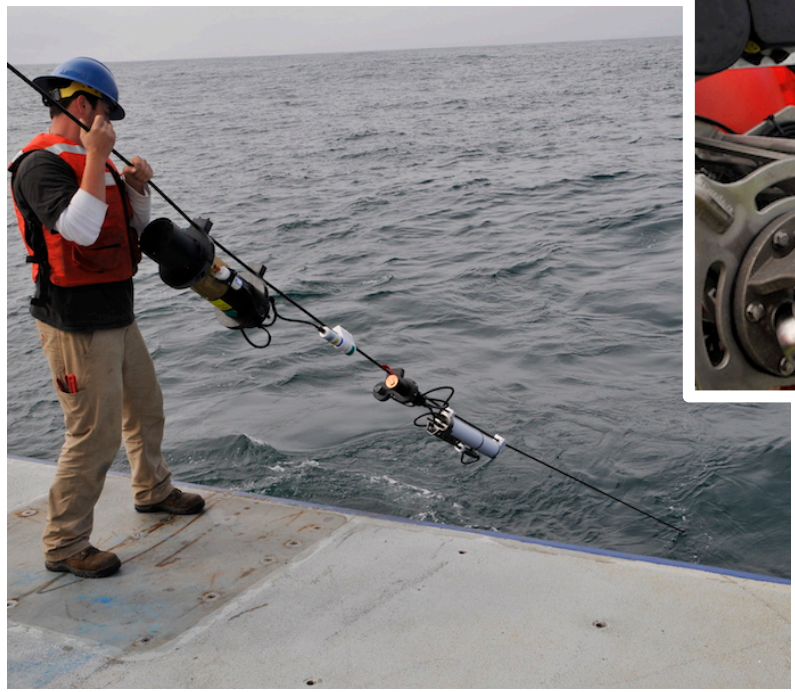
- Modifications to the baseline
  - Additional instruments added as a part of Global Surface Piercing Profiler (GSPP) Plan B
    - To buoy bottom and tower
    - To Near Surface Instrument Frame
    - At 40, 80 and 130 m on the mooring riser
  - Inline instrument frames being added for instrument clusters at 40, 80 and 130 m

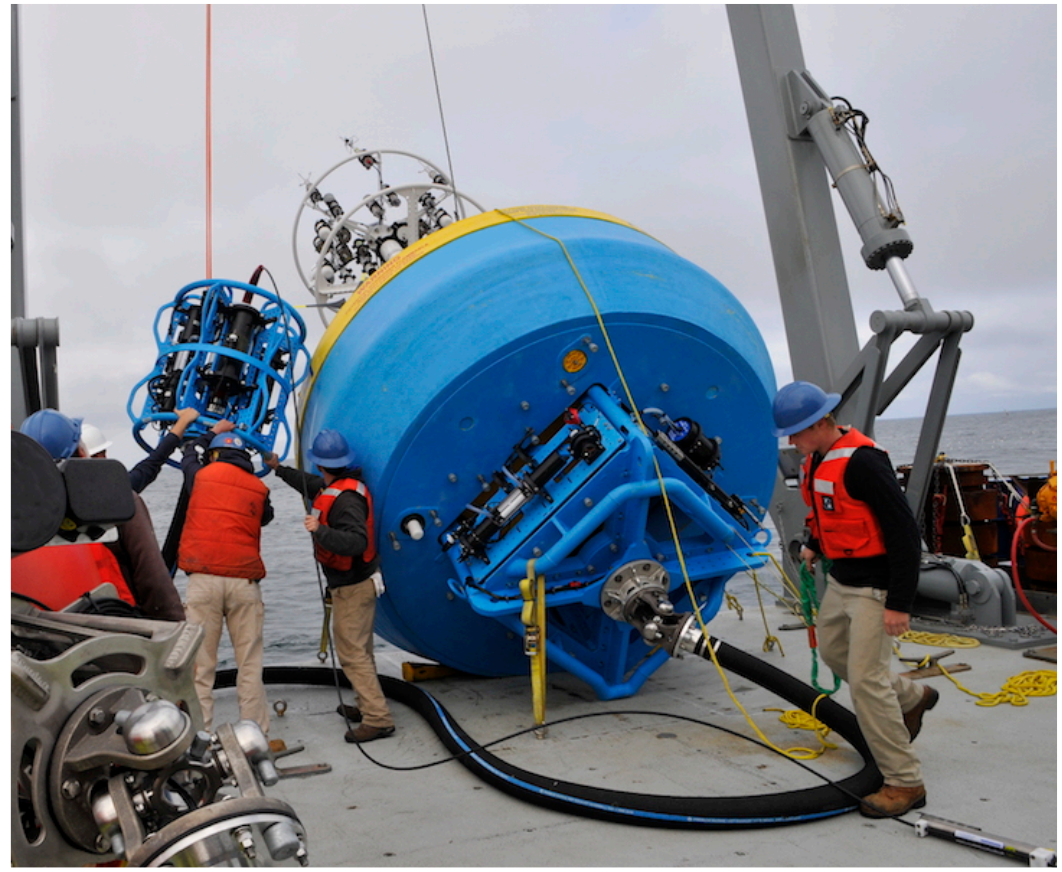


Global Surface Mooring



- Power and Comms same as Coastal Surface Moorings





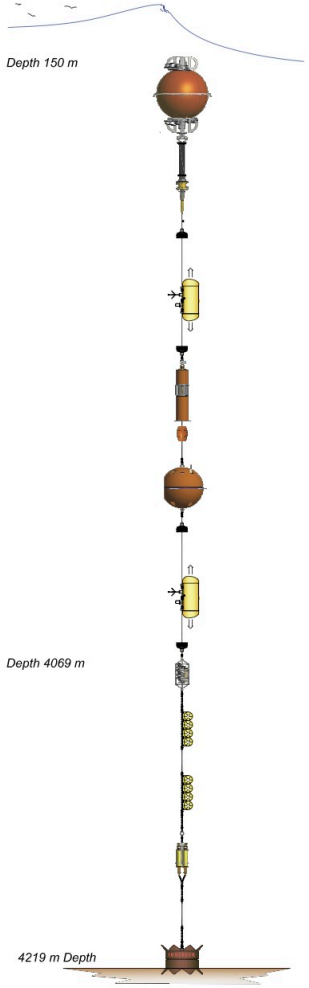
- No power transmitted below the NSIF
- Only inductive communications below the NSIF

Global Surface Mooring

- Additional instruments can be mounted in the following locations
  - On the surface buoy (tower or bottom frame)
  - On the Near Surface Instrument Frame (~15 m depth)
  - Clamped on the inductive line (down to 1500 m depth)
  - In the ADCP frame at 500 m
  - ✦ Anything mounted below 1500 m will not have inductive comms

NOTE: Addition of instruments in any location requires reanalysis of mooring design due to added weight/drag

Global Profiler Mooring



Sub-System	Global Profiler Mooring Configuration
Platform Control	Main Controller in lower cage
Telemetry	Inductive modem Acoustic modem (data to shore via glider)
Power System	Primary Batteries
Mooring Riser	64” Sphere, Inductive Wire Rope, In-line Release, Mid-water Flotation Sphere, Inductive Wire Rope, Controller Cage, Glass Spheres, Acoustic Release, Anchor
Profiler	McLane Moored Profiler: 1 at Irminger, 2 at all other Arrays
Instruments *(7-11 total)*	CTDPF, DOSTA, FLORD, VEL3D on profiler(s) ZPLSG (2) mounted in 64” Sphere CTDMO mounted on inductive rope above WFP

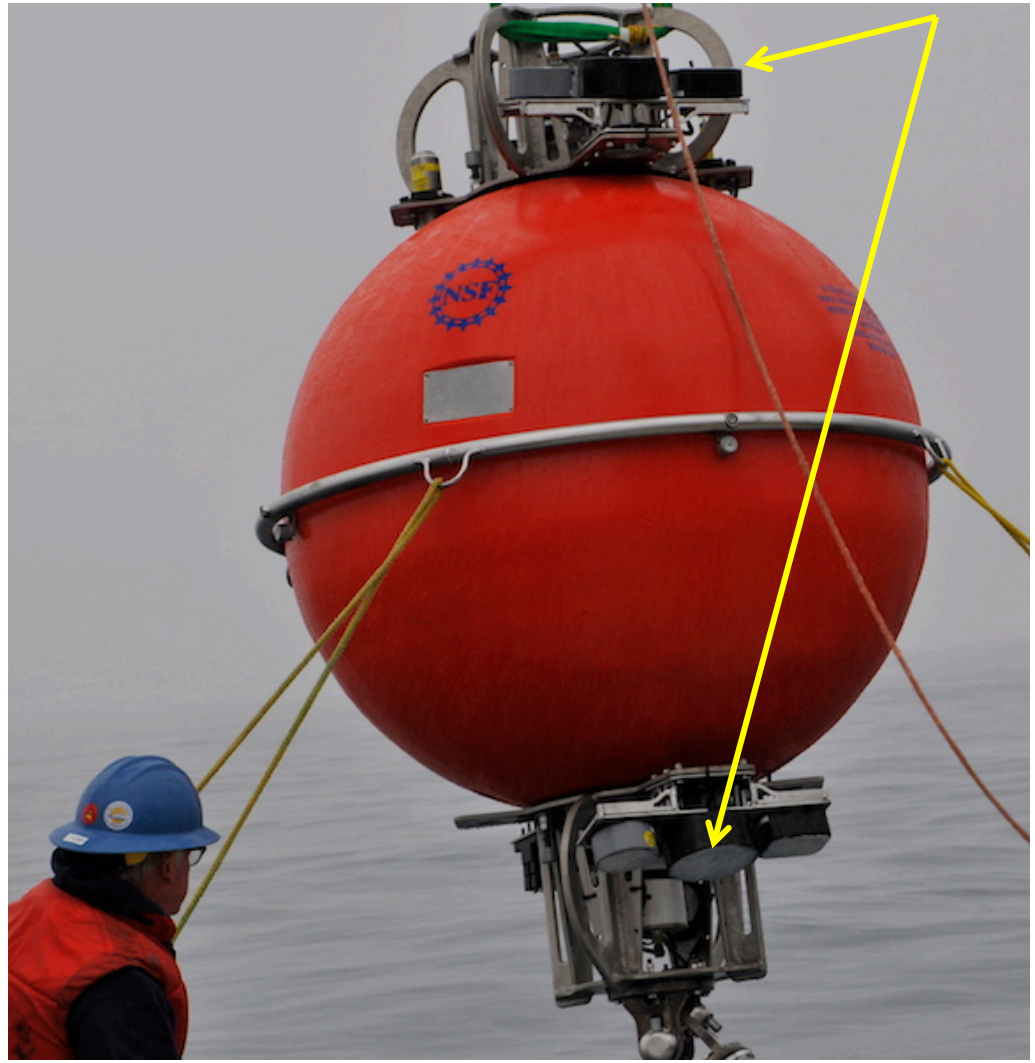
Global Profiler Mooring

- Modifications to the baseline
  - Removal of Global Surface Piercing Profiler (GSPP)
    - Instruments added to Global Surface Mooring, and Global Profiling Gliders added to profiler above Global Profiler Mooring
    - Primary data path changed from GSPP satellite telemetry, to acoustic telemetry with Open Ocean Gliders
  - Addition of an inductive CTDMO to the riser above the profiler(s)

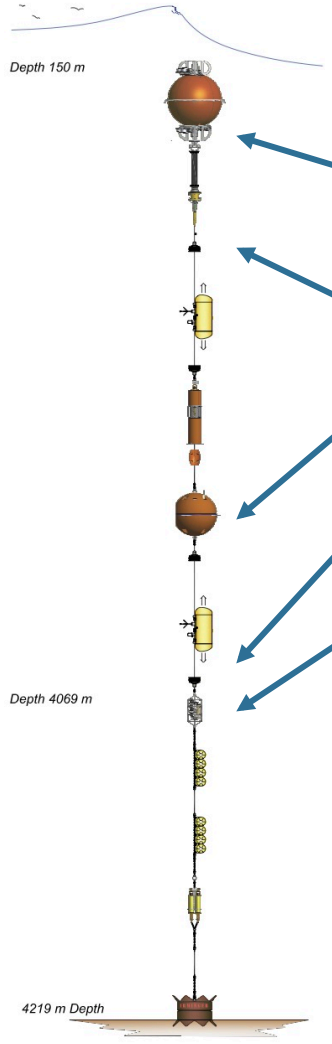
Global Profiler Mooring

- McLane Moored Profilers

- ZPLSG (bio-acoustic sonar)



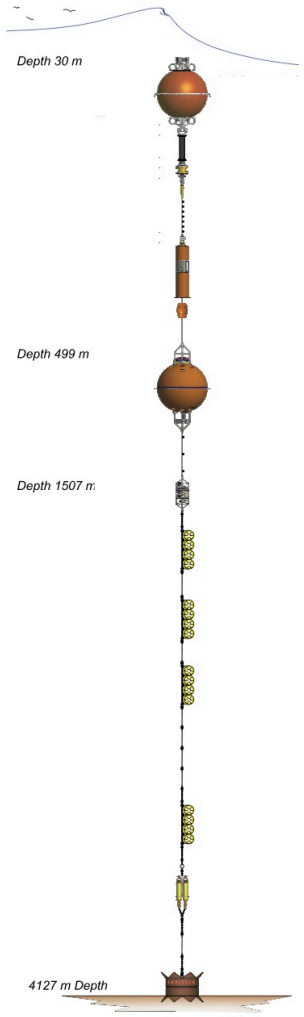
Global Profiler Mooring



- Instruments can be mounted in the following locations
  - On the upper 64” sphere (~150 m depth)
  - On the mid-water sphere
  - On the inductive line above the top profiler stop or below the bottom profiler stop
  - In the Controller Cage
- Adding instrumentation to the profilers would require a design change by McLane

NOTE: Addition of instruments in any location requires reanalysis of mooring design due to added weight/drag

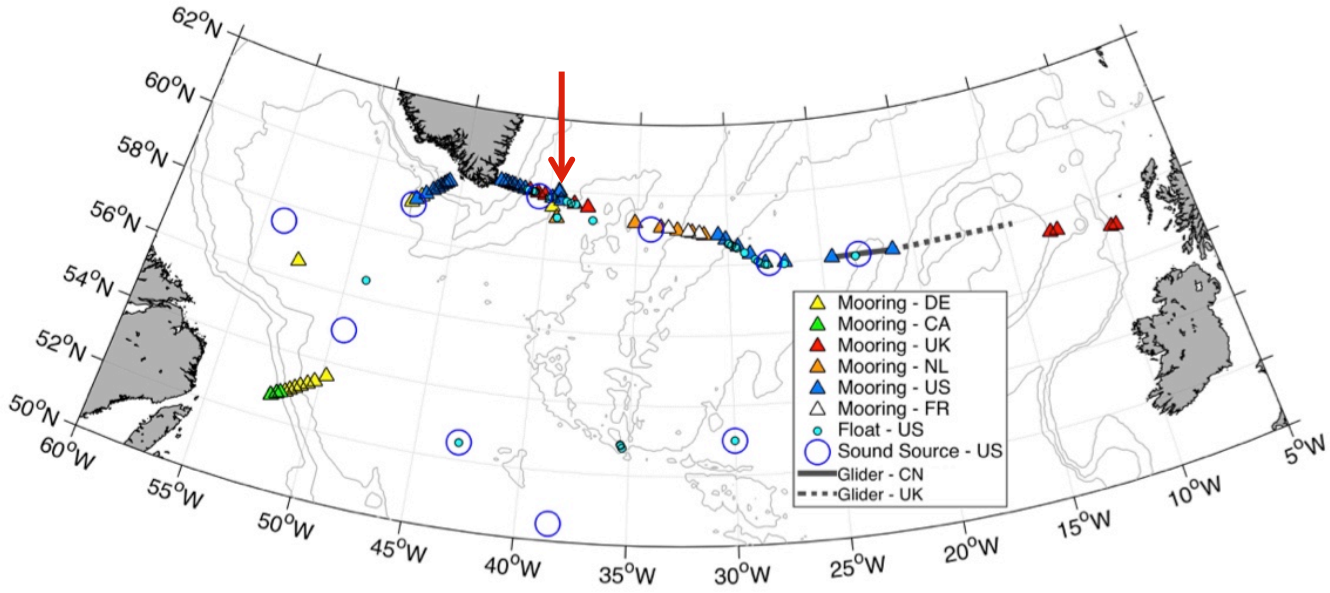
Global Flanking Mooring



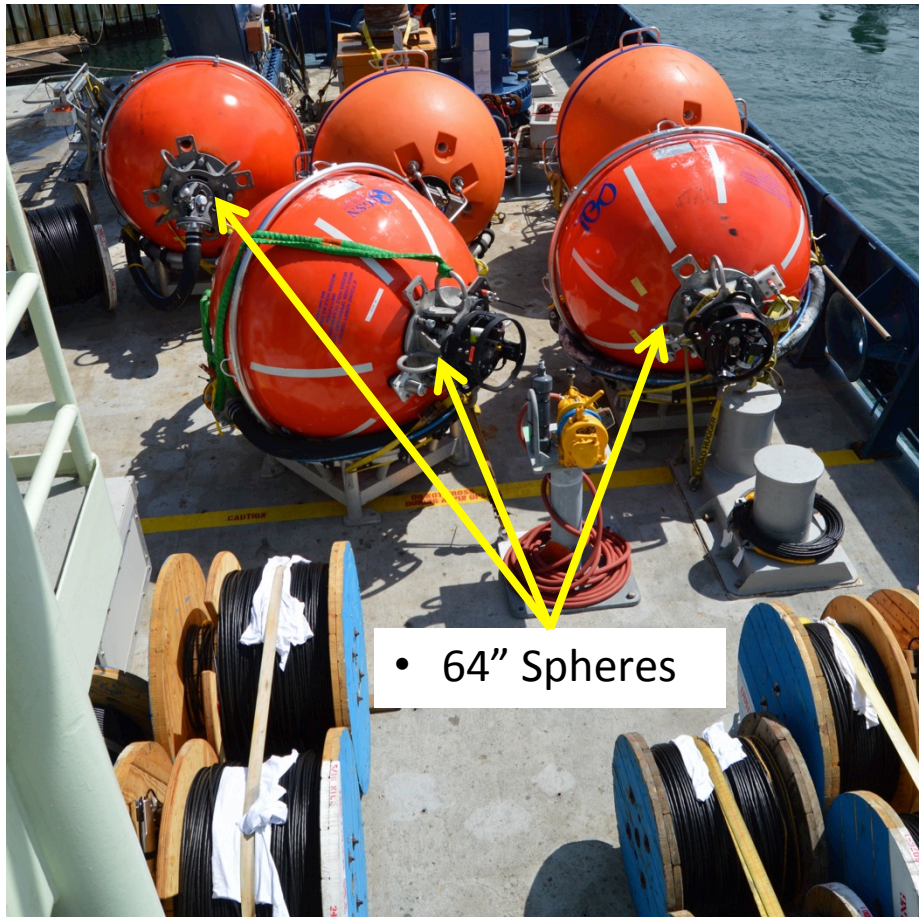
Sub-System	Flanking Mooring Configuration
Platform Control	Main Controller in lower cage Secondary Controller in upper 64” sphere
Telemetry	Inductive modem Acoustic modem (data to shore via glider)
Power System	Primary Batteries
Mooring Riser	64” Sphere, Inductive Wire Rope to 1500 m, In-line release, ADCP Flotation Sphere, Controller Cage, Glass Spheres, Acoustic Release, Anchor
Instruments *(16-24 total)*	CTDMO, DOSTA, FLORT, PHSEN in 64” Sphere CTDMO (10) on inductive line ADCP, CTDMO in Flotation Sphere at 500 m *4 CTDMO/VELPT pairs on Irminger Flanking Moorings*

Global Flanking Mooring

- Modifications to the baseline
  - Instruments added to Irminger Flanking Moorings for coordination with OSNAP (Overturning in the Subpolar North Atlantic Program)
    - CTDMO and VELPT pairs added at 100, 400, 700, and 1000 m above the seafloor
  - Orientation of Irminger Array adjusted such that the Flanking Moorings are along the OSNAP line

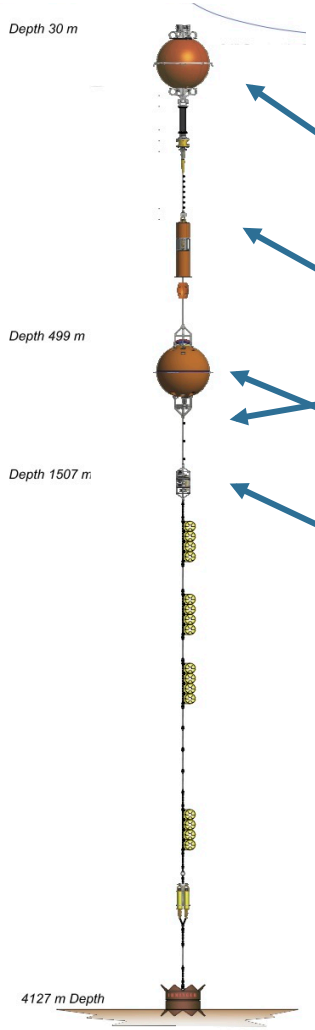


Global Flanking Mooring



• Mid-Water ADCP Sphere

Global Flanking Mooring



- Instruments can be mounted in the following locations
  - On/in the 64” sphere (~30 m)
  - Clamped on the inductive line (down to 1500 m depth)
  - In the ADCP sphere at 500 m
  - In the Controller Cage

NOTE: Addition of instruments in any location requires reanalysis of mooring design due to added weight/drag

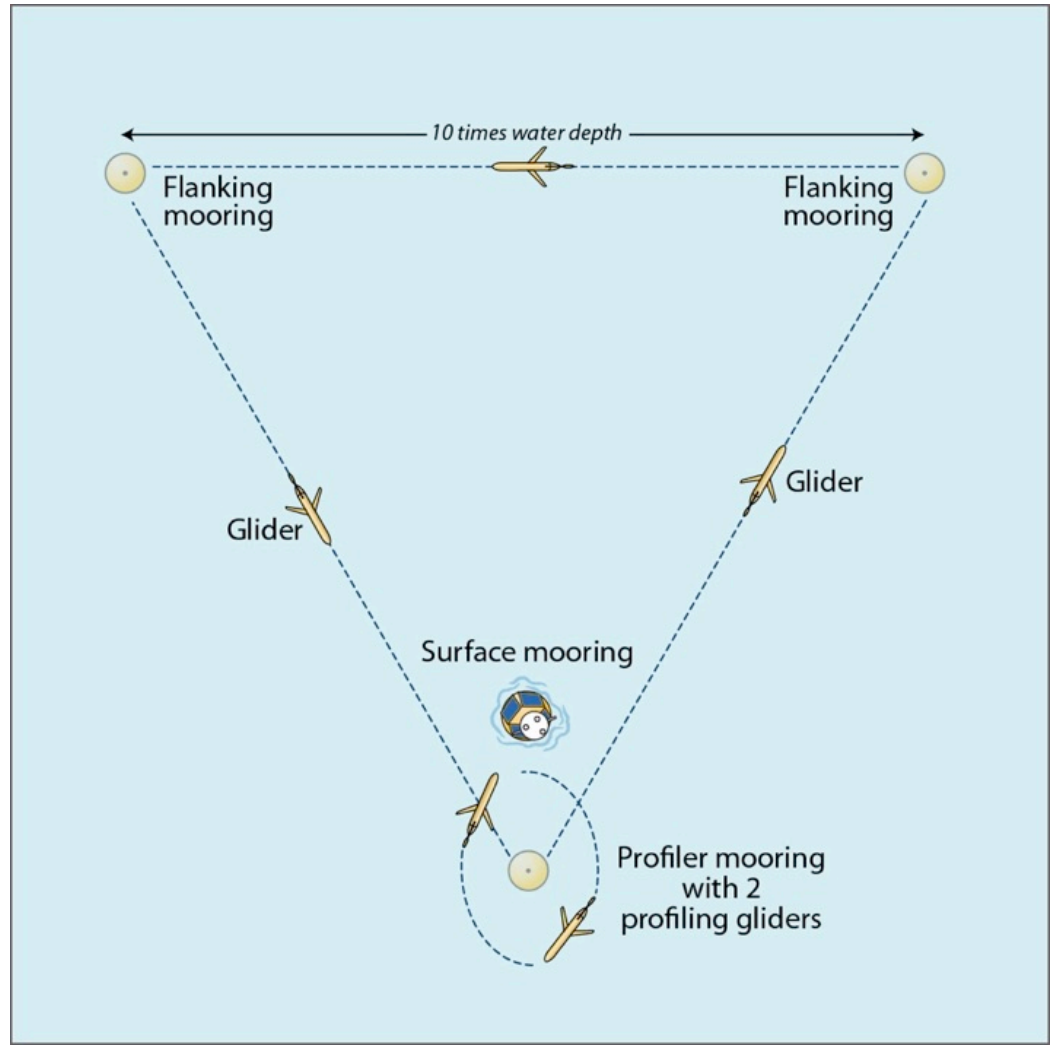
Open Ocean Glider

- Teledyne Webb G2
  - 1000 m engine
- Operations
  - Transit around perimeter of array collecting measurements
  - Collect data from subsurface moorings and telemeter to shore
- Instruments

  CTDGV – SBE CTD-GP

  DOSTA – AADI 4831

  FLORD – ECO FLBB



Global Profiling Gliders

- Teledyne Webb G2
  - 1000 m engine
- Operations
  - Hold position @ 1000 m
  - Profile 200 m, ~3 times a day
- Instruments

  CTDGV – SBE CTD-GP

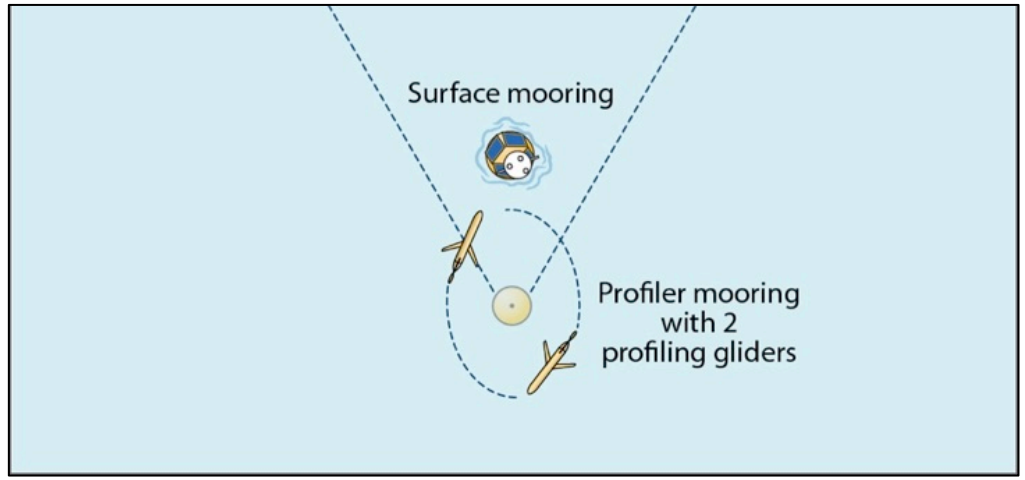
  DOSTA – AADI 4831

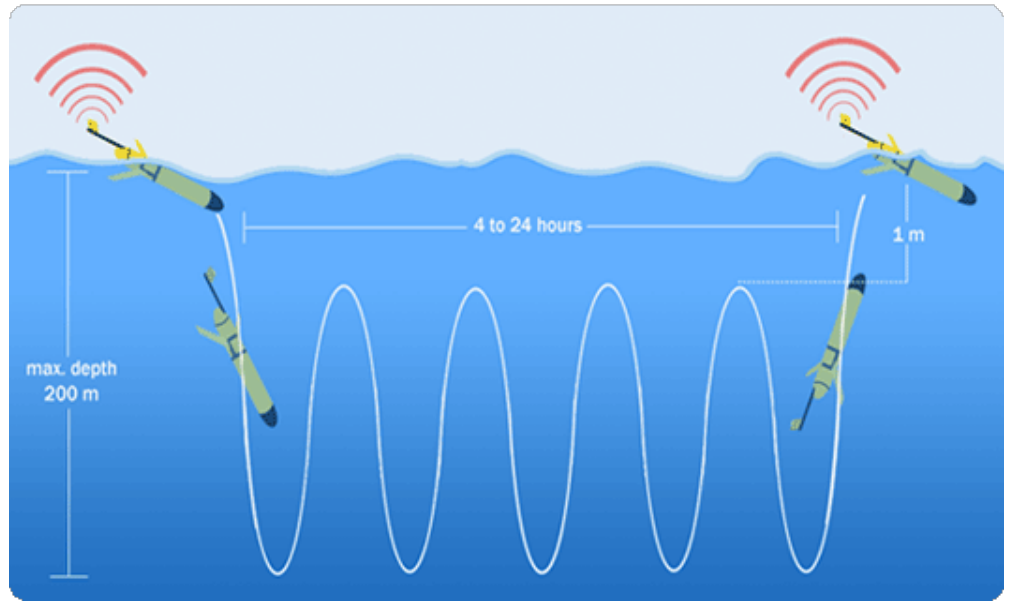
  NUTNR – Satlantic SUNA

  PARAD – QSP-2155 PAR

  FLORT – ECO FLBBCD

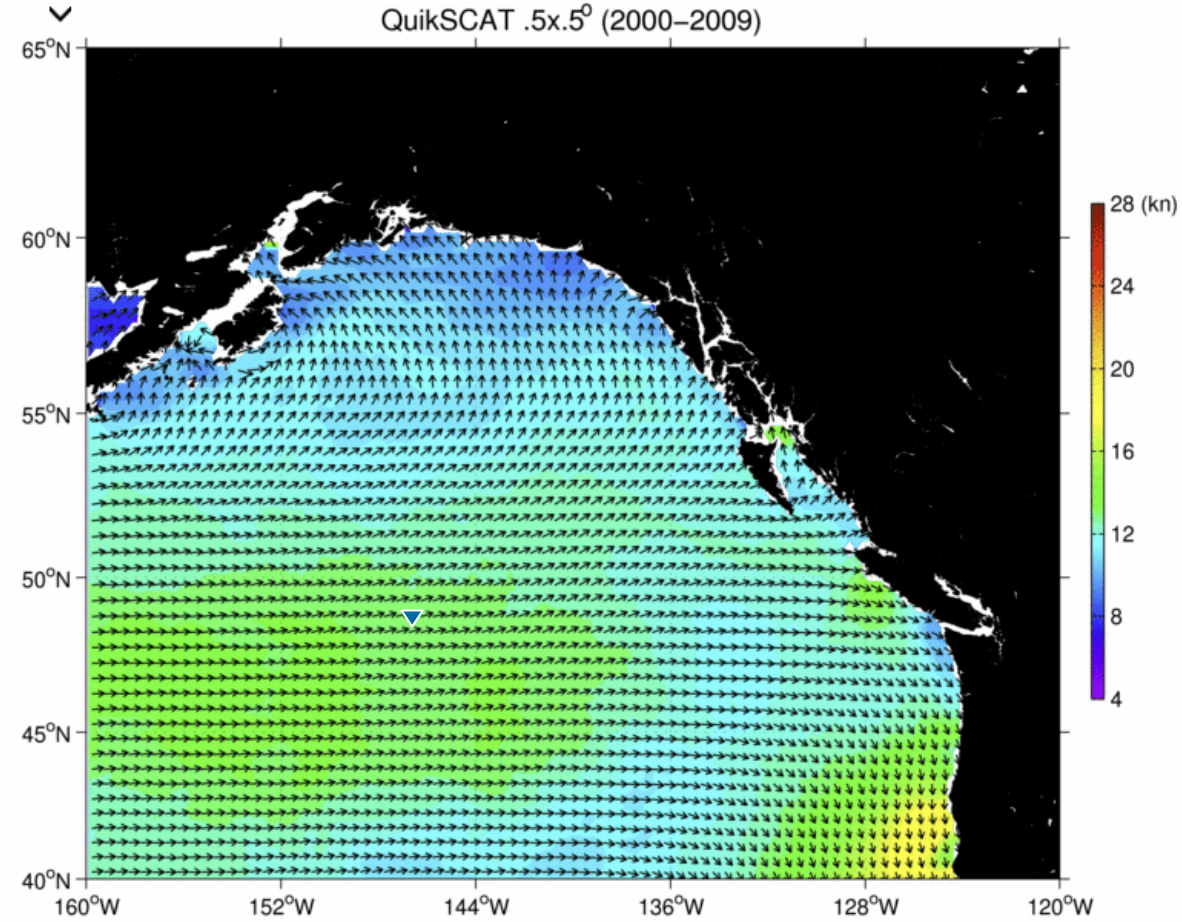
  FLORT – ECO BB3





Global Station Papa Array

- 50° N, 145° W
  - Nominally 4250 m
  - Apex to the WSW
  - No OOI Surface Mooring
    - NOAA PMEL Surface Mooring
- Strong wind and waves
- Moderate to low eddy activity
- Long history of observation here (since 1949)



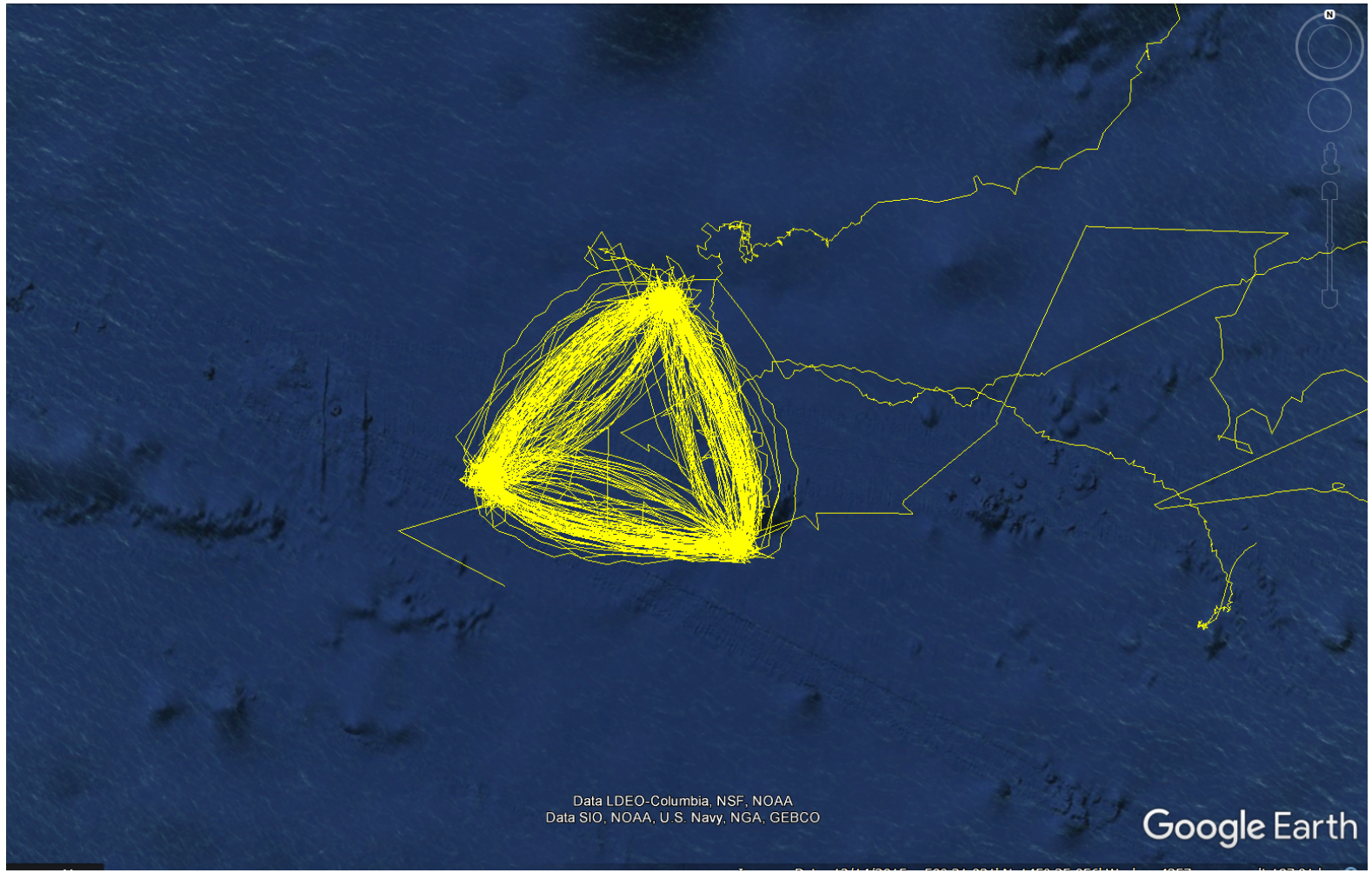
3203-00007 Station Papa Site Characterization Paper

Global Station Papa Array

- Array occupied since July 2013
  - All platforms deployed
- What's deployed now
  - 3 of 3 moorings deployed
  - 1 of 3 Open Ocean Gliders deployed (365)
    - 365 is adrift and low on power
    - Looking into possible recovery options (R/V *Sikuliaq*)
  - 0 of 2 Global Profiling Gliders deployed
- Issues
  - No significant issues with subsurface moorings
  - Currents and weather can make glider operations difficult

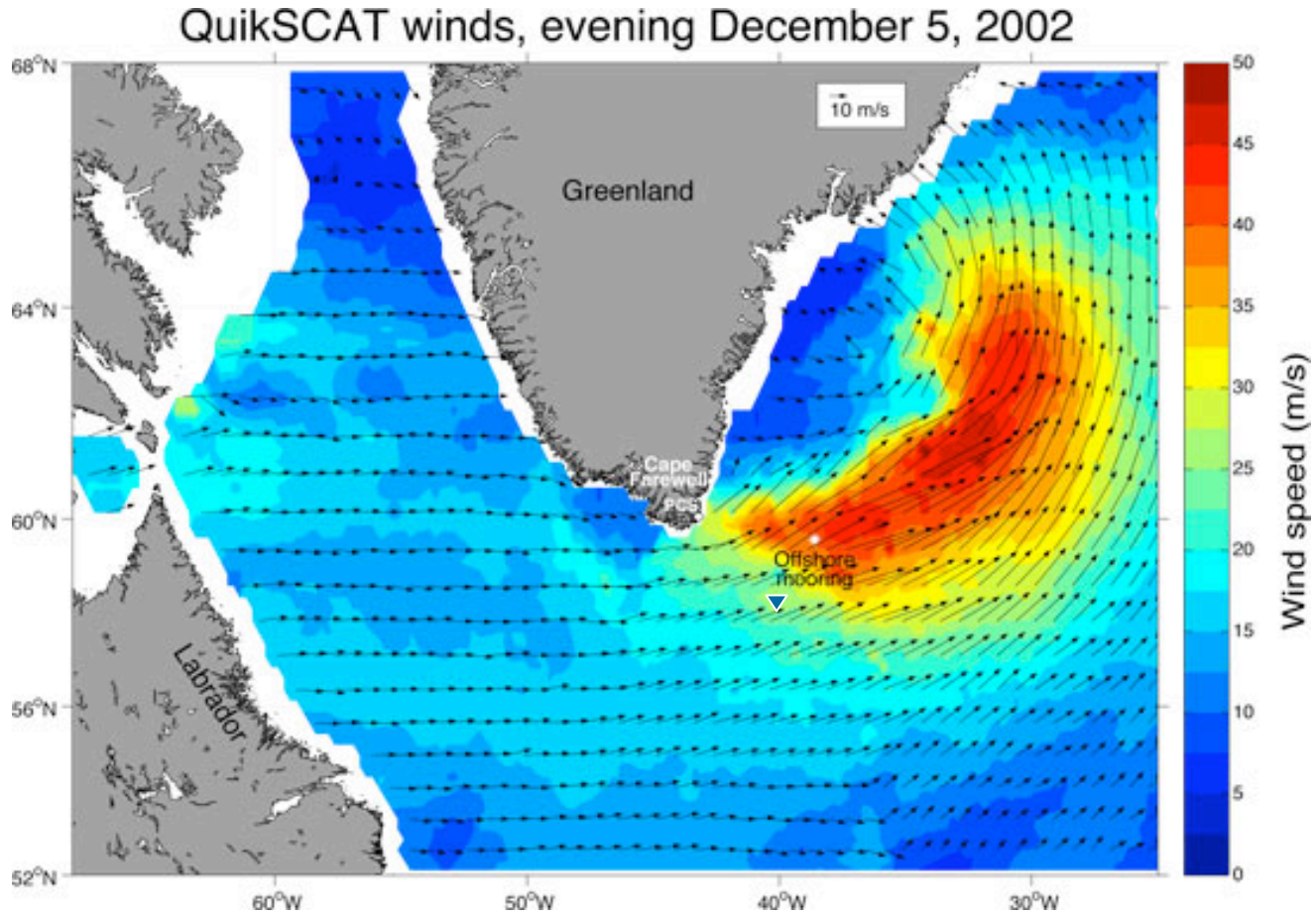
Global Station Papa Array

Cumulative tracks of 9 of 16 gliders deployed at the Station Papa Array



Global Irminger Sea Array

- 60° N, 40° W
  - Nominally 2800 m
  - Apex to the NNE
  - Flanking Moorings inline with OSNAP moorings
- Strong wind and waves associated with tip jet
- High eddy activity
- North Atlantic Deep Water formed here



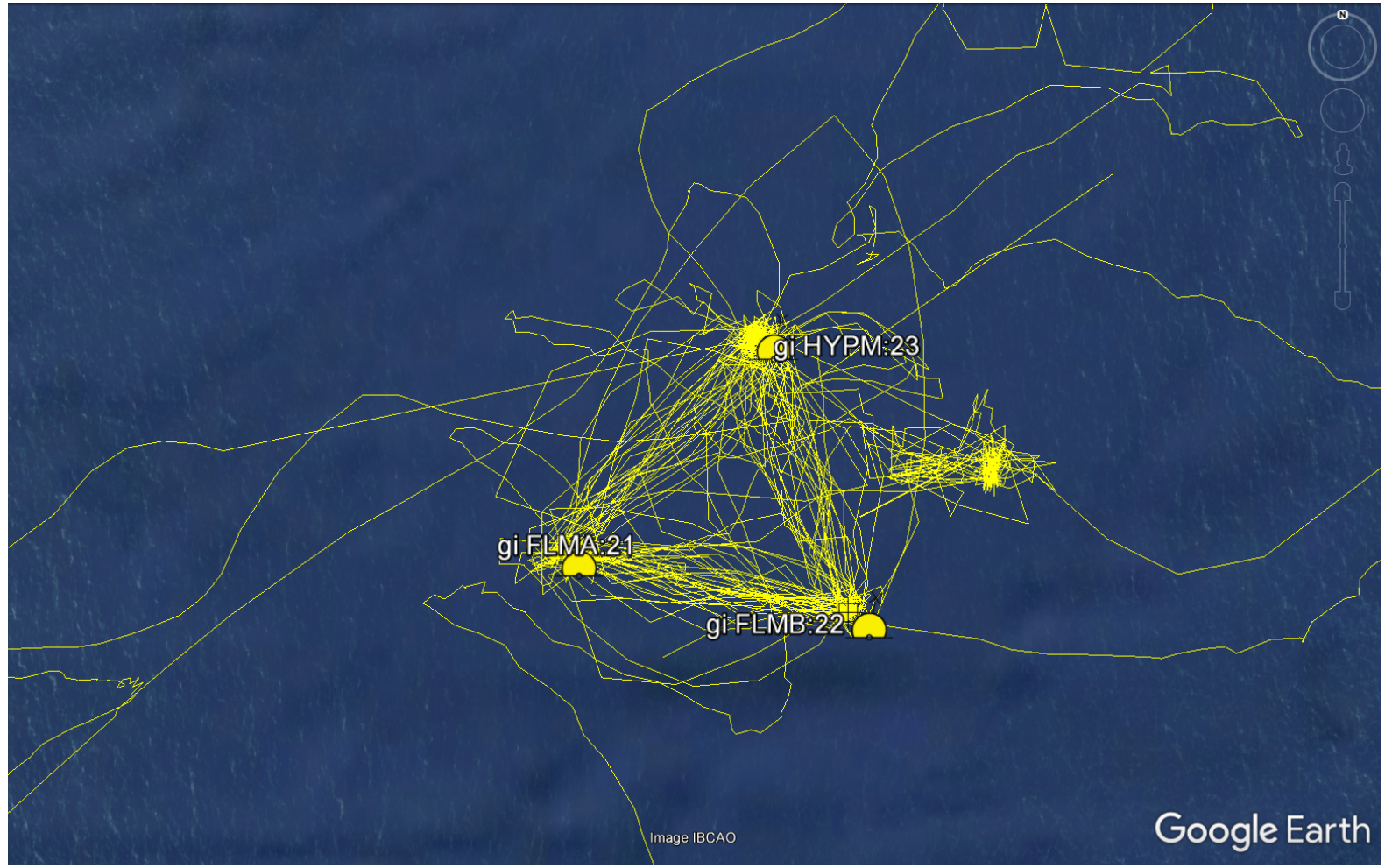
3202-00007 Irminger Sea Site Characterization Paper

Global Irminger Sea Array

- Array occupied since Sep 2014
  - All platforms deployed
- What's deployed now
  - 4 of 4 moorings deployed
  - 1 of 3 Open Ocean Gliders deployed (559)
    - 559 is adrift and has wing damage
    - Looking into possible recovery options (none likely)
  - 0 of 2 Global Profiling Gliders deployed
- Issues
  - No significant issues with Subsurface Moorings
  - Currents and weather can make glider operations difficult
  - Working on improving robustness of surface moorings
    - Wind turbine reliability
    - Icing prevention
    - Implementing new inline frames for inductive instrument clusters

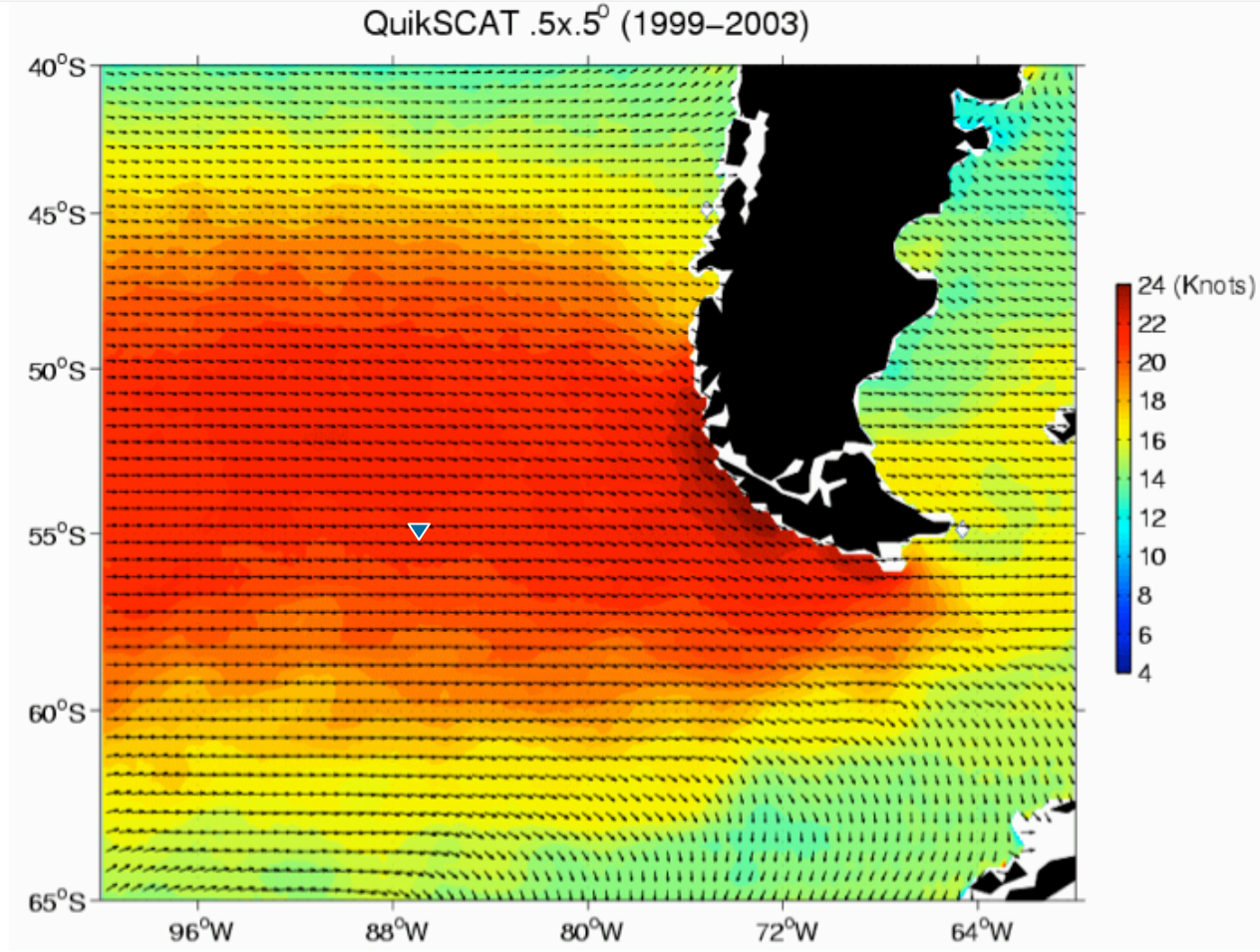
Global Irminger Sea Array

Cumulative tracks of 7 of 16 gliders deployed at the Irminger Sea Array



Global Southern Ocean Array

- 55° S, 90° W
  - Nominally 4800 m
  - Apex to the South
- Strong wind and waves, strong atmospheric forcing
- Antarctic Intermediate Water formed here



3201-00007 Southern Ocean Site Characterization Paper

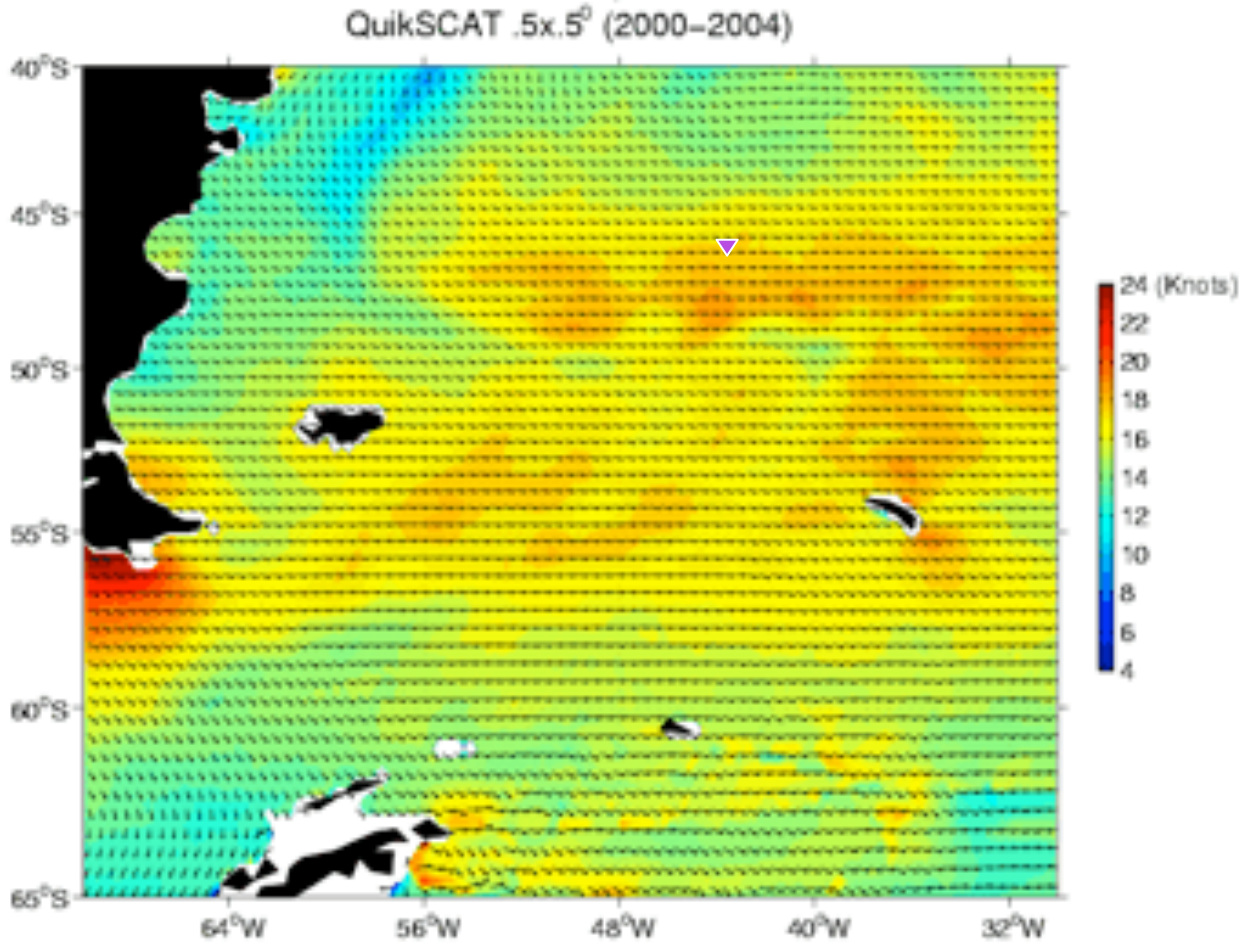
Global Southern Ocean Array

- Array occupied since Feb 2015
  - All platforms deployed
- What's deployed now
  - 4 of 4 moorings deployed
  - No gliders deployed as directed by NSF
    - 0 of 3 Open Ocean Gliders
    - 0 of 1 Global Profiling Glider
- Issues
  - No significant issues with Subsurface Moorings
  - Currents and weather can make glider operations difficult
  - Working on improving robustness of surface moorings
    - Wind turbine reliability
    - Implementing new inline frames for inductive instrument clusters

Global Argentine Basin Array

- 42° S, 42° W
  - Nominally 5200 m
  - Apex to the South

- Strong wind and waves, atmospheric forcing
- High eddy activity
- Bathymetric “mud waves” found here



3206-00007 Argentine Basin Site Characterization Paper

Global Argentine Basin Array

- Array occupied since Mar 2015
  - All platforms deployed
- What's deployed now
  - 4 of 4 moorings deployed
  - 2 of 3 Open Ocean Gliders deployed (364, 470)
  - 1 of 1 Global Profiling Glider deployed (578)
    - Steering degraded on 364, 578
    - 470 dropped weight and adrift
- Issues
  - 2015 Hybrid Profiler Mooring knocked down (to be recovered)
  - Currents and weather can make glider operations difficult
  - Working on improving robustness of surface moorings
    - Wind turbine reliability
    - Implementing new inline frames for inductive instrument clusters
  - Heavy bio-fouling by gooseneck barnacles affects both gliders and moorings

Global Argentine Basin Array

Cumulative tracks of ~5 of 10 gliders deployed at the Argentine Basin Array

CGSN Global Operations

- Cruises
  - 4 Global Cruises per year
  - 13 total Global Cruises to date
- Moorings
  - 15 Global Moorings refurbished and deployed each year
  - 48 Global Moorings deployed since 2014
- Gliders
  - 48 gliders deployed at Global Array sites
  - 15 glider deployment cruises
  - 6052 science days
    - Approximately 3 profiles per day
  - 44% science days vs. planned science days
  - 91,656 total science km flown