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Version 1.3

Cruise Plan – First deployment of 55°S, 90°W Global Node, RV Atlantis AT26-29, Punta Arenas, Chile February 12, 2015 to Punta Arenas, Chile March 5, 2015

Overview

The National Science Foundation (NSF) Ocean Observatories Initiative (OOI) will deploy four Global Nodes. One node, called Southern Ocean, is planned to be deployed and maintained near 55°S, 90°W. The platforms to be deployed at the site include four moorings and a number of ocean gliders. This cruise is the first cruise to the site, and the primary objective is to deploy the array, thus initiating a planned ~25 year occupation of the site.

Because this is the first cruise to the site, there is the need for bathymetric mapping to finalize the siting of the four moorings to be deployed on this cruise and to do enough mapping to support subsequent redeployments of the array, planned for once a year. There is also the need to do CTD (conductivity, temperature, depth) profiles and to collect water samples to both calibrate instrumentation to be deployed on the moorings and also to validate the moored and glider-borne instrumentation once in the water. In addition, standard underway meteorological and oceanographic measurements from the ship will be collected and compared to the initial observations made by the moored array and the gliders.

The cruise will be conducted on the RV Atlantis, sailing from Punta Arenas, Chile on February 12, 2015 and returning to Punta Arenas, Chile on March 5, 2015. Investigation of the weather and sea state conditions at 55°S, 90°W leads to the conclusion that conditions are likely to be challenging. As a result, in all probability, the exact cruise plan executed in early 2015 will not exactly match the cruise plan presented here. Instead, the intent of this document is to lay out key dates, key positions and way points, transit distances, and planned activities to both convey that information to the ship's officers and crew and to the science party and to demonstrate the feasibility, should weather and sea state allow, of completing the planned work

Cruise Plan – 55°S followed by Argentine Basin

55°South Cruise: 22 Sea days, 16 science, 6 transit

Feb 9, 10, 11: Mobilization days in Punta Arenas, Chile

Feb. 12: Depart for 55°S array

March 5: Return Punta Arenas, Chile

March 6: Demobilization of 55°S, 90°W cruise

The location of the array and cruise track are shown in Figure 1. A blow up of the array is shown in Figure 2.

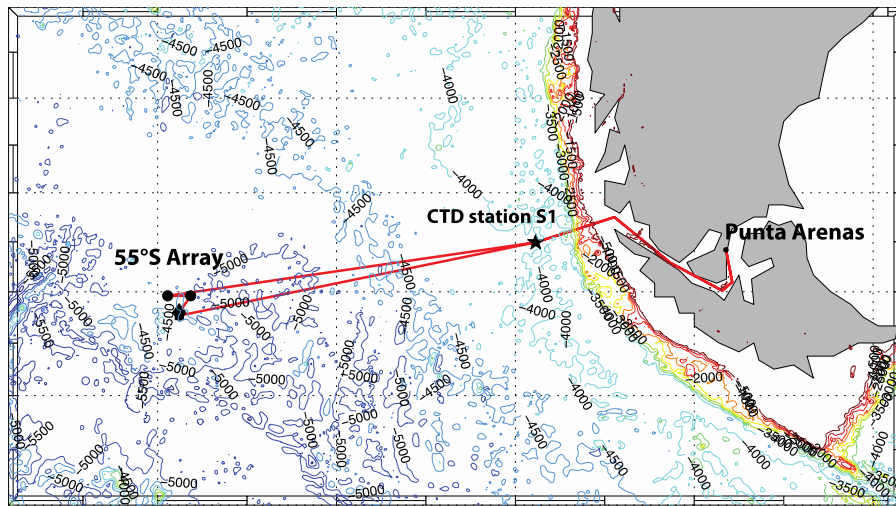


Figure 1. Cruise track for RV Atlantis AT26-29, starting and ending in Punta Arenas, Chile. A stop at S1 is planned when outbound to the 55°S, 90°W array site. Water depth is in meters.

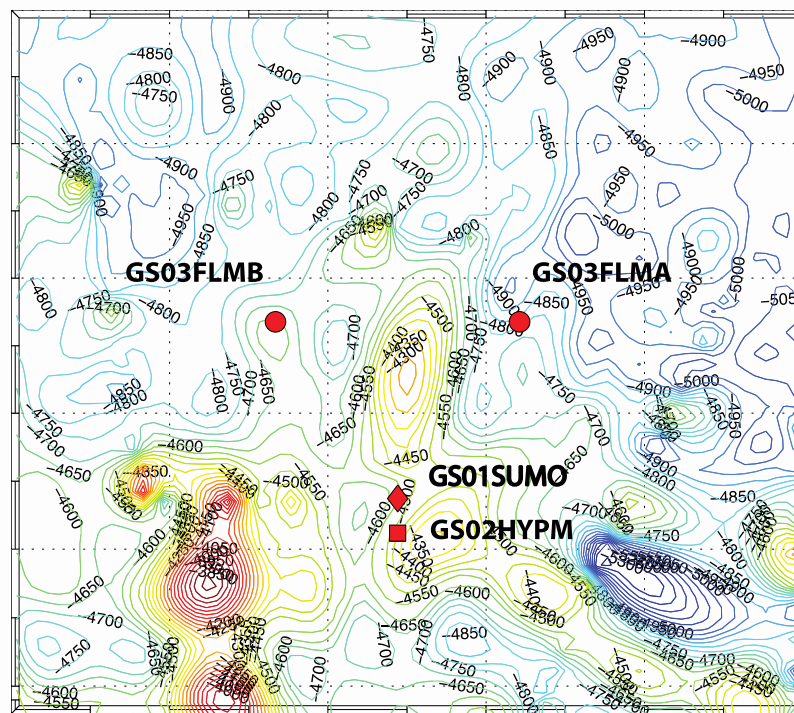


Figure 2. The OOI 55°S, 90°W moored array. Depth contours in meters. GS01SUMO is the surface mooring. GS02HYPM is the profiler mooring. GS03FLMA and GS03FLMB are the taut subsurface flanking moorings.

Ports, Waypoints, Mooring Locations

Punta Arenas, Chile 53.1667°S, 70.9333°W (53° 10.002'S, 70° 55.998'W)

West out of Punta Arenas via Straits of Magellan (actual waypoints to be set by ship)

WP1	53.8123°S, 70.7251°W (53° 48.739'S, 70° 43.503' W)
WP2	53.9782°S, 71.0607°W (53° 58.691'S, 71° 3.644'W)
WP3	53.4250°S, 72.8004°W (53° 25.5'S, 72° 48.023'W)
WP4	52. 5015°S, 74.6785°W (52° 30.090'S, 74° 40.710'W)

Calibration station (outbound stop for CTD profiles, acoustic release tests, and instrument calibrations.

S1	53.0131'S, 77.3151'W (53° 0.788'S, 77° 18.908'W)
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55°S, 90°W moorings

GS02HYPM	54.4704°S, 89.2796°W (54° 28.224'S, 89° 16.776'W)
GS01SUMO	54.4068°S, 89.2796°W (54° 24.408'S, 89° 16.776'W)
GS03FLMA	54.0814°S, 89.6652°W (54° 4.884'S, 89° 39.912'W)
GS03FLMB	54.0814°S, 88.8940°W (54° 4.884'S, 88° 53.640'W)

Transit Distances

<i>Waypoints</i>	<i>Distance Between (nm)</i>	<i>Cumulative Distance (nm)</i>
Punta Arenas to WP1	39.5	39.5
WP1 to WP2	25.6	65.1
WP2 to WP3	42.4	107.5
WP3 to WP4	151.4	258.9
WP4 to S1	100.9	359.8
S1 to GS01SUMO	434.9	794.7
GS1SUMO to GS02HYPM	3.8	798.5
GS02HYPM to GS03FLMB	23.8	822.3
GS03FLMB to GS03FLMA	27.3	849.6
GS03FLMA to WP4	520.0	1,369.6
WP4 to WP3	151.4	1,521.0
WP3 to WP2	42.4	1,563.4
WP2 to WP1	25.6	1,589.0
WP1 to Punta Arenas	39.5	1,628.5

Transit of 1,628.5 nm at 10 knots requires 6.8 days, at 8 knots requires 8.5 days. Due to the probability of rough weather and sea state keeping transit speeds low, planning has been done assuming 8 kts for transits.

Draft Cruise Plan

- February 8, 2015
RV Atlantis arrives Punta Arenas; demobilization
- February 9, 10, 11, 2015
Mobilization, loading RV Atlantis
- February 12, 2015
1200 local Sail from Punta Arenas
West via WP1, WP2, WP3 to S1, no underway sampling in Chilean waters
359.8 nm @ 8 kts = 45 hours
- February 13, 2015
Transit to S1
- February 14, 2015
0900 local arrive S1
24 hours – multiple CTD casts to test CTD, test releases, calibrate SIO instruments
Continue transit to array site, once in international waters start underway Sampling
Once in international waters, start deployments of Argo floats and surface drifters
- February 15, 2015
0900 underway to GS01SUMO
434.9 nm at 8 kts = 54.4 hours = 2 days 6.4 hours
- February 16, 2015
Transit to GS01SUMO
- February 17, 2015
Transit to GS01SUMO
- February 18, 2015
1600 local arrive GS01SUMO
Begin bathymetric survey
- February 19, 2015
Bathymetric survey
- February 20, 2015
Bathymetric survey
- February 21, 2015
Deploy GS01SUMO – the surface mooring
Followed by anchor survey, CTD cast
- February 22, 2015
Deploy GS02HYPM – the profiler mooring
Followed by anchor survey, acoustic coms, CTD cast
- February 23, 2015
Deploy 3 gliders, transit to GS03FLMB site
- February 24, 2015
Deploy GS03FLMB – flanking mooring B
Followed by anchor survey, acoustic coms, CTD cast

February 25, 2015
 Deploy GS03FLMA – flanking mooring A
 Followed by anchor survey, acoustic coms, CTD cast

February 26, 2015
 Rendezvous with gliders, CTD casts near gliders
 Transit to GS01SUMO – surface mooring

February 27, 2015
 Collect shipboard data while holding station near surface mooring

February 28, 2015
 Transit to flanking moorings via profiler mooring
 Verify profiler mooring operation
 Verify flanking mooring operation

March 1, 2015
 1100 local - begin transit to Punta Arenas
 778.9 nm at 8 kts = 97.4 hours = 4.1 days

March 2, 2015
 0800 local Underway to Punta Arenas
 Transit to Punta Arenas

March 3, 2015
 Transit to Punta Arenas

March 4, 2015
 Transit to Punta Arenas

March 5, 2015
 1200 local RV Atlantis docks at Punta Arenas

March 6, 2015
 Demobilization in Punta Arenas

Related Shipping and Travel Calendar

December 12, 2015
 WHOI gear for 55°S ships from WHOI

December 16, 2105
 SIO gear for 55°S ships from SIO

January 29, 2015
 WHOI personnel begin to arrive Punta Arenas

January 30, 2015
 SIO personnel begin to arrive Punta Arenas

February 12, 2015
 RV Atlantis sails

March 5, 2015
 RV Atlantis returns

March 9, 2015
 55°S science party leaves Punta Arenas

Deck Plan

A drawing of the layout of mooring components and handling gear on the deck of RV Atlantis is shown below in Figure 3:

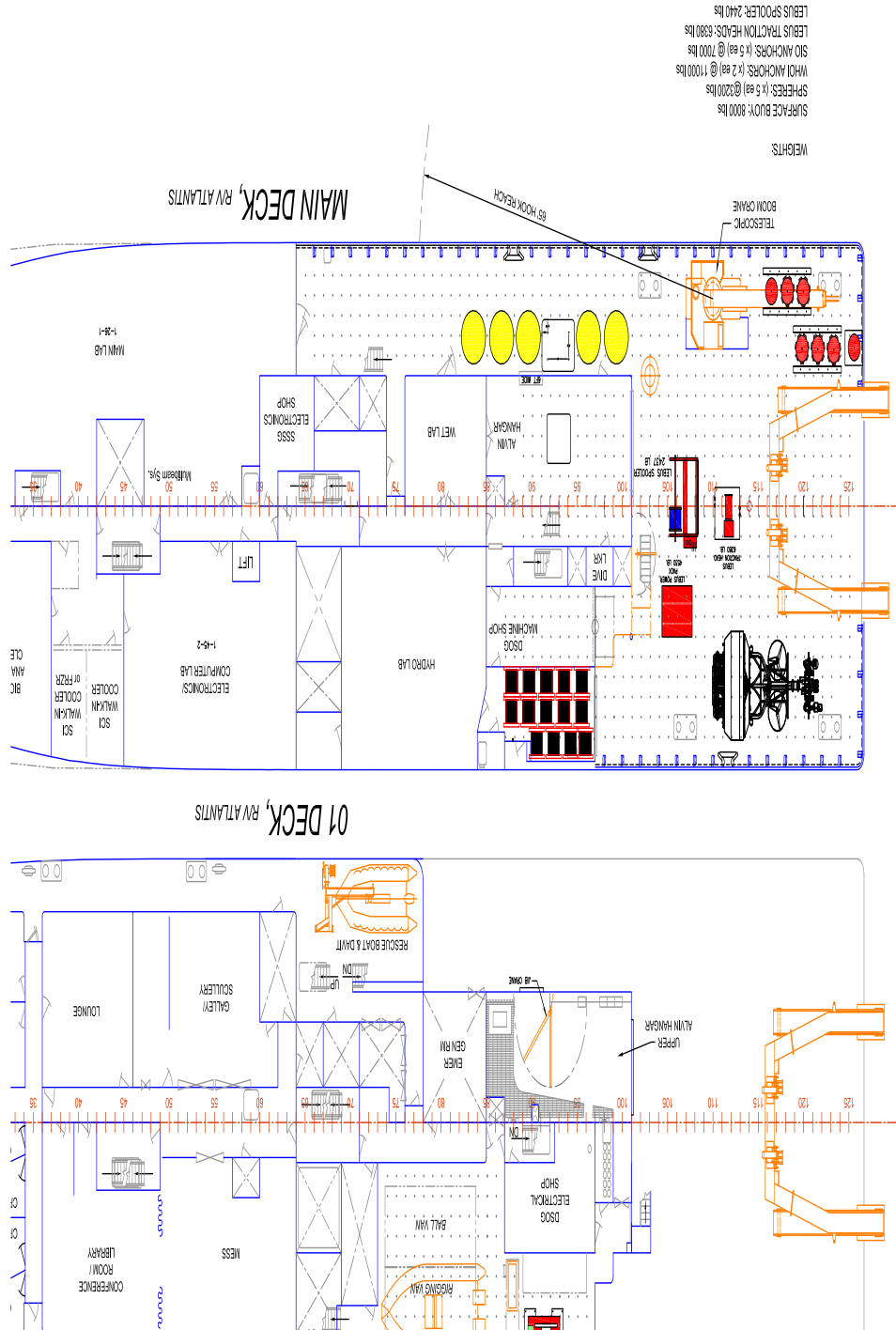


Figure 3. Deck layout draft plan for AT 26-29.

Underway Observing

Sampling within Chilean waters is limited to the CTD casts and instrument calibrations to be done at site S1 while outbound and into deep water off the coast of Chile.

Once in international waters, the full suite of RV Atlantis underway meteorological and oceanographic sampling should be turned on, including multibeam. On the outbound leg, from the Chilean maritime boundary to the array, 12 Argo profiling floats and 7 surface drifters will be deployed, with approximate locations in Tables 1 and 2, and shown on

Argo Float	Target Latitude	Target Longitude
1	53° 32' 04" S	80° 36' W
2	53° 39' 30" S	81° 21' W
3	53° 47' 14" S	82° 06' W
4	53° 52' 40" S	82° 51' W
5	53° 57' 45" S	83° 36' W
6	54° 03' 18" S	84° 21' W
7	54° 09' 19" S	85° 06' W
8	54° 14' 18" S	85° 51' W
9	54° 18' 21" S	86° 36' W
10	54° 22' 53" S	87° 21' W
11	54° 25' 51" S	88° 36' W
12	54° 26' 47" S	89° 0' W

Table 1. Target locations for the deployment of ARGO floats while outbound from Punta Arenas towards the OOI 55°S, 90°W array.

Surface Drifter	Target Latitude	Target Longitude
1	Westbound 54° 28' 10" W	88° W
2	Westbound 54° 28' 10" W	88° W
3	at array 54° 14' 55" W	89° 34' 57" W
4	at array 54° 14' 55" W	89° 34' 57" W
5	at array 54° 14' 55" W	89° 34' 57" W
6	eastbound 53° 58' 55" W	88° 30' W
7	Eastbound 53° 58' 55" W	88° 30' W

Table 2. Target locations for the deployment of surface drifters while outbound from Punta Arenas towards the OOI 55°S, 90°W array.

map in Figure 4. Argo floats are spaced along the outbound track in international waters. Drifters are deployed in 3 groups. Two near 88°W while outbound. Three at our furthest west location in the array. Two near 88° 30'W as we head east.

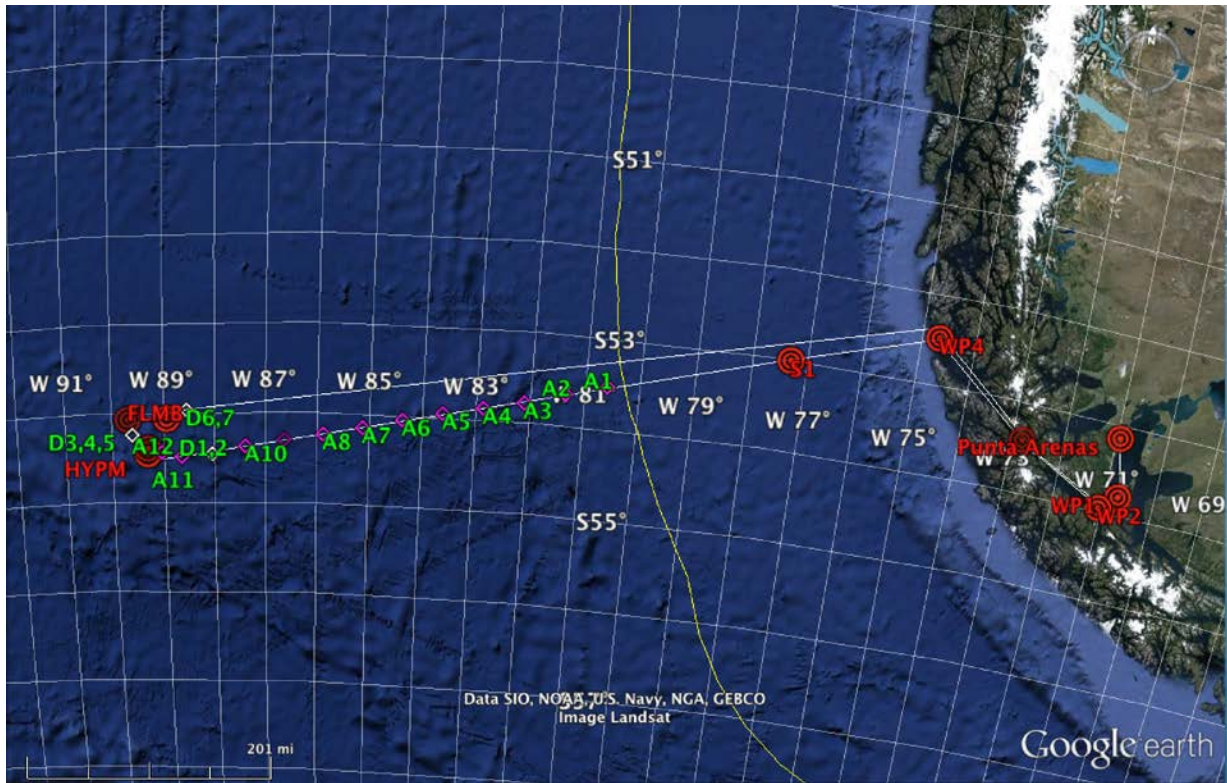


Figure 4. Cruise track with Argo float (A1 to A12) and surface drifter (D1 to D7) deployment target locations indicated.

CTD casts and water sampling

Ship's CTD with rosette for water samples (24 10 liter bottles) to be used. Ship's CTD to have pressure, temperature, salinity, depth, dissolved oxygen, and fluorometer/turbidity. Underwater PAR if possible. Arrangements have been made with three WHOI research groups to process samples for chlorophyll, carbon, and nutrients (nitrate/nitrite). Liquid nitrogen will be on board and filtered samples stored in the liquid nitrogen. Bottles and chemical supplies as needed as well as log sheets and protocol summaries have either been put onboard *Atlantis*. CTD sampling will be done at each mooring. CTD profiles will also be used for calibration of SIO instrumentation and for validation of the WHOI surface mooring and the gliders.

Moorings

Four moorings are to be deployed in the array as shown in Figure 2. The surface mooring would, weather permitting, be the first to be deployed, as this would clear deck space needed to rig for the other deployments. The surface mooring (Figure 5) is a buoy first

deployment; the deployment would begin just after breakfast and continue through the day. The profiler mooring, located near the surface mooring would be deployed next; it is shown in Figure 6. The two remaining moorings, taut subsurface moorings called flanking moorings, share a design as shown in Figure 7.

Following deployment, a 3-point acoustic ranging survey would be done to establish the location of the acoustic release and anchor for each mooring. A CTD profile would be collected with water samples at each mooring. Intercomparisons would be done between shipboard sensors and moored sensors at each mooring. For the surface mooring, at a least a day of intercomparison between the ship's meteorological and oceanographic sensors and those on the surface mooring is sought. RF telemetry will be monitored from the surface mooring. Acoustic communications would establish functioning of the profiler and flanking moorings and their instrumentation.

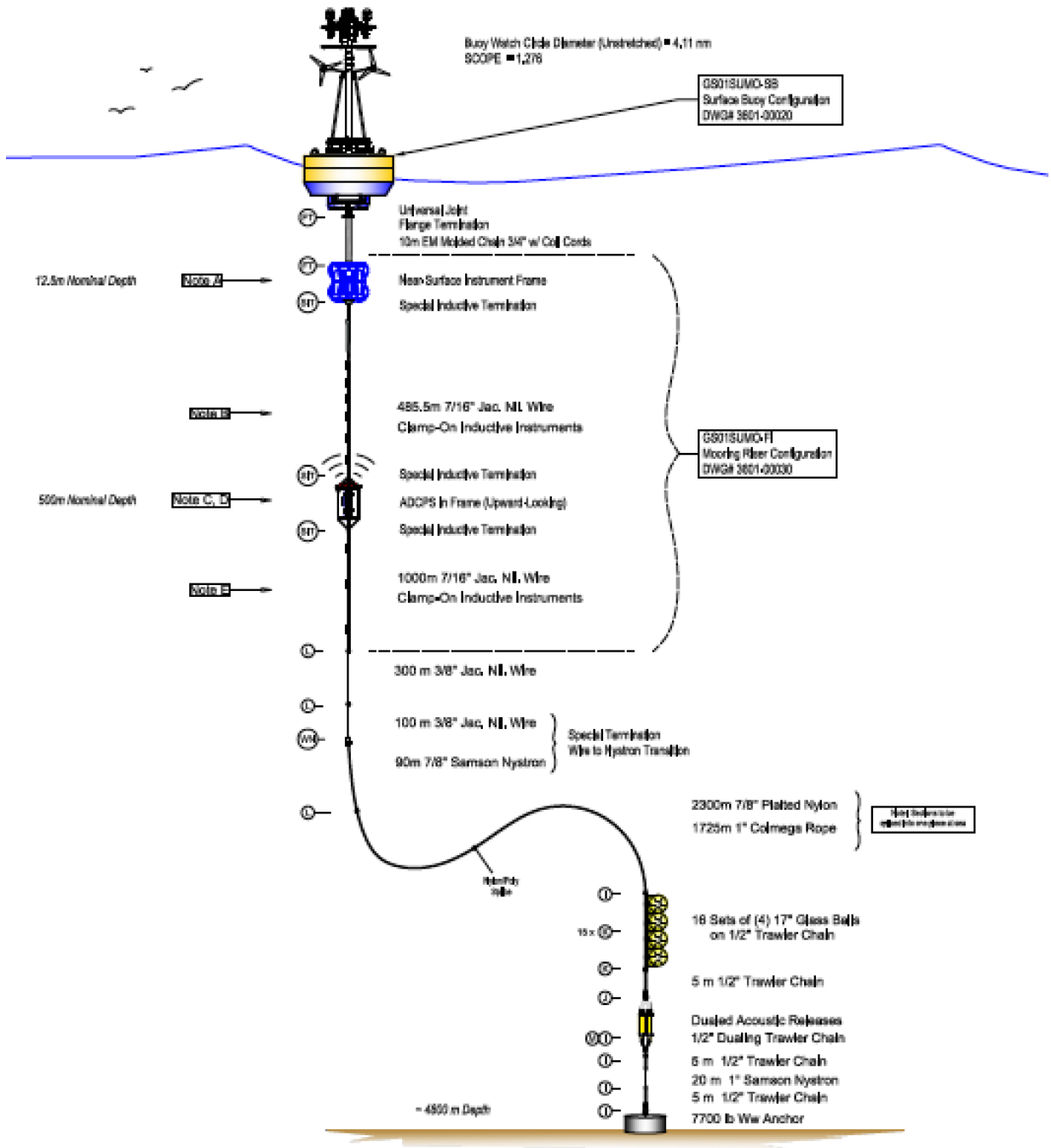


Figure 5. Schematic drawing of the surface mooring, GS01SUMO, to be deployed on AT 26-29.

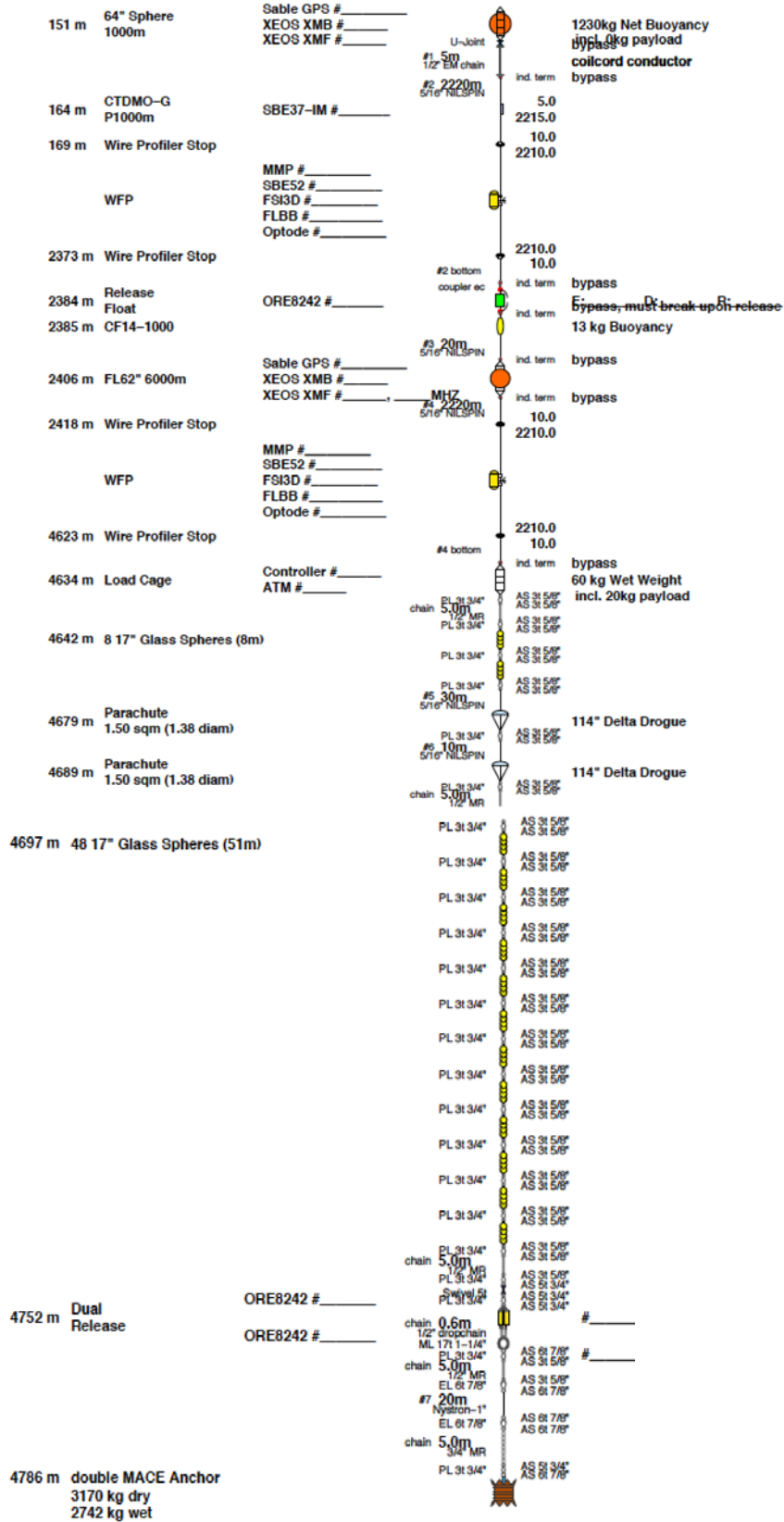


Figure 6. Schematic of the profiler mooring, GSO2HYPM, to be deployed on AT 26-29.

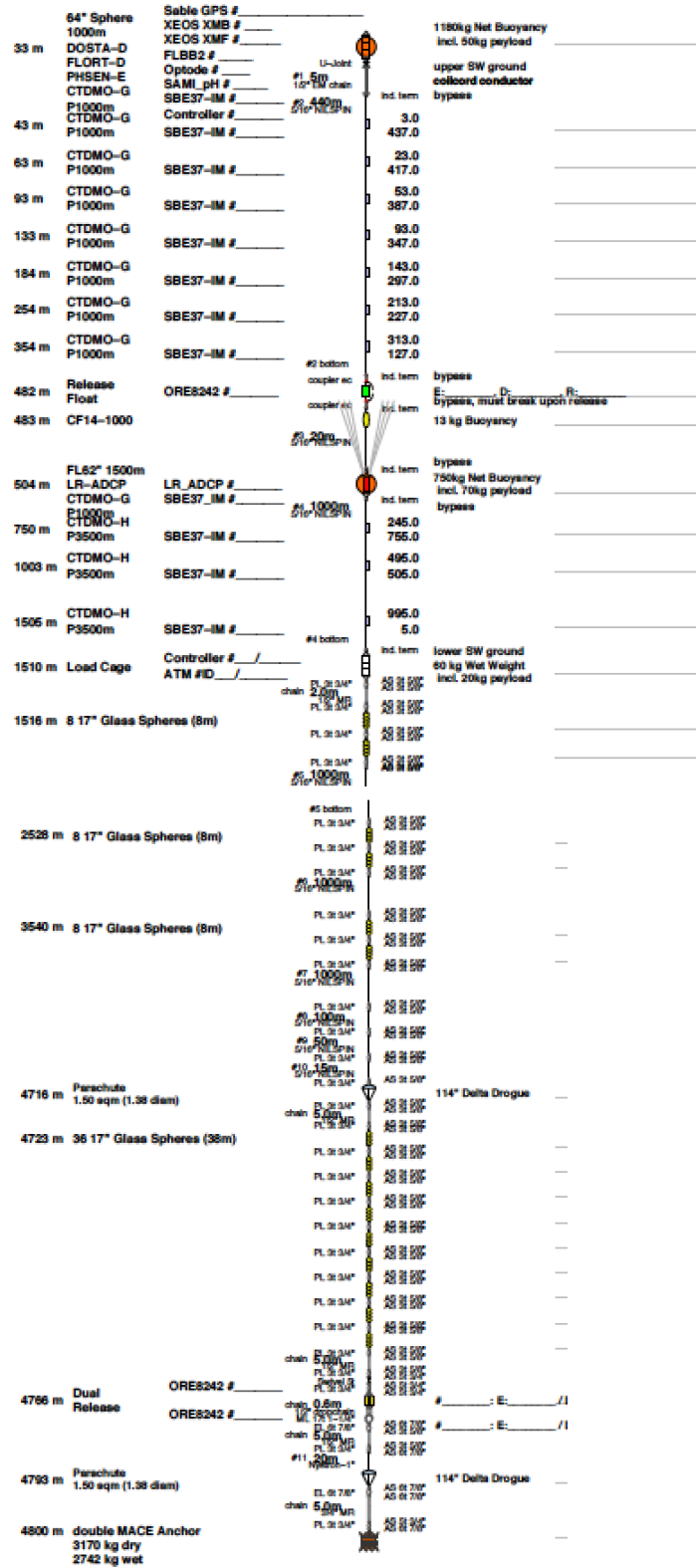


Figure 7. Schematic drawing of the flanking moorings to be deployed on AT 26-29.

Science Party

Cruise AT 26-29 science party is given in Table 3.

	Name	Institution	Gender	Function
1	Robert A. Weller	WHOI	M	Chief Scientist
2	Kris Newhall	WHOI	M	Ops Lead
3	James Ryder	WHOI	M	Moorings
4	Ben Pietro	WHOI	M	Moorings
5	Aidan Alai	WHOI	M	Glider Ops
6	John Lund	WHOI	M	Surface Mooring
7	Dave Wellwood	WHOI	M	Water Sampling
8	David Gassier	SIO	M	SIO lead
9	Ethan Morris	SIO	M	SIO deck lead
10	James Uyloan	SIO	M	SIO Moorings
11	James Kuo	SIO	M	SIO Moorings
12	Gabriela Chavez	SIO	F	Water Sampling, Recorder
13	Dave Sims	WHOI	M	SSSG Tech
14	Catie Graver	WHOI	F	SSSG Tech
15	TBD			Chilean Observer

Note: Berthing to be allocated for two pilots.

Table 3. Science crew sailing on AT 26-29.