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)

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

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

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 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

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

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

<table>
<thead>
<tr>
<th>Surface Drifter</th>
<th>Target Latitude</th>
<th>Target Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Westbound 54° 28’ 10” W</td>
<td>88° W</td>
</tr>
<tr>
<td>2</td>
<td>Westbound 54° 28’ 10” W</td>
<td>88° W</td>
</tr>
<tr>
<td>3</td>
<td>at array 54° 14’ 55” W</td>
<td>89° 34’ 57”W</td>
</tr>
<tr>
<td>4</td>
<td>at array 54° 14’ 55” W</td>
<td>89° 34’ 57”W</td>
</tr>
<tr>
<td>5</td>
<td>at array 54° 14’ 55” W</td>
<td>89° 34’ 57”W</td>
</tr>
<tr>
<td>6</td>
<td>eastbound 53° 58’ 55” W</td>
<td>88° 30’ W</td>
</tr>
<tr>
<td>7</td>
<td>Eastbound 53° 58’ 55” W</td>
<td>88° 30’ W</td>
</tr>
</tbody>
</table>

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.

![Cruise track with Argo float and surface drifter deployment target locations indicated.](image)

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.

<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
<th>Gender</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robert A. Weller</td>
<td>WHOI</td>
<td>M</td>
<td>Chief Scientist</td>
</tr>
<tr>
<td>Kris Newhall</td>
<td>WHOI</td>
<td>M</td>
<td>Ops Lead</td>
</tr>
<tr>
<td>James Ryder</td>
<td>WHOI</td>
<td>M</td>
<td>Moorings</td>
</tr>
<tr>
<td>Ben Pietro</td>
<td>WHOI</td>
<td>M</td>
<td>Moorings</td>
</tr>
<tr>
<td>Aidan Alai</td>
<td>WHOI</td>
<td>M</td>
<td>Glider Ops</td>
</tr>
<tr>
<td>John Lund</td>
<td>WHOI</td>
<td>M</td>
<td>Surface Mooring</td>
</tr>
<tr>
<td>Dave Wellwood</td>
<td>WHOI</td>
<td>M</td>
<td>Water Sampling</td>
</tr>
<tr>
<td>David Gassier</td>
<td>SIO</td>
<td>M</td>
<td>SIO lead</td>
</tr>
<tr>
<td>Ethan Morris</td>
<td>SIO</td>
<td>M</td>
<td>SIO deck lead</td>
</tr>
<tr>
<td>James Uyloan</td>
<td>SIO</td>
<td>M</td>
<td>SIO Moorings</td>
</tr>
<tr>
<td>James Kuo</td>
<td>SIO</td>
<td>M</td>
<td>SIO Moorings</td>
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<tr>
<td>Gabriela Chavez</td>
<td>SIO</td>
<td>F</td>
<td>Water Sampling, Recorder</td>
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<tr>
<td>Dave Sims</td>
<td>WHOI</td>
<td>M</td>
<td>SSSG Tech</td>
</tr>
<tr>
<td>Catie Graver</td>
<td>WHOI</td>
<td>F</td>
<td>SSSG Tech</td>
</tr>
<tr>
<td>TBD</td>
<td></td>
<td></td>
<td>Chilean Observer</td>
</tr>
</tbody>
</table>

Note: Berthing to be allocated for two pilots.

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