

VOYAGE PLAN ss2013_v03

**Integrated Marine Observing System (IMOS) Facility 3.
Southern Ocean Time Series (SOTS) moorings for climate and
carbon cycle studies southwest of Tasmania (47°S, 140°E).**

Itinerary

Begin loading Hobart
0800hrs Friday 26 April 2013

Depart Hobart
0800hrs Sunday 28 April 2013

Arrive Hobart
0800hrs Saturday 11 May 2013
and demobilise.

Principal Investigators

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Scientific Objectives

The overall scientific objective is to obtain frequent measurements of surface and deep ocean properties that control the transfer of CO₂ from the atmosphere to the upper ocean, and then onwards to the ocean interior in the form of sinking particles. This “biological pump” drives carbon sequestration from the atmosphere, and writes the sedimentary record. The controls on its intensity are complex and involve processes that vary on daily, weekly, seasonal, and inter-annual timescales. Obtaining observations with the necessary frequency is not possible from ships. For this reason the IMOS Southern Ocean Time Series Facility seeks to obtain this information using automated sensor measurements and sample collections.

This voyage will carry out the annual servicing of SOTS moorings, along with a limited set of ancillary underway and on-station water column observations. The moorings to be deployed are:

- ♦ **SOFS-4 mooring** to make meteorological and upper ocean measurements of physical and chemical properties important to air-sea exchange of heat, water, momentum, and dissolved gases (oxygen and CO₂).
- ♦ **Pulse-10 mooring** to make upper ocean measurements of properties that control carbon uptake and export to the ocean interior, including temperature, salinity, mixed layer depth, light, oxygen, total dissolved gases, phytoplankton fluorescence, particle backscatter, and dissolved nitrate, and collect 24 paired water samples later study of nutrients and phytoplankton identification.

- ♦ **SAZ-16 mooring** to collect sediment trap samples in the deep sea (below 1000m) to quantify the transfer of particulate carbon and other materials to the ocean interior.

The moorings to be recovered are:

- ♦ Pulse-9 mooring
- ♦ SOFS-3 mooring (bottom half only – top recovered in 2012 after it broke loose)
- ♦ (SAZ-15 mooring will not be recovered, and will remain in the ocean until recovery in 2014)

Ancillary measurements to be carried out include swath mapping, underway and CTD sensor and sample collections, zooplankton net sampling, towing of a continuous plankton recorder, launch of Argo floats, and a piggy-back project to calibrate ship acoustic sensors.

Voyage Objectives

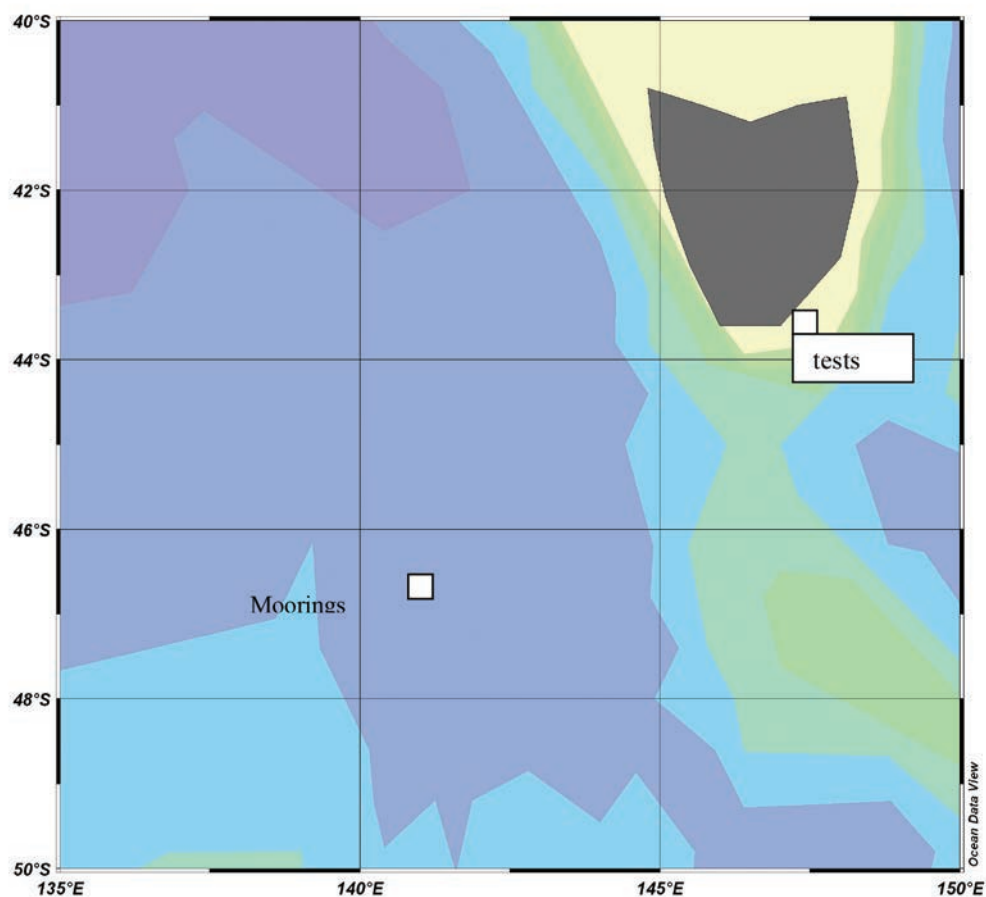
Priority-ranked list of tasks to achieve the overall objectives:

1. Deploy new moorings (SOFS-4, SAZ-16, Pulse-10)
2. Recover existing moorings (SOFS-3, Pulse-9, but not SAZ-15 which remains until 2014)
3. Do ancillary CTD measurements (2 casts to 1000m)
4. Do ancillary underway measurements (towed CPR, sensor measurements)
5. Deploy zooplankton drop-net (up to 6 times to 100m)
6. Deploy Argo floats (up to 3 floats)
7. Support piggy-back acoustic calibration in Storm Bay on Day 1.

Activities required in port:

1. mount stern ramp cover, with welded-on gap protectors
2. test A-frames and winch hydraulics
3. load moorings:
 - a. spool on SAZ-16 mooring to net-drum
 - b. over-spool on SOFS-4 mooring to net-drum
 - c. load Pulse-10 mooring in half-height container and cage pallets
4. mount half-height open container on mezzanine deck for equipment storage
5. load additional mooring equipment in cage pallets, on deck, and in CTD room
6. load 3 anchors on deck
7. have crew practice moving anchors 200 mm above deck using dual-lift
8. mount the Argos antenna on the monkey island, and the associated receiving unit on the ship's bridge.
9. ensure CTD has following sensors mounted: PAR, fluorescence, transmission, oxygen
10. take up to 3 team-members for piggy-back acoustic calibrations in Storm Bay on Day 1, and then off-load them and on-load up to 3 main science party members.

Voyage track



Deployment Locations (Lat, Lon, Bottom Depth):

SAZ-16 46° 47.400'S, 141° 49.500'E 4530 m
Pulse-10 46° 55.800'S, 142° 15.000'E 4300 m
SOFS-4 46° 45.880'S, 141° 58.023'E 4550 m

Recovery Locations (Lat, Lon, Bottom Depth):

SOFS-3 46° 40.377'S, 142° 05.706'E 4695 m
Pulse-9 46° 50.959'S, 142° 23.913'E 4330 m

Nearby mooring that will not be recovered until 2014

SAZ-15 46° 50.229'S, 141° 40.710'E 4591 m

Time Estimates

Transit times at 11 knots (total 3 days)

	Decimal latitude	Decimal longitude	Distance (nm)	Total distance (nm)	Steaming time (hrs)	Total steam (hrs)
Hobart	42.87	147.35				
Storm Bay	43.33	147.350	27.62	27.62	2.51	2.51
Moorings	46.80	141.884	311.50	339.12	28.32	30.83
Hobart	42.87	147.35	352.44	748.98	32.04	68.09

Tentative Calendar (highly weather dependent)

2013-04-28: do CTD, anchor movement, and piggy-back acoustic calibration in Storm Bay Offload piggy-back team, on-load remaining science party

2013-04-29: transit to SOTS mooring site towing CPR, doing underway sensor tests stop once to do CTD to 500m to test acoustic releases mounted on CTD

2013-04-30: deploy SOFS-4, triangulate

2013-05-01: deploy SAZ-16, triangulate

2013-05-02: recover Pulse-9

2013-05-03: spool off Pulse-9, and spool-on Pulse-10

2013-05-04: deploy Pulse-10

2013-05-05: recover SOFS-3 (bottom half only, top half recovered earlier)

2013-05-06: CTD(s) to 1000m, shipboard meteorology, deploy zooplankton drop-net

2013-05-07: CTD(s) to 1000m, shipboard meteorology, deploy zooplankton drop-net

2013-05-08: weather day

2013-05-09: weather day

2012-05-10: transit to Hobart, towing CPR, doing underway sensor tests

2013-05-11: 08:00 arrive Hobart, demobilize

Southern Surveyor Equipment

1. stern-ramp cover fitted, with welded-on gap protectors
2. rosette with 12 Niskin bottles and CTD with MNF O₂, PAR, fluorometer, and transmissometer.
3. working echosounder and recorder
4. connections for hull-mounted hydrophone to acoustic release deck unit
5. deployments and recoveries will require operating with the stern-ramp cover in place, without pound boards, and with the ramp gates open.

User Equipment

1. half-height container with mooring equipment on O1 deck – with sediment traps strapped to its forward side for on-deck storage
2. ~10 cage pallets, and 3 large anchors on trawl deck (see suggested loading plan)
3. 4 SAZ sediment traps lashed to exterior of half-height on O1 deck
4. 2x acoustic release deck units and 2x hand-held hydrophones
5. Grappling canon and other mooring recovery equipment
6. Argos antenna fitted to monkey island and deck unit in bridge.

Special Requests

1. in port, spool on SAZ-16, and SOFS-4 moorings to net-drum. Use non-elastic working line on net drum, and separate moorings with planks and jackstraps.. Install wide check block on stern A-frame. Test all hydraulics.
2. in port, install mast with antenna on monkey island and deck unit on bridge for Argos communication
3. at sea, closely coordinate the CTD casts with ship operations – specifically to avoid releasing grey water or other wastes at this time.
4. Depart wharf with up to 3 members for piggy-back acoustic calibration project, and then offload them using work boat and on-load up to 3 members of science party.

Personnel List

Person	Employer	Role
1. Tom Trull	CMAR-UTAS-ACE	Chief Scientist
2. Stephen Bray	ACE CRC	Moorings, sediment traps
3. Mark Rosenberg	ACE CRC	Moorings, CTD, glider, floats
4. Peter Jansen	ACE CRC	Moorings, electronics
5. Eric Schulz	BOM	Moorings, meteorology
6. James LaDuke	CMAR	Moorings
7. Chris Coxson	UTAS student	Sediment traps
8. Ryan Walker	UWA student	Bio-acoustics
9. Hugh Barker	CMAR	MNF Computing Support
10. Lindsay MacDonald	CMAR	MNF Electronics Support
11. Rod Palmer	CMAR	MNF Voyage Manager
12. Tara Martin	CMAR	MNF Swath Mapping
13. Mark Rayner	CMAR	MNF Hydrochemist
14. Shoichiro Baba	JAMSTEC/CMAR	Mooring engineer
15. TBA		

As per AMSA requirements for additional berths on *Southern Surveyor*, the following personnel are designated as System Support Technicians and are required to carry their original AMSA medical and AMSA Certificate of Safety Training on the voyage:

Name	AMSA Certificate of Safety Training No.
Lindsay McDonald	ASO4157
Hugh Barker	BBO5460
Tara Martin	BBO5761
Rod Palmer	BBO5328
Mark Rayner	ASO2432

This voyage plan is in accordance with the directions of the Marine National Facility Steering Committee for the Research Vessel *Southern Surveyor*.

- ♦ all participants will be on watch on an as-needed basis
- ♦ cabin assignments are tentative, subject to discussions with MNF and ship staff.

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Chief Scientist