



2013

RV Southern Surveyor
program



voyagesummaryss2013_v03

SS2013_v03

Voyage: 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).

Voyage period

Start: 28/04/2013

End: 11/05/2013

Port of departure: Hobart, Australia

Port of return: Hobart, Australia

Responsible laboratory

ACE CRC

PB 80, Hobart, 7001, Australia

Chief Scientist

Dr. Tom Trull

CSIRO-UTAS-ACE CRC

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 carried out the annual servicing of SOTS moorings, along with a limited set of ancillary underway and on-station water column observations. The moorings deployed were:

- 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 recovered were:

- Pulse-9 mooring
- SOFS-3 mooring bottom (top recovered by RV *Mirai* in Jan 2013 after it broke loose.)
- (SAZ-15 mooring was left in the ocean to complete it's program, for recovery in 2014)

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

Voyage Objectives

This voyage was carried out to service the IMOS Southern Ocean Time Series Facility. Three new moorings were deployed (SOFS-4 air-sea flux mooring, SAZ-16 sediment trap mooring, and Pulse-10 biogeochemistry mooring). Two old moorings were recovered (Pulse-9 and the lower half of SOFS-3, with the top half having been recovered in January 2013 after prematurely breaking free). The third old mooring (SAZ-15) was left in the ocean to complete its sampling mission to August 2013, with recovery planned for March 2014. Additional ancillary work included CTD casts, towing of a continuous plankton recorder, zooplankton net drops, and a piggy-back project to calibrate the ship acoustic system. The voyage was successful in achieving its scientific goals, though there were some issues including difficulties with mooring deployment hardware and procedures, and a minor injury on deck. Overall, the crew and science party performed well despite occasionally rough seas.

Voyage Narrative

(narrative times are local – UTC+10 hours)

2013-04-24 Wednesday:

Mobilisation began with loading and spooling on of moorings, ahead of the Thurs. ANZAC holiday.

2013-04-26 Friday:

Loading and spooling on completed, while being filmed by the ABC Catalyst program.

2013-04-28 Sunday:

We departed at 0800 in strong northerly winds and anchored in Opossum Bay, where the ship acoustic systems were calibrated by the piggy-back team of Mark Lewis and Tim Ryan, practice moving the SOFS-4 anchor on deck was completed, 3 test CTDs were completed (the first two had Niskin lanyard miss-trips; 4 Winkler oxygen test bottles were collected from the final fully successful cast), and the 3 pairs of acoustic releases were separately lowered on the aft hydro-wire and successfully tested. During much of the operations a 3-person ABC Catalyst media crew carried out filming. They and the acoustic calibration team were then transferred to shore using the work-boat and the rest of the science party was loaded (Chris Coxson, Ryan Walker, Mark Rayner, Stelios Kondylas, Shoichiro Baba). We remained on anchor overnight to let high swells subside.

2013-04-29/30 Monday/Tuesday:

We departed Opossum Bay at 0800 Monday, targeting a dawn Wednesday arrival at the SOTS site, and deployed the CPR at 1330 in 100m water depth. The transit was moderately rough with winds of 35-40 knots (and occasionally more) and swell of 5-7m.

Large luminescent squid were occasionally sighted during the Tuesday night transit.

2013-05-01 Wednesday:

First light revealed remaining swells of ~4m, and winds still gusting to 30+ knots. We held a JHA/Toolbox meeting at 0800 and set up the deck in time for the surface float lift at ~1000. Overall this was a success, but there were two non-ideal aspects:

- 1) the release-hook self-triggered when the float was put in the water (over the side with the crane) and the load came off. *Recommendation – implement a means of ensuring the release hook does not release when unloaded, e.g. using a different release design and/or a breakable tape or tie.*
- 2) at this point the tag lines were not yet cleared and pulling them free brought the float back towards the boat where it rocked its bumper bar against the hull twice. No direct contact with the sensors occurred. *Recommendation – implement a means to rapidly release the tag lines, e.g. by using shorter and fewer lines, and having a link at the deck eye that can be quickly cut by a dedicated person, so that the tag-men can simply continue to pull on the long ends to retrieve the short ends.*

Deployment continued with careful attention to keep spooling-out speed much slower than through the water speed so that tension on the mooring line was maintained at all times. The sun came out and winds dropped below 25 knots and we were visited by a pod of ~30 pilot whales, as well as snowy albatrosses that sat on the water to watch. Anchor drop was completed successfully at 1710. With Thursday conditions looking acceptable but likely to degrade late in the day, we pushed on to crane down floats and traps to prepare for an early start on the SAZ-16 deployment Thursday morning, finishing the day at 2000 and collecting meteorological data near the SOFS-4 buoy overnight.

2013-05-02 Thursday:

We held a Toolbox for the SAZ-16 deployment at 0645, but by 0800 the weather had degraded to the point (~4 m swell, 30+ knots) where it was no longer prudent to deploy, especially in light of the forecast wind shift (from west to north-north-west) and intensification of conditions (5-6 m swell, 35 knots) for later in the day. Instead we carried out 2 CTDs to 1200m (with paired Niskin bottle trips at 10 depths) and sampled them for oxygen, dissolved inorganic carbon, alkalinity, salinity, nutrients, and at one depth (35m) coccolithophores. Mixed layer depth was ~120m, defined by the presence of cold, fresh water above warmer saltier water – presumably as a result of Ekman transport of the colder water northward. The first cast had some minor additional stratification at ~65m depth. A third CTD to 1000m depth to collect water for the CSIRO calibration facility was also completed. Plans to deploy the zooplankton net at 2100 were aborted as the swell had risen.

2013-05-03 Friday:

Weather remained rough and no operations could be undertaken, not even acoustic triangulation of the deployed moorings.

2013-05-04 Saturday:

In the morning the weather eased enough to complete acoustic triangulation of the SOFS-4 mooring, and in by 1600 eased just enough to begin deck work. We proceeded to deploy the SAZ-16 mooring in moderate winds 25-28 knots, and moderate to occasionally rougher seas. We approached from the east-northeast into fairly steep pitching waves, with occasional moderate rolls. The deployment was completed about 0130 Sunday morning, making for a very long day, especially on top of the previous two nights with poor conditions for sleeping. Unfortunately we had an accident during the deployment. During the release of the 4th sediment trap the release-hook suspended from the A-frame swung across the deck and struck Stephen Bray on his safety goggles, driving them into his face and causing lacerations and bruising above and below his left eye. After administering first aid, we completed the anchor deployment with deck personnel all wearing eye protection and with an added tag line above the release. Additional considerations of how best to minimize swing of the release hook are ongoing.

2013-05-05 Sunday:

In good conditions of 2-3m swell and 18-25 knot winds, we triggered the Pulse-9 acoustic releases about 1045, and then held a Toolbox on the bridge prior to starting recovery. The mooring came to the surface in a nice stretched-out line and we hand grappled the lowest float pack. Recovery was completed about 1930. Unfortunately during the towing of the mooring the surface float broke free, with two bungees parting near their tops and one near the bottom; search was carried out back along the track of the recovery, in darkness, but it was not found. Three night-time zooplankton net drops were completed and operations finished for the evening ~2100.

2013-05-06 Monday:

Craning began at 0800 to transfer recovered Pulse-9 gear to the O1 deck and bring Pulse-10 gear down. Spooling off of Pulse-9 was completed by 1600, and spooling on of Pulse-10 by 2000. Three daytime zooplankton net drops were completed. The SOFS-4 releases were stood-down (disabled), SAZ-16 was triangulated, SOFS-3 successfully queried in preparation for later recovery, and SAZ-15 queried to verify its state (for later recovery in 2014).

2013-05-07 Tuesday:

We held a Toolbox on the Bridge at 0730 and then began the Pulse-10 deployment. The difficult dual-lift was done without incident despite occasional moderate rolling. Deployment was completed at before 1600. We then triangulated the Pulse-10 mooring and collected meteorological data near the SOFS-4 mooring overnight.

2013-05-08 Wednesday:

We triggered the SOFS-3 acoustic releases about 0650, and held a Toolbox on the bridge at 0730 while waiting for it to surface. We recovered the floats and departed the SOTS site moving slowly while reeling in the rope to the net drum. We then deployed the CPR at 1130, and collected a set of 8 underway DIC and Alkalinity samples at hourly intervals.

2012-05-09 Thursday:

We transited to the ANFOG glider recovery site to attempt recovery, but this failed. We attempted to launch the workboat, but rough seas required this to be aborted after it was over the side but before it was in the water. During these operations the glider slipped under the ship and was damaged and lost. We re-continued, towing the CPR, towards Hobart.

2013-05-11 Friday:

08:00 arrive Hobart, demobilize

Principal Investigators:

A. *Eric Schulz*, BOM-CAWCR, E.Schulz@bom.gov.au

B. *Tom Trull*, ACE CRC – UTAS – CMAR – CAWCR, Tom.Trull@utas.edu.au

Mooring deployment locations

Mooring Deployment Locations			
SOFS-4 Deployed 1 May 2013			
Anchor Target Site	46° 45.880'S	141° 58.023'E	4550 m
Anchor Drop Site:	46° 46.795'S	141° 59.024'E	4610 m
Anchor Triangulated Site:	46° 46.628'S	141° 59.586'E	4654 m
Distance from Drop to Triangulated site: 0.37 nmiles			
Distance from Drop to Target site: 1.12 nmiles			
Watch Circle Radius: 2.1nm			
Surface Light: Amber flash, 6s frequency, 0.5s duration (two redundant light systems)			

Mooring Deployment Locations			
SAZ47-16 Deployed 4 May 2013			
Anchor Target Site	46° 47.400'S	141° 49.500'E	4530 m
Anchor Drop Site:	46° 47.7516' S	141° 48.8316'E	4496 m
Anchor Triangulated Site:	46° 47.603'S	141° 49.392'E	4531 m
Distance from Drop to Triangulated site: 0.41 nmiles			
Distance from Drop to Target site: 0.58 nmiles			

Mooring Deployment Locations			
Pulse-10 Deployed 7 May 2013			
Anchor Target Site	46° 55.800'S	142° 15.00'E	4300 m
Anchor Drop Site:	46° 56.3495'S	142° 16.0126'E	4236 m (4326 Swath)
Anchor Triangulated Site:	46° 56.268'S	142° 17.079'E	4332 m
Distance from Drop to Triangulated site: 0.73 nmiles			
Distance from Drop to Target site: 0.88 nmiles			
Watch Circle Radius: 1.1nm			
Surface Light: White flash, 3s frequency			

CTD Deployments

CTD deployments 04 and 06 were carried out to 1200m depth. Niskin bottle samples were collected at 10 depths (1000, 800, 600, 400, 200, 150, 120, 70, 35, 5m; paired Niskins with both sampled each depth) for dissolved oxygen, DIC, alkalinity, salinity and nutrients. Mounted sensors measured temperature, conductivity, dissolved oxygen, photosynthetically available radiation, phytoplankton fluorescence, and beam transmission. CTD 05 was aborted. An additional cast, CTD 07, was carried out to 1000m to collect water for the CMAR Calibration Facility.

CPR Deployments

Deployment 1: Outside mechanism 185, Inside Mechanism 0

Launch: UTC 29/04/2013 04:00 43° 40.7' S 147° 4.0' E

Recover: UTC 30/04/2013 20:35 46° 45.0' S 142° 08.7' E

Deployment 2: Outside mechanism 185, Inside Mechanism 1

Launch: UTC 08/05/2013 01:36 46° 33.228'S 142° 21.069'E

Recover: UTC 08/05/2013 23:07 45° 2.45'S 147° 18.38'E

Redeploy: UTC 09/05/2013 03:05 44° 45.445' S 147° 34.597' E

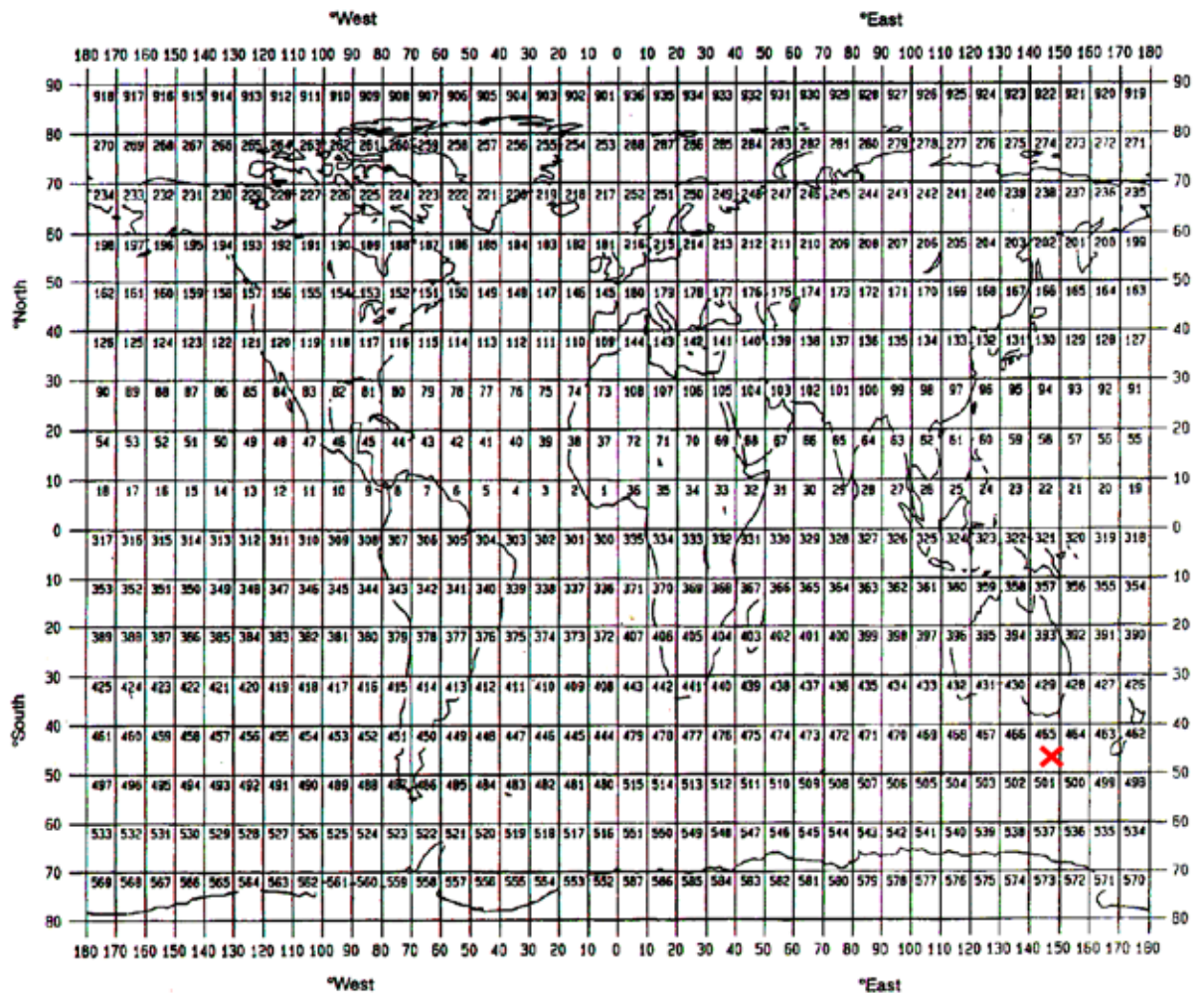
Recover: UTC 09/05/2013 08:05 44° 07.75' S 146° 32.1' E

Underway Samples

DIC and Alkalinity paired samples collected at 8 locations during the return transit to Hobart:

1. 8/5/2013 01:26 46 33.811 142 19.548 34.673 11.1 #41
2. 8/5/2013 02:31 46 28.640 142 32.969 34.734 11.5 #42
3. 8/5/2013 03:33 46 23.793 142 47.386 34.724 11.6 #43
4. 8/5/2013 05:11 46 16.655 143 10.588 34.550 10.5 #44
5. 8/5/2013 05:59 46 13.382 143 21.796 34.302 09.4 #45
6. 8/5/2013 08:35 46 02.441 143 88.869 34.373 09.7 #46
7. 8/5/2013 21:45 46 08.616 147 00.404 35.402 15.4 #47
8. 8/5/2013 23:22 46 01.037 147 21.582 35.436 15.6 #48

GEOGRAPHIC COVERAGE - INSERT 'X' IN EACH SQUARE IN WHICH DATA WERE COLLECTED



MOORINGS, BOTTOM MOUNTED GEAR AND DRIFTING SYSTEMS

Item No.	PI	Approximate position						Data Type	DESCRIPTION
		deg	min	N/S	deg	min	E/W		
1	A	46	46.628	S	141	59.586	E	M02, M06, M90, H71, D01, H90, H17, H21M90, H71, D01, H90, H17, H21	Deployed SOFS-4 anchored meteorological mooring with large surface tower buoy. Surface buoy moves within a 'watch circle' of 2.1 nmile and has a light that flashes amber every 6 seconds for 0.5 seconds. Recovered bottom half of SOFS-3 deployed 15 July 2012 (top half recovered in Jan 2013 after it broke free in Oct 2012).
2	B	46	56.268	S	142	49.392	E	H90	Deployed Pulse-10 anchored biogeochemistry mooring with small surface float (1m diameter, 80cm freeboard). Surface buoy moves within a 'watch circle' of 1.1 nmile and has a light that flashes white every 3 seconds. Recovered Pulse-9 deployed 17 July 2012.
3	B	46	47.603	S	141	49.392	E	H90	Deployed SAZ47-16 anchored sediment trap subsurface mooring.

SUMMARY OF MEASUREMENTS AND SAMPLES TAKEN

Item No.	PI	No.	Units	Data Type	DESCRIPTION
1	B	1	cast	H10	2 CTD casts to 1200m, sampled at 10 depths for analyses of nutrients, salinity, DIC, alkalinity, dissolved oxygen
2	A	700	miles	H71	Continuous monitoring of underway seawater supply for temperature, salinity for study of physical heat and mass flux
3	A	700	miles	M02	Continuous monitoring of incoming short and long-wave radiation for heat fluxes
4	A	700	miles	M06	Continuous monitoring of routine meteorological observations (wind, air temperature, humidity and pressure) for heat, mass and momentum fluxes
5	A	700	miles	M90	Continuous monitoring of precipitation for mass fluxes
6	B	4	drops	B03	6 Freefalling dropnet deployments collecting from surface to 90m depth, where it is cinched shut by the deployment line. Net diameter 60cm and mesh 100 microns.
7	B	700	miles	B03	Towed continuous plankton recorder

Curation Report

Item No.	DESCRIPTION
1	Water samples collected from the CTD and underway system are returned to CSIRO Marine and Atmospheric Research for gas and salinity measurements and then discarded following quarantine protocols.
2	Continuous Plankton Recorder and Dropnet samples are preserved with formaldehyde and provided to the IMOS SOOP Facility, CSIRO Marine and Atmospheric research.

Voyage track chart

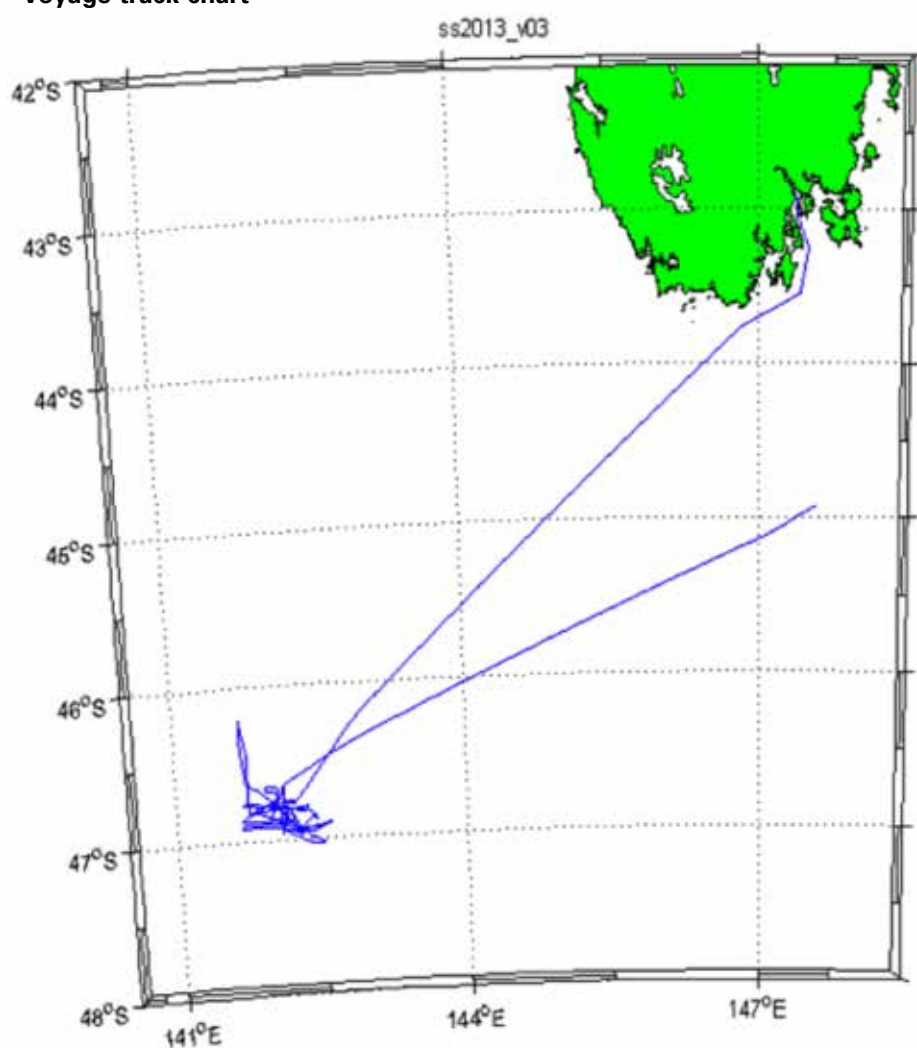


Figure 1. Ship track

General ocean area(s): Southern Ocean – Indian Sector

Specific areas: Subantarctic Zone southwest of Tasmania

Personnel list

Scientific Participants

Name	Affiliation	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, Scribe
8. Ryan Walker	UWA student	Bio-acoustics, Scribe
9. Hugh Barker	MNF-CMAR	Computing support
10. Lindsay McDonald	MNF-CMAR	Electronics support
11. Rod Palmer	CMAR	Voyage manager
12. Tara Martin	CMAR	Swath Mapping, Event Logging
13. Mark Rayner	CMAR	Hydrochemist
14. Shoichiro Baba	JAMSTEC/CMAR	Mooring engineer
15. Stelios Kondylas	MNF	Observer, Deck Video

Marine Crew

Name	Role
Michael Watson	Master
Mike Tuck	Chief Mate
Simon Smeaton	Second Mate
Fred Rostrom	Chief Engineer
Seamus Elder	First Engineer
Bill Bourne	Second Engineer
Warren Leary	Chief Cook
Charmayne Aylett	Chief Steward
Aaron Buckleton	Second Cook
Tony Hearne	CIR
Nathan Arahanga	IR
Peter Taylor	IR
Jonathon Lumb	IR
Matt Streat	IR

Acknowledgements

Thanks to the Master, Crew, MNF staff, and Science Team for all their efforts.

Tom Trull

Chief Scientist

2.7 m Modular Buoy with the following equipment:

- (1) ASMET with Iridium Telemetry L22 and L23
- (1) Pickup Rope Launcher 27.195 MHz
- (1) PMEL PC02 System, SN 156 IME 7
- (1) CSIRO MRU logger for (FLUTUS, Optode, LICOR PAR, loadcell, MRU) IME 300234011835840
- (1) LICOR PAR U-1905A-Q47470
- (1) XEOS Melo GPS tracker IME 300034012196210
- (2) Solar lights, Flood 8 sec, 0.5 sec On
- (1) TriAXIS Wave Height Meter TASD4811, IME 300025010311410
- (1) HRH 245, (1) SBE39 SN 5289

Sensors at 1.01 m Depth, FLUTUS 1803 Optode 1157 XEOS KIL0 IME 30023401084930 Aquadopp profiler 1 MHz

20 k lb. Load Cell at universal Sensing Systems PN10826-3 SN003

Note: All shackles above Corlaga to be shot peened and coated

Note: Custom swages built for using 7/8" shackles and 3/16" wire rope

HARDWARE DESIGNATION

Designation	Description
A	U-Joint, 1" Chain Shackles
B	1" EndLink, 7/8" Chain Shackles
C	7/8" Chain Shackles, 1" EndLink
D	3/4" Chain Shackles, 7/8" EndLink
E	7/8" Chain Shackles, 7/8" EndLink
F	3/4" Anchor Shackles, 7/8" EndLink
G	5/8" Chain Shackles, 7/8" EndLink
H	5/8" Chain Shackles, 7/8" EndLink
I	1/4" Master Link, (1) 5/8" Ch Sh, (1) 7/8" End Link, (1) 7/8" Anc Sh
J	7/8" Chain Shackles, 7/8" EndLink, 3/4" Chain shackles

Hardware w/spares

- (2) - 1" Chain Shackle **
- (2) - 1" Anchor Shackle
- (16) - 7/8" Chain Shackle **
- (16) - 3/4" Chain Shackle **
- (41) - 5/8" Chain Shackle
- (7) - 7/8" Anchor Shackle
- (3) - 3/4" Anchor Shackle **
- (2) - 1.25" Master Link
- (7) - 1" Weldless End Link
- (30) - 7/8" Weldless End Link

** = Shot peened and coated

DEPTH

8 m 7/8" Chain

15 m 7/8" T.B. Wire Rope

Temp (353264), PAR 201316

Temp (353265), PAR 201318

Temp (353266)

AWCP - cage 1.83 m long 104kg AW/75kg Ww SN555555

15 m 7/8" T.B. Wire Rope

Temp (353267), PAR 201319

Temp (353268)

Temp (353269)

Temp (353270)

Temp (353271)

Temp (353272)

Temp (353273)

SPE 3750P-SAP MicroGel (G.T.P) SN 6962

Temp (353276)

Temp (353277)

Temp (353290)

Temp (353291)

Temp (353292)

Temp (353293)

Temp (353294)

Temp (353295)

Temp (353296)

Temp (353297)

Temp (353298)

Temp (353299)

ADCP - cage 1.83 m long 136kg AW/100kg Ww SN 12747-1274

SBE375M 9184

300 m 7/8" T.B. Wire Rope

200 m 3/8" T.B. Wire Rope

350 m 3/8" T.B. Wire Rope

350 m 3/8" T.B. Wire Rope

Speed Wire/Nylon Termination < 100 M m 3/8" Wire 90 M 7/8" Nylon one piece, potted termination

2200 m 7/8" Nylon

1725 m 1" Corlaga

(40, 10 x 4pk) 17" Glass Balls on 1/2" Trawler Chain - CSIRO mounting ~ 20 meters

5 m 1/2" Trawler Chain

1 M chain with release links

5 m 1/2" Trawler Chain

20 m 1" Samson Nylon

5 m 1/2" Trawler Chain

Dualled Acoustic Release EGO Model 8242 25690 33556

Scope = 1.27 Water Depth = 4550 m

Est. Anchor Wt 7500 lbs 4000 kg in air

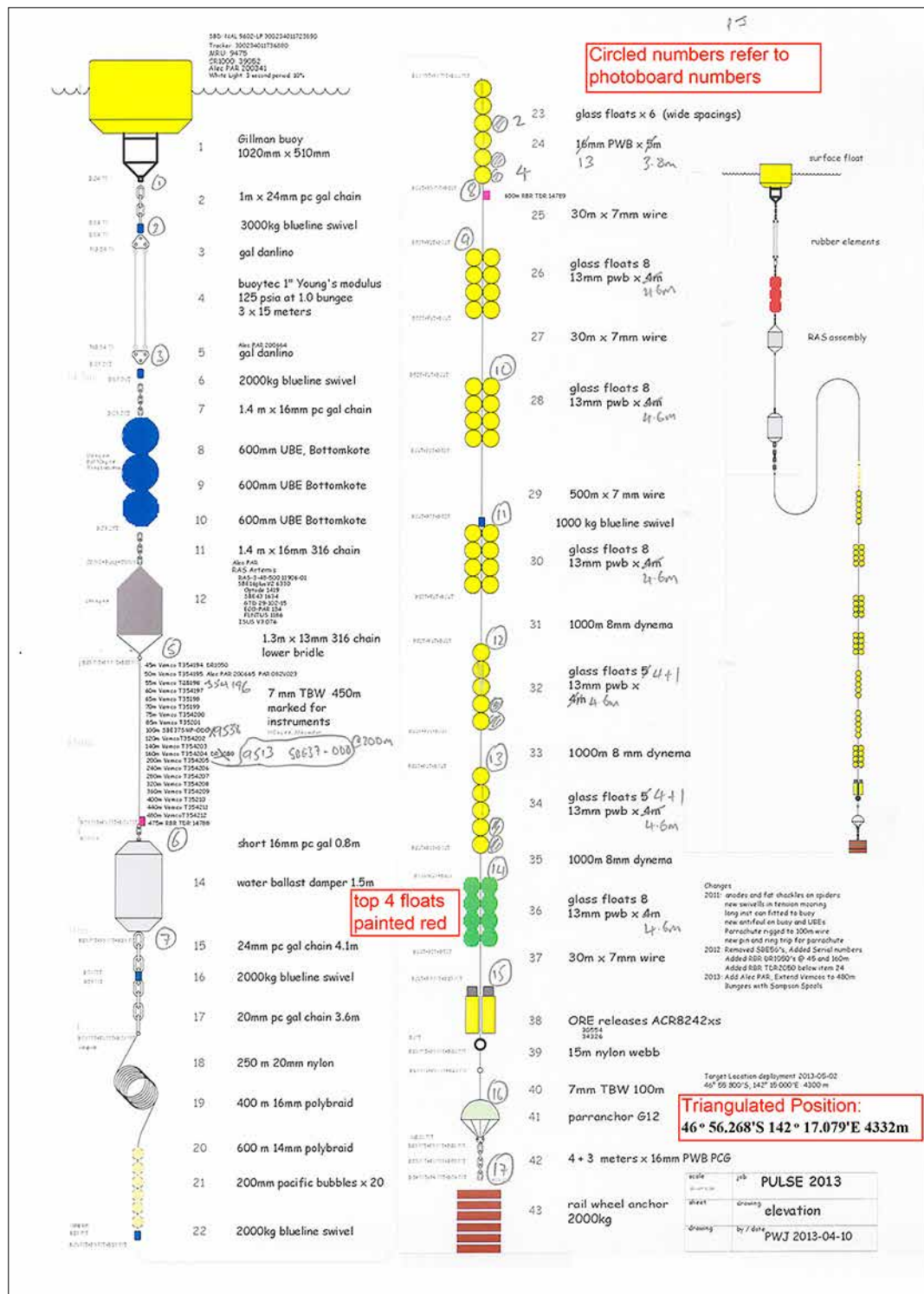
Southern Ocean Flux Station

Forth Deployment scope 1.27 - 2013-04-10

June 2013 - 2013-04-10

Proposed Location 46° 45.860'S, 141° 58.023'E 4550 m Deployment 2013-04-30

14 VOYAGE SUMMARY – SS2013_v03



Pulse-10 mooring diagram – as deployed



<h2 style="margin: 0;">RV Southern Surveyor</h2> <h3 style="margin: 0;">CTD Log Sheet</h3>							<div style="display: flex; justify-content: space-between;"> <div>Survey ss2013_v03</div> </div> <div style="display: flex; justify-content: space-between;"> <div>Date 01-May-2013</div> </div> <div style="display: flex; justify-content: space-between;"> <div>Deployment 4</div> </div> <div style="display: flex; justify-content: space-between;"> <div>CTD CTD21</div> </div>				
	Start	Bottom	End								
Time(UTC)	23:54:14	00:30:19	01:10:10								
Latitude	46 51.622S	46 51.738S	46 51.928S								
Longitude	142 01.104E	142 01.360E	142 01.698E								
Bottom Depth	4497	4517	4476								
Altimeter		98.9									

CTD data						Firing		Sample bottles					
Po...	Bot...	Dep...	Press.	Temp.	Sal.	Time	Ok	Sal.	DO	Nut.	DO T.	Po...	
24												24	
23												23	
22												22	
21	100	400	3.4	10.782	34.584	01:08:13	Yes	G21	457	421	10.2	21	
20	1066	400	3.5	10.785	34.584	01:07:39	Yes	G20	448	420	11.1	20	
19	1052	400	36.0	10.744	34.579	01:05:59	Yes	G19	447	419	11.1	19	
18	1062	400	35.9	10.751	34.580	01:05:24	Yes	G18	446	418	11.2	18	
17	1064	400	70.2	10.631	34.565	01:03:47	Yes	G17	444	417	10.0	17	
16	1024	400	69.8	10.647	34.567	01:03:07	Yes	G16	443	416	11.3	16	
15	1006	400	118.7	10.399	34.542	01:01:10	Yes	G15	442	415	10.9	15	
14	1059	400	118.0	10.399	34.541	01:00:33	Yes	G14	441	414	11.2	14	
13												13	
12	1063	400	150.5	10.109	34.791	00:58:55	Yes	G13	440	412	10.7	12	
11	1071	400	150.4	10.118	34.790	00:58:18	Yes	G12	439	411	11.1	11	
10	1010	400	202.0	9.555	34.700	00:56:33	Yes	G11	438	410	11.3	10	
9	1054	400	200.8	9.557	34.700	00:55:58	Yes	G10	437	409	10.5	9	
8	1058	400	399.6	9.097	34.628	00:51:16	Yes	G09	137	408	9.6	8	
7	1061	400	398.7	9.096	34.628	00:50:41	Yes	G08	134	407	9.8	7	
6	1050	400	602.3	8.684	34.572	00:46:09	Yes	G07	132	406	9.2	6	
5	1001	400	602.0	8.688	34.573	00:45:26	Yes	G06	130	405	9.2	5	
4	1068	400	801.1	7.598	34.489	00:40:42	Yes	G05	129	404	8.3	4	
3	1067	400	800.0	7.607	34.488	00:40:06	Yes	G04	122	403	8.2	3	
2	103	400	998.2	5.628	34.373	00:35:47	Yes	G03	119	402	6.7	2	
1	1060	400	997.1	5.652	34.373	00:35:12	Yes	G02	116	401	6.8	1	

Operator

Hugh

Samplers

msr

Comments

CTD deck logs – deployment 4

RV Southern Surveyor

CTD Log Sheet

	Start	Bottom	End
Time(UTC)	03:34:18	03:57:24	04:40:53
Latitude	46 56.016S	46 55.969S	46 56.052S
Longitude	142 14.818E	142 15.082E	142 15.689E
Bottom Depth	4390	4374	4331
Altimeter		98.9	

Survey ss2013_v03

Date 02-May-2013

Deployment 6

CTD CTD21

CTD data						Firing		Sample bottles				
Po...	Bot...	Dep...	Press.	Temp.	Sal.	Time	Ok	Sal.	DO	Nut.	DO T.	Po...
24												24
23												23
22												22
21	100	400	5.3	10.539	34.561	04:38:54	Yes		455	521	11.0	21
20	1066	400	5.1	10.539	34.561	04:38:12	Yes		451	520	11.1	20
19	1052	400	35.0	10.539	34.561	04:36:57	Yes		423	519	10.9	19
18	1062	400	35.3	10.542	34.561	04:36:24	Yes		199	518	10.9	18
17	1064	400	69.7	10.524	34.559	04:35:00	Yes		197	517	10.8	17
16	1024	400	68.5	10.532	34.560	04:34:16	Yes	B04	195	516	10.8	16
15	1006	400	118.8	10.424	34.543	04:32:37	Yes		196	515	10.8	15
14	1059	400	120.3	10.421	34.543	04:31:57	Yes		194	514	10.8	14
13												13
12	1063	400	155.4	9.968	34.763	04:30:08	Yes		193	512	10.4	12
11	1071	400	154.5	9.976	34.766	04:29:35	Yes		191	511	10.6	11
10	1010	400	206.6	9.437	34.679	04:27:00	Yes		189	510	9.9	10
9	1054	400	203.6	9.453	34.682	04:26:22	Yes	B03	187	509	10.0	9
8	1058	400	400.2	9.083	34.628	04:21:18	Yes		186	508	9.7	8
7	1061	400	400.3	9.086	34.629	04:20:43	Yes		185	507	9.6	7
6	1050	400	600.6	8.674	34.570	04:15:43	Yes		184	506	9.0	6
5	1001	400	599.3	8.673	34.570	04:14:25	Yes	B02	183	505	9.1	5
4	1068	400	798.6	7.234	34.471	04:09:10	Yes		182	504	8.1	4
3	1067	400	798.6	7.217	34.470	04:08:32	Yes		180	503	7.9	3
2	103	400	996.3	5.607	34.378	04:03:35	Yes		179	502	6.7	2
1	1060	400	998.5	5.602	34.377	04:02:28	Yes	B01	178	501	6.6	1

Operator

Hugh

Samplers

Comments

CTD deck logs – deployment 6

<h2 style="margin: 0;">RV Southern Surveyor</h2> <h3 style="margin: 0;">CTD Log Sheet</h3>							<div style="display: flex; justify-content: space-between;"> <div>Survey ss2013_v03</div> </div> <div style="display: flex; justify-content: space-between;"> <div>Date 02-May-2013</div> </div> <div style="display: flex; justify-content: space-between;"> <div>Deployment 7</div> </div> <div style="display: flex; justify-content: space-between;"> <div>CTD CTD21</div> </div>				
	Start	Bottom	End								
Time(UTC)	06:19:09	06:42:18	07:05:53								
Latitude	46 54.822S	46 54.867S	46 55.090S								
Longitude	142 30.546E	142 30.503E	142 30.429E								
Bottom Depth	4339	4339	4339								
Altimeter		98.9									

CTD data						Firing		Sample bottles				
Po...	Bot...	Dep...	Press.	Temp.	Sal.	Time	Ok	Sal.	DO	Nut.	DO T.	Po...
24												24
23												23
22												22
21	100	400	993.7	5.683	34.383	06:47:19	Yes					21
20	1066	400	993.1	5.683	34.382	06:47:07	Yes					20
19	1052	400	992.9	5.683	34.382	06:46:56	Yes					19
18	1062	400	993.1	5.683	34.382	06:46:45	Yes					18
17	1064	400	994.3	5.678	34.383	06:46:34	Yes					17
16	1024	400	995.1	5.680	34.382	06:46:23	Yes					16
15	1006	400	993.1	5.681	34.382	06:46:12	Yes					15
14	1059	400	993.4	5.677	34.382	06:46:01	Yes					14
13												13
12	1063	400	994.6	5.678	34.382	06:45:50	Yes					12
11	1071	400	995.4	5.675	34.382	06:45:39	Yes					11
10	1010	400	996.5	5.669	34.382	06:45:28	Yes					10
9	1054	400	998.0	5.662	34.382	06:45:17	Yes					9
8	1058	400	997.8	5.660	34.382	06:45:06	Yes					8
7	1061	400	999.4	5.653	34.381	06:44:55	Yes					7
6	1050	400	999.4	5.651	34.382	06:44:44	Yes					6
5	1001	400	999.6	5.656	34.381	06:44:33	Yes					5
4	1068	400	999.1	5.655	34.382	06:44:18	Yes					4
3	1067	400	999.2	5.657	34.382	06:43:34	Yes					3
2	103	400	1001.0	5.657	34.381	06:43:18	Yes					2
1	1060	400	1000.8	5.653	34.382	06:42:47	Yes					1

Operator

Hugh

Samplers

Comments

CTD to 1000m for Water for Calibration lab

CTD deck logs – deployment 7

CSR/ROSCOP PARAMETER CODES

METEOROLOGY

M01	Upper air observations
M02	Incident radiation
M05	Occasional standard measurements
M06	Routine standard measurements
M71	Atmospheric chemistry
M90	Other meteorological measurements

PHYSICAL OCEANOGRAPHY

H71	Surface measurements underway (T,S)
H13	Bathythermograph
H09	Water bottle stations
H10	CTD stations
H11	Subsurface measurements underway (T,S)
H72	Thermistor chain
H16	Transparency (eg transmissometer)
H17	Optics (eg underwater light levels)
H73	Geochemical tracers (eg freons)
D01	Current meters
D71	Current profiler (eg ADCP)
D03	Currents measured from ship drift
D04	GEK
D05	Surface drifters/drifting buoys
D06	Neutrally buoyant floats
D09	Sea level (incl. Bottom pressure & inverted echosounder)
D72	Instrumented wave measurements
D90	Other physical oceanographic measurements

CHEMICAL OCEANOGRAPHY

H21	Oxygen
H74	Carbon dioxide
H33	Other dissolved gases
H22	Phosphate
H23	Total – P
H24	Nitrate
H25	Nitrite
H75	Total – N
H76	Ammonia
H26	Silicate
H27	Alkalinity
H28	PH
H30	Trace elements
H31	Radioactivity
H32	Isotopes
H90	Other chemical oceanographic measurements

MARINE CONTAMINANTS/POLLUTION

P01	Suspended matter
P02	Trace metals
P03	Petroleum residues
P04	Chlorinated hydrocarbons
P05	Other dissolved substances
P12	Bottom deposits
P13	Contaminants in organisms
P90	Other contaminant measurements
B01	Primary productivity
B02	Phytoplankton pigments (eg chlorophyll, fluorescence)
B71	Particulate organic matter (inc POC, PON)
B06	Dissolved organic matter (inc DOC)
B72	Biochemical measurements (eg lipids, amino acids)
B73	Sediment traps
B08	Phytoplankton
B09	Zooplankton
B03	Seston
B10	Neuston
B11	Nekton
B13	Eggs & larvae
B07	Pelagic bacteria/micro-organisms
B16	Benthic bacteria/micro-organisms
B17	Phytobenthos
B18	Zoobenthos
B25	Birds
B26	Mammals & reptiles
B14	Pelagic fish
B19	Demersal fish
B20	Molluscs
B21	Crustaceans
B28	Acoustic reflection on marine organisms
B37	Taggings
B64	Gear research
B65	Exploratory fishing
B90	Other biological/fisheries measurements

MARINE GEOLOGY/GEOPHYSICS

G01	Dredge
G02	Grab
G03	Core – rock
G04	Core – soft bottom
G08	Bottom photography
G71	In-situ seafloor measurement/sampling
G72	Geophysical measurements made at depth
G73	Single-beam echosounding
G74	Multi-beam echosounding
G24	Long/short range side scan sonar
G75	Single channel seismic reflection
G76	Multichannel seismic reflection
G26	Seismic refraction
G27	Gravity measurements
G28	Magnetic measurements
G90	Other geological/geophysical measurements