

MoorSPICE Cruise Report

R/V Thomas G. Thompson

Noumea - Solomon Sea-Bismarck Sea - Noumea

28 February – 31 March 2014

I. Introduction:

Scientific Objectives:-

The key motivation for MoorSPICE is to obtain a quantitative view of the mean and variability of the equatorward South Pacific western boundary current flow through the main exit channels of the Solomon Sea to the equatorial Pacific, as well as the sea water transformations when transiting through the Solomon Sea. Each pathway possibly means different water mass combinations, and implies a different time scale for water to reach the equator. The ratio of transport through each of the straits may also vary with time. MoorSPICE is designed to provide an instant description of the circulation and properties, and a time series of the transport and property fluxes, and their variability from intraseasonal to annual time scales.

MoorSPICE is an international program that includes France, Japan, Papua New Guinea and U.S.A. The MoorSPICE program consists of mooring deployments of current meter and T/S sensors within the Solomon Sea. The moorings were set more-or-less simultaneously in Vitiaz Strait (USA), St. Georges Channel (USA) and Solomon Strait (France) during the Pandora Cruise on the R/V Atalante in July-August 2012. JAMSTEC (Japan) mooring deployments occurred simultaneously north of New Ireland. These Japanese moorings were recovered in late February just days before our cruise began.

Cruise Objectives:-

Specific objectives of this MoorSPICE cruise are:

- To recover the four moorings in Solomon Strait, two moorings in St. Georges Channel and three moorings in Vitiaz Strait deployed as part of the Pandora 2012 Cruise.
- To redeploy two moorings in Vitiaz Strait and two moorings in Solomon Strait
- To undertake a CTD/LADCP and hydrographic (oxygen, salinity and nutrient bottle samples) survey of the waters in the Solomon Sea and Bismarck Sea
- To undertake a biological survey to study nitrogen fixation (and hence contribution to primary productivity) of diazotrophs (i.e. cyanobacteria, specifically *trichodesmium*) in the epipelagic (near surface, light controlled) and mesopelagic (autotrophic zone to ~ 1000 m).
- To provide training for seven graduate and undergraduate students on ocean mooring technology, the oceanography of the Southwest Pacific and other topics.

Itinerary:

Depart: Noumea, New Caledonia: 12:45 28 February 2014

Arrive: Noumea, New Caledonia: 09:00 31 March 2014

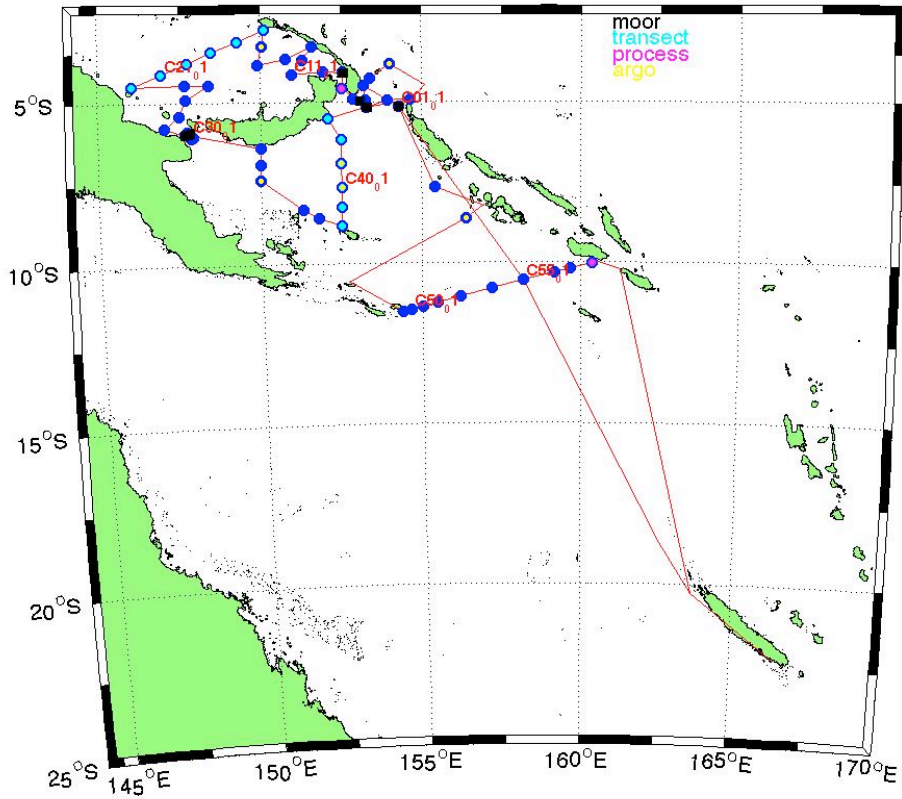


Figure 1: Location of Hydrographic CTD/LADCP Stations (blue), Biology Transect (cyan) and Process (pink) stations, Argo float deployments (yellow) and MoorSPICE moorings (black) recovered and deployed during the MoorSPICE Cruise.

II Cruise Narrative

A brief narrative of the daily events of the cruise is given. The cruise track, CTD/LADCP and hydrographic/biology sampling, and location of the moorings are shown in Figure 1. Unless specified, local time is used in the following, GMT + 11 hours (Noumea time). The positions and times of the mooring recoveries are given in Table 1 and the CTD/LADCP/Biology casts are in Table 2. Cruise personnel are listed in Table 3.

28 February 2014

Departed round midday as we were waiting for a ship part to arrive from the airport. The loading over the past few days went relatively smoothly. The Thompson docked at Quai Fed near downtown Noumea and hiring a mobile crane for a few hours made loading the SIO and French container relatively easy, then we palette-jacked the anchors etc. out of the SIO hired container. Smooth seas for our north-west heading.

We have seven students on board ranging from undergraduates to graduate students – 3 (Cyril Germaineaud Aquilin, Sammy Metref and Flo Garnier) from France, 1 (Lydia Keppler) from Fiji (via Germany), 1 (Sri Nandini) from Noumea (via Fiji), 1 (Marion Alberty) from SIO and 1 (George Amba) from Papua New Guinea. They are all excellent and none have been to sea on an oceanographic cruise before. Marion has started a blog which all the students will contribute to: <http://moorspice2014.wordpress.com>

We also have a contingent of three biologists (Hugo Berthelot, Mar Benevides, Veronique Cornet-Barthwaux) on board studying nitrogen fixation in cyanobacteria (sp. *Trichodesmium*).

We will deploy six Argo floats in the marginal seas (the first ever in the Bismarck Sea) and Marion and Lydia had set-up the Argo floats in port. They also set-up the LADCP on the 24 10-litre bottle rosette with the help of Spencer.

1 March 2014

Had a brief science meeting with the Captain Eric, Marine Tech Patrick and First Mate Damien about safety and ship-board procedure. Rain and lightening off in the distance.

Our first CTD test casts (~14:00 C00_01 and C00_02) were done today since the winch and wire were not working well during the last cruise. Seemed to work well enough. Tested both wires so did two casts.

2 March 2014

Still lovely seas and fair winds. Getting deck and all ready for mooring recovery etc.

3 March 2014

Still great sailing. Winds out of the north-west. Great sunsets. Had science talks in the library tonight that were well attended. Sophie, Janet, Hugo and Mar gave overviews of SPICE, MoorSPICE and the Biology program respectively. Did test cast C00_03 and closed all bottles at 1000 m to test for bottle leaks in oxygen analysis.

Named our shift Kunul (04:00-16:00) after the PNG bird of paradise and Vonu (16:00-04:00) after a Fijian turtle.

4 March 2014

Heard from Jules Hummon about a large eddy that was clearly visible in the sADCP data, but

could benefit from remotely sensed measurements so we could get a better visualization of size. Sophie said they are often eddies in this region at the entrance to the Solomon Sea that propagate westward as per the Qiu et al. paper on interseasonal variability.

Had science talks from Sri, Lydia, Marion and George.

5 March 2014

Solomon Strait M3: Depth: 2617; Start Position: 5°S 08.447S; 154°17.81E. Recovery Began mooring recovery after C01_01 station at around 07:35 and Lydia sites buoy port-side aft around 300 m from ship. First float on deck around 08:30 and all on board around 12:45. Mooring quite weedy except for in the location of the oxygen minimum. The cable tended to become twisted because there were no swivells on the line.

Had science talks from Cyril, Flo and Sammy

6 March 2014

Solomon Strait M2a: Depth 2900; Start Position: 5° 09.424'S, 153° 17.016E. Recovery. Released and spotted around 08:10. Top float on board around 09:10 and acoustic releases on board around 12:45. Again, wire twisted and doubled over. All instruments in line without swivells.

Solomon Strait M2a: Depth 2560; Start Position: 5° 09.312'S, 153° 19.686E. Recovery. Released and spotted around 13:25. Top float on board around 14:22 and acoustic releases on board around 16:20. All well – some weed etc. on big cheese float.

Strong winds heading toward St. Georges Channel to undertake night CTD stations. Winds well above 30-40 knots – way too strong to be on deck. Strong current out of St. George and strong undercurrent into the channel. Headed up to NE side of New Ireland to undertake CTD station.

7 March 2014

Solomon Strait M1: Depth 2050; start position: 4° 57.408S; 153° 6.149E. Mooring released and appears at 10:01 on port side. Top float on board 11:20 and releases on board ~14:00.

After mooring recovery headed up toward St. George channel. Winds relatively strong (~ 30 knots T) but not as bad as yesterday, and abated somewhat for CTD#9.

8 March 2014

On station at St George Channel around 04:00 with surface current (0-150 m) from NNW and opposing undercurrent (200-300 m). Both opposing currents were about 0.5 m/s (~1 knot).

St Georges West: Depth = 1243 m; Ranged in Position: 152° 31.117'E; 4° 6.820'S. Recovery.

We originally stood off this mooring about 300 m, but ranging at 09:05 suggested we were ~2000 m off site. Had some miscommunication about mooring site, but eventually the ADCP float was sighted at 09:35 not far from the ranged in position about 1.5 nm from TGT. Small boat recover used, and hooked into releases since top float was missing. Bought on board at 10:45 and finished recovery 12:17.

St Georges East: Depth = 1433 m; Ranged in Position: 152° 33.80'E; 4° 6.17'S, Recovery.

Began recovery around 14:08 just north of expected position. Releases sent vertical response, but took ages to release – not clear why although sometimes releases can be temperamental and not listen! Eventually released at 15:22 about 300 m starboard. At 16:35 sent small boat to hook into ADCP buoy. Again the top float was missing so lost many seacats and temperature loggers. Bought ADCP float on board at 17:35. Absolutely teaming rain but warm and finished around

19:05. The students very much enjoyed helping on the mooring recovery work (at least it seems that way!).

9 March 2014

Fair seas and mild winds. Continuing our saw-tooth survey through the Bismarck Sea. Strong barrier layers and salinity and oxygen variability. Ship lost power at 10:13 which meant the sADCP as down until power restored at 10:56. Beautiful sunset near coast of New Ireland.

10 March 2014

Continuing fair conditions in the Bismarck sea. Extremely interesting profiles. Strong flow toward equator along coast, but perhaps evidence of an eddy in the Bismarck Sea – will check this out on the altimeter and other remotely sensed data. After leaving Station C16_01 crossed a very strong surface front where the clarity of the water changed color and a strong convergence zone trapping logs and other large debris, and attracting many birds. Another beautiful sunset near Hanover Island off coast of New Ireland. Marlin spotted.

11 March 2014

Start of Biology transect across the Bismarck Sea doing double-dip sampling. Also Mar is testing oxygen consumption of deep critters so we are doing extra oxygen samples.

12 March 2014

Biology transect continues. Finished at KarKar Island which has a volcano on it (crater at 1200 m and another peak at 1800m) that erupted in January 2013 apparently.

13 March 2014

Continued CTD surveys in Bismarck. Station C26_01 right near Tolokiwa island which is the shape of a classic conical volcano, with lovely white puffy clouds on top. Off to the SW is Long Island. The current is starting to get stronger toward the NW. Feeling the influence of water out of the Vitiaz Strait. Many ships in strait as major thoroughfare to/from Australia and Asia.

14 March 2014

Began 75 kHz shipboard ADCP survey across the mooring line heading from west to east beginning probably around 01:30. Ship seems to maintain a 9.5 knot steam. Many ships in the area (it is currently 03:30 local and I see five very close to our position). As expected, the current is again strongly to the NW, about 1.5 knots in the upper layer (40-65 m). There is a significant undercurrent (150-300 m) of close to 1 m/s in the same direction. Finished two complete ADCP surveys at eastern end (WP 88) at ~ 04:15 then headed to Vitiaz Middle (WP 84), back to western end (WP87) and then to Vitiaz West (WP85).

Vitiaz West: Depth = 978 m; Ranged in Position: 147° 39.96'E; 5° 58.69S. Recovery. At 07:30 at mooring site ranged A/R 32296 and consistent signals returned of 938m. Strong NW current of ~ 1m/s all the way down to ~400 m. Moved ship ~ 300 m port abeam of mooring site. Released mooring 3-5 times and at 08:30 Spencer spotted yellow float (~525 m). Small boat was used in recovery to hook the yellow buoy. Only the bottom part of this mooring was recovered – actually much more recovered above the bottom flotation at 525 m was recovered than expected,

from around 200 m down, although many of the upper instruments were flooded. Wire rub cuts were visible along clamps and also along the line from rubbing. Mooring complete at 10:53.

Vitiaz Middle: Depth = 1130 m; Ranged in Position: 147° 46.68'E; 5° 56.64'S. Recovery. Ranged in AC35943 at site 13:10. Todd spotted orange syntactic at 13:15 but again the top yellow float was not visible. Small boat was used in recovery. In the end recovered all instruments except SBE39 just below top floatation. Rabiit ears antennae were up but no messages were received from iridium. Instruments were extremely clean except around location of AAIW from 900-1000 m. At top of mooring spotted large fish that looked like a manta ray, then Todd spotted what was later identified as an oar fish around the releases. These are rare and like best to live at ~1000m.

Undertook bathy survey for deployment of Vitiaz Middle (Va and Vb) moorings tomorrow. Completed second process CTD cast for biologists.

15 March 2014

Undertook multiple (3 crossings?) ADCP surveys across Vitiaz St. until mooring recovery time. Subsurface maximum toward the NW is still extraordinarily strong at ~0.8-1 m/s. Came on station (WP 86) at 05:00 local time.

Vitiaz East: Depth = 900 m; Ranged in Position: 147° 50.05'E; 5° 54.98S. Recovery. Strategy has been to go directly to the ranged in position of the mooring and drop the transducer in to determine the slant (hypotenuse) distance from the releases. We then backed off ~250-300 m so that mooring was directly 90° of our starboard (where we had the deckbox and pinger) and more aft than forward. Ranged in beginning around 07:00 and release 154142 enabled about 07:05 am. As with previous mooring recoveries we had to enable the releases a number of times, but at 07:49 am the soundings indicated that the releases were 267 m away and on their way up. At 08:05 the large yellow buoy became visible but nothing else: could be that the 3 glass balls at 800 m do not have enough flotation. Small boat used to hook into the yellow buoy. The wire had been cut (fragmented wires) just below the ADCP buoy at 320 m, and the 248 m wire length between the ADCP and the 35" yellow buoy had doubled back and wrapped around the 229 m shot beneath the yellow bouy. Recovered both the SIO-T and SBE56 on that doubled segment. All instruments very clean. Completed recovery around 09:55.

Vitiaz Vb: Deployment. Did drift test and vessel wanted to go eastward. Started deployment round 13:00 about 500 m due east of release point. Mooring tended to lay out to port but not too much strain. Wind ~15 knots out of WNW and currents fairly consistently now about 1.5 knots to NNW. Anchor dropped round 15:22. Then triangulated in position after.

Ranged in Position: 5° 56.911'S; 147° 44.043'E; depth = 1085

Completed 3 CTD stations (C30-32) to south of Vitiaz St.

16 March 2014

Continued with ADCP crossings after the CTD stations. Began west-east ADCP survey at 03:55 and finished at 06:12. At mooring site deployment Vitiaz a wind is 15 knots from NNW and current is WNW.

Vitiaz Va: Deployment. Had to replace capstan switch but then mooring deployed from ~09:30 fairly smoothly in ideal conditions without much wind or waves in cooler overcast conditions. Deployment completed by 12:30 followed by triangulation.

Ranged in Position: 5° 56.971'S; 147° 42.957'E; depth = 1080 m

17 March 2014

Began next CTD/LADCP north-south sections in the North Solomon Sea under calm ideal conditions with a beautiful moon shining the way. Later the long transit down to C36_01 started under the full moon rising.

18 March 2014

Started CTD/Biology Transect in North Solomon Sea just off WoodLark island. Calm conditions with an autumn nip in the air. Had to do a jog-leg between C38 and C39 as marked as uncharted (unsurveyed) territory on the map.

19 March 2014

Continued CTD/Biology transect in North Solomon Sea. Undertook Kraken – our 5700 m cast in the New Britain Trench. Extremely calm conditions, no wind, no current – becalming. Sampled every bottle with oxygen and Vonu did an excellent job of completing this turn-around rapidly. Finished last transect station C43 around midnight. Beautiful short sunset but with a vivid green flash!

20 March 2014

Reached WP 50 on SE coast of New Britain at 06:40 to begin ADCP transect across St Georges channel, reached WP 9 at 09:10 and saw the incredibly beautiful and rugged SW coast of New Ireland. Then on to M2 mooring deployment arriving around 12 noon.

Solomon Strait M2: Deployment. Set up around 2.5 km SE from mooring site (2.3km mooring). Again, the conditions are freakishly calm – with no wind or current to speak of, and extremely hot. There was a 180° reversal of currents from no current to the SW to no current toward the NE – this is likely tidally driven. Began deployment around 12:30 and anchor dropped around 16:19. Because of the stillness of the surface I was able to watch the top ADCP float from the 02 level deck until 16:27 when it disappeared from sight but leaving a streaky scar across the ocean surface where it had been drawn down into the deep.

Anchor Drop Position: 5° 07.99'S; 153° 20.28'E (ranged 5° 08' 5'' S; 153° 20' 22'' E); target depth = 2350 m

Completed a reoccupation of CTD station C44_01 and did a CTD/LADCP profile at M2a location (WP7/ CTD4_01) with biology using bottles as a process station. Lovely night for stars on the bow with bioluminescence sparking our wake.

21 March 2014

Undertaking ADCP survey out in the alley along the NE edge of Solomon Strait. Arrived WP4 at around 03:17 and currents then toward SE (unexpectedly!). Arrive WP52 at 06:20am to a beautiful sunrise. Completed CTD station C45_01 and found unexpected salinity minimum associated with an oxygen minimum. Unclear of the source of this water mass. Much interleaving evident in oxygen and salinity. Probably coming up the east side of the Solomon Islands and mixing with that through Solomon Strait.

22 March 2014

TSG system out from 04:00 until 16:00 this evening.

Solomon Strait M3: Deployment. Set up around 3 km SE from mooring site (2640 m mooring).

Conditions not quite as hot as yesterday. Current 0.5 knots from NE and wind at ~10 knots. Began deployment around 07:30 when cooler, had to tow about 400 m and anchor dropped around 11:57. Because of the stillness of the surface I was able to again watch the top ADCP float from the 02 level deck until 12:07 when it disappeared.

Anchor Drop: 5° 8.07'S; 154 18.138'E

Ranged in Position: 5° 8.12'S; 154 18' 6"E; depth 2618

23 March 2014

At 04:00 undertook Station Krakenette at 4630 m deep on sill between the New Britain trench basin of the Solomon Sea and the southern basin of the Solomon Sea at around 04:00. En route to Giza to download data from Send Moorings and PIES. Arrived at ~ 15:15 but signal from dynamic height mooring indicates a flat battery in the modem so went on to PIES location (in ~300 m water depth – very close to a large fringing reef). Success here with a relatively quick download. Had wonderful DIY barbie on the bow overlooking the reef in clear calm conditions. Couldn't ask for a better spot! Then a fabulous sunset to top it off. Undertook station deep C48_01 at 22:00 in the south Solomon Sea deep basin to explore deep oxygen signal.

24 March 2014

Relatively quiet day with ADCP survey underway to Misima. Arrived around 10:30 pm and Spencer downloaded mooring data until 12 midnight, then spent remainder of time till round 04:00 trying to download PIES data, but the instrument would not talk to us! We undertook a bathy survey of about 1 km west-east across the mooring site until 04:30 then watched the sunrise.

25 March 2014

Began multiple yo-yo CTD stations at C50 around 17:00. Only have enough time to spend 9hrs at each end. Spencer caught a large yellow-tail.

26 March 2014

Continued CTD transect survey along NE heading at entrance to Solomon Sea. Heading means we have no internet connection. Continue to pack up and prepare for port arrival on 31 March.

27 March 2014

Continuing CTD transect at entrance to Solomon Sea. Started last repeat station around 20:30 with bottle samples for PO (including double oxygen samples so that both Sammy and Florent can perform analysis on C57_02).

28 March 2014

Finished last CTD at 05:15. Absolutely magical sunrise off Gaudalcanal before ADCP transect across Indispensible Strait.

29 March 2014

Underway to Noumea, packing up and ping-pong. Heaviest seas so far, swell out of SE but not too bad.

Table 1: MoorSPICE mooring recoveries and deployments.

Mooring	Date/Time (GMT) Recovered	Date/Time (GMT) Deployed	Anchor Drop	Ranged in Position	Depth
St Georges West	07/03/2014 23:53	20/07/2012 00:47	152° 31.155'E 4° 06.925'S	152° 31.116'E 4° 6.82'S	1243 m
St Georges East	08/03/2014 06:35	20/07/2012 05:55	152° 33.86'E 4° 06.37S	152° 33.86'E 4° 6.17'E	1433 m
Vitiaz East	13/03/2014 20:30	28/07/2012 01:06:08	147° 50.266'E; 5° 55.129S	147° 50.05'E; 5° 54.98S	900 m
Vitiaz Middle	15/03/2014 02:15	29/07/2012 00:13:06	147° 46.894'E 5° 56.829S	147° 46.68'E; 5° 56.64'S	1130 m
Vitiaz West	14/03/2014 20:05	28/07/2012 06:00:24	147° 40.188'E; 5° 58.873S	147° 39.96'E; 5° 58.69S	980 m
Vitiaz-a		15/03/2014 04:22:00		5° 56.911'S; 147° 44.043'E;	1085 m
Vitiaz-b		16/03/2014 01:30:00		147° 42.957'E 5° 56.971'S;	1080 m
Solomon Strait M1	06/03/2014 23:01			153° 16.149'E 4° 57.408'S	2050 m
Solomon Strait M2a	05/03/2014 21:03			153°17.016'E 5° 9.424'S	2560 m
Solomon Strait M2b	06/03/2014 02:24			153°19.686'E 5° 9.312'S	2710 m
Solomon Strait M3	04/03/2014 20:35			154° 17.81'E 5° 8.447'E	2617 m
Solomon Strait New M2		20/03/2014 01:30:00		153° 20.28'E 5° 7.99'S	2340 m
Solomon Strait New M3		21/03/2014 20:45		154° 18.138'E 5° 8.071'S	2613 m

Table 2: Event Log: Chronology of CTD/LADCP stations, Argo deployments and mooring work.

Station	Cast	Lat (Start)	Long (Start)	Type	CTD Depth (m)	Water depth (m)	Start cast (GMT)
C0	01	18 42.2953 S	162 35.1921 E	CTD test	1350	N/A	01 Mar 2014 04:01:11
C0	02	18 42.3059S	162 35.1939 E	CTD test	999	N/A	01 Mar 2014 06:53:47
C0	03	10 33.5 S	158 11.45 E	CTD test	999	1989	03 Mar 2014 05:57:00
C01	01	05 08.554 S	154 17.551 E	CTD	2594.8	2614	04 Mar 2014 16:46:56
M3	N/A	05 08.447 S	154 17.81 E	IRD Mooring rec	N/A	2617	04 Mar 2014 20:35
C02	01	04 56.0563 S	154 38.8968 E	CTD	989	1010	05 Mar 2014 04:17:19
C03	01	04 56.3658 S	153 57.1520 E	CTD	3470	3500	05 Mar 2014 09:37:06
C04	01	05 10.095 S	153 16.9 E	CTD	2638	2660	05 Mar 2014 18:27
M2a	N/A	05 09.424 S	153 17.016 E	IRD Mooring rec	N/A	2560	05 Mar 2014 21:03
M2b	N/A	05 09.312 S	153 19.686 E	IRD Mooring rec	N/A	2710	06 Mar 2014 02:24
C05	01	04 54.3083 S	152 52.2315 E	CTD	725	746	06 Mar 2014 08:43:56
C06	01	04 29.9909 S	153 11.3389 E	CTD	3033	3100	06 Mar 2014 13:28:39
C07	01	04 56.3786 S	153 14.8065 E	CTD	3526	3580	06 Mar 2014 18:23:40
M1	N/A	04 57.408 S	153 16.149 E	IRD Mooring rec	N/A	2050	06 Mar 2014 23:01
C08	01	04 34.2332 S	152 31.3370 E	CTD	2520	2548	07 Mar 2014 07:25:03

C08	02	04 35.1830 S	152 31.2962 E	Process	600	2614	07 Mar 2014 10:34:43
C09	01	04 04.5961 S	152 32.4182 E	CTD	1588	1625	07 Mar 2014 14:43:55
MSG	West	04 06.82 S	152 31.12 E	SIO Mooring rec	N/A	1443, fb 220	07 Mar 2014 22:41
MSG	East	04 06.17 S	152 33.85 E	SIO Mooring rec	N/A	1433, fb 260	08 Mar 2014 03:30
C10	01	04 04.0286 S	151 56.3713 E	CTD	607	633	08 Mar 2014 13:04:26
C11	01	04 08.2379 S	150 58.9518 E	CTD	2220	2245	08 Mar 2014 19:51:25
C12	01	03 41.7469 S	151 18.1914 E	CTD	2544	2566	09 Mar 2014 02:08:43
C13	01	03 17.5156 S	151 35.1629 E	CTD	1050	1072	09 Mar 2014 07:40:01
C14	01	03 39.2270 S	150 46.3929 E	CTD	2400	2430	09 Mar 2014 13:23:44
C15	01	03 51.2530 S	149 55.1232 E	CTD	2295	2323	09 Mar 2014 19:52:29
C16	01	03 16.9430 E	150 02.6971 E	CTD	2439	2464	10 Mar 2014 01:20:55
A01	8242	03 16.92 S	150 2.691 E	Argo	N/A	N/A	10 Mar 2014 03:41
C17	01	02 46.9561 S	150 07.4023 E	CTD / resp	980	1010	10 Mar 2014 07:06:25
C17	02	02 46.9539 S	150 07.4053 E	CTD / trans	965	1013	10 Mar 2014 09:08:18
C18	01	03 07.8297 S	149 17.4370 E	CTD	2000	2194	10 Mar 2014 14:58:02
C18	02	03 07.8657 S	149 17.4015 E	CTD / trans	1100	2193	10 Mar 2014 17:40:50
C19	01	03 26.5707 S	148 29.0890 E	CTD / resp	1609	1623	10 Mar 2014 23:25:40

C19	02	03 26.5708 S	148 29.0751 E	CTD / trans	1100	1629	11 Mar 2014 02:23:39
C20	01	03 46.4598 S	147 45.1595 E	CTD	1269	1291	11 Mar 2014 07:52:06
C20	02	03 46.5046 S	147 44.9393 E	CTD / trans	1100	1290	11 Mar 2014 10:21:36
C21	01	04 07.0837 S	146 57.1792 E	CTD / resp	1951	1982	11 Mar 2014 16:09:29
C21	2	04 07.0822 S	146 57.1780 E	CTD / trans	1100	1982	11 Mar 2014 18:59:31
C22	01	04 29.1866 S	146 02.9670 E	CTD	1059	1083	12 Mar 2014 01:29:52
C22	02	04 29.1867 S	146 02.9652 E	CTD / trans	1060	1081	12 Mar 2014 03:24:27
C23	01	04 27.0025 S	147 40.0977 E	CTD	1970	1995	12 Mar 2014 12:31:45
C24	01	04 28.7751 S	148 24.7155 E	CTD	1820	1842	12 Mar 2014 17:59:40
C25	01	04 53.9984 S	147 42.0356 E	CTD	1825	1849	13 Mar 2014 00:33:09
C26	01	05 23.7608 S	147 28.6278 E	CTD	1460	1488	13 Mar 2014 05:24:52
C27	01	05 46.1380 S	147 02.6122 E	CTD	1141	1167	13 Mar 2014 09:57:23
Vitiaz	West	05 58.69 S	147 39.97 E	SIO Mooring rec	N/A	980, fb 200	13 Mar 2014 22:30
Vitiaz	Middle	05 56.65 S	147 46.68 E	SIO Mooring rec	N/A	1131	14 Mar 2014 02:15
C28	01	05 53.2700 S	147 43.7914 E	CTD	1080	1102	14 Mar 2014 08:33:46
C28	02	05 53.2754 S	147 43.7703 E	biology	1070	1101	14 Mar 2014 10:38:43
C29	01	05 56.9618 S	147 39.7685 E	CTD	1022	1046	14 Mar 2014 12:32:26

Vitiaz	East	05 54.98 S	147 50.05 E	SIO Mooring rec	N/A	900, fb 170	14 Mar 2014 20:15
C30	01	06 00.0013 S	147 49.5173 E	CTD/ resp	1330	1360	15 Mar 2014 08:35:01
C31	01	06 03.0058 S	147 55.9839 E	CTD	1460	1495	15 Mar 2014 11:28:40
C32	01	06 04.9925 S	147 51.0519 E	CTD	1430	1463	15 Mar 2014 13:44
C33	01	06 24.8670 S	149 59.8262 E	CTD	1580	1606	16 Mar 2014 15:30:25
C34	01	06 54.6220 S	149 59.9109 E	CTD	2000	6456	16 Mar 2014 20:05:18
C35	01	07 24.9352 S	149 59.93.58 E	CTD	1999	4000	17 Mar 2014 01:16:36
A02	8243	07 27.123 S	150 00.227 E	Argo	N/A	N/A	17 Mar 2014 03:08
C36	01	08 20.4747 S	151 17.3389 E	CTD	1390	1412	17 Mar 2014 11:41:46
C37	01	08 35.4418 S	151 47.5147 E	CTD	1020	1052	17 Mar 2014 16:00:26
C38	01	08 49.7858 S	152 29.0735 E	CTD/ trans	915	937	17 Mar 2014 21:14:25
C38	02	08 49.7859 S	152 29.0718 E	CTD/ resp	N/A	936	17 Mar 2014 22:55:46
C39	01	08 14.8239 S	152 29.8483 E	CTD/ trans	2001	4990	18 Mar 2014 03:21:25
C39	02	08 14.7876 S	152 29.8014 E	CTD/ resp	1000	4990	18 Mar 2014 06:10:21
C40	01	07 37.9740 S	152 29.9386 E	CTD/ trans	2000	6800	18 Mar 2014 11:09:52
C40	02	07 37.9755 S	152 29.9394 E	CTD/ resp	1000	6850	18 Mar 2014 14:07:05
A03	8245	07 37.771 S	152 29.992 E	Argo	N/A	N/A	18 Mar 2014 15:13

C41	01	06 54.2684 S	152 29.9176 E	CTD/ trans	2000	4247	18 Mar 2014 18:53:41
C41	02	06 53.9929 S	152 29.9017 E	CTD/ resp	999	4244	18 Mar 2014 22:06:58
A04	8246	06 53.980 S	152 29.824 E	Argo	N/A	N/A	18 Mar 2014 23:21
C42	01	06 10.1530 S	152 29.8502	CTD/ trans	5700	5754	19 Mar 2014 03:01:49
C42	02	06 10.0081 S	152 29.8504 E	CTD/ resp	1000	5769	19 Mar 2014 08:24:28
C43	01	05 30.2278 S	152 05.8947 E	CTD/ trans	1180	1235	19 Mar 2014 13:24:55
C43	02	05 30.1824 S	152 05.8883 E	CTD/ resp	1000	1211	19 Mar 2014 15:18:38
M2	N/A	05 07.99 S	153 20.28 E	IRD Mooring depl	N/A	2340	20 Mar 2014 01:30
C44	01	05 09.5981 S	153 16.8794 E	CTD/ resp	2538	2667	20 Mar 2014 07:18:30
C45	01	03 49.2636 S	154 01.0523 E	CTD	2595	2619	21 Mar 2014 01:28:04
A05	8247	03 49.29 S	154 00.85 E	Argo	N/A	N/A	21 Mar 2014 03:38
C46	01	04 14.9725 S	153 24.0991 E	CTD	3250	3595	21 Mar 2014 07:26:52
M3	N/A	05 08.071 S	154 18.138 E	IRD Mooring depl	N/A	2613	21 Mar 2014 20:45
C47	01	07 37.9108S	155 24.6205E	CTD	4600	4624	22 Mar 2014 16:59
C48	01	04 14.9725 S	153 24.0991 E	CTD	3250	3595	23 Mar 2014 11:14
A06	8247	08 38.27 S	156 23.75E	Argo	N/A	N/A	23 Mar 2014 14:35
C49	01	11 30.0359S	154 23.5309E	CTD/Re sp	1180	1219	25 Mar 2014 03:50

C50	01	11 27.882S	154 38.3859E	CTD/yo yo	1710	1736	25 Mar 2014 07:02
C50	02	11 27.8851S	154 38.3886E	CTD/yo yo	1700	1730	25 Mar 2014 09:17
C50	03	11 27.8856S	154 38.3859E	CTD/yo yo	1700	1732	25 Mar 2014 10:30
C50	04	11 27.8859S	154 38.3874E	CTD/yo yo	1700	1732	25 Mar 2014 11:39
C50	05	11 27.8860S	154 38.3871E	CTD/yo yo	1700	1730	25 Mar 2014 13:01
C50	06	11 27.8852S	154 38.3877E	CTD/yo yo	1700	1730	25 Mar 2014 14:03
C51	01	11 22.2106S	154 59.8856E	CTD	2249	2278	25 Mar 2014 17:29
C52	01	11 14.361S	155 28.5851E	CTD	2380	2400	25 Mar 2014 22:15
C53	01	11 03.662S	156 12.8841E	CTD	3000	3860	26 Mar 2014 05:14
C54	01	10 48.7075S	157 12.4236	CTD/res p	640	633	26 Mar 2014 13:26
C55	01	10 33.5431S	158 11.4082E	CTD	1970	1988	26 Mar 2014 19:04
C56	01	10 18.2613S	159 10.9462E	CTD/res p	3130	3158	27 Mar 2014 02:05
C57	01	10 00.6270S	160 21.7147E	CTD/YO YO	3300	3354	27 Mar 2014 10:16
C57	02	10 00.6166S	160 21.6223E	CTD/YO YO	2000	3344	27 Mar 2014 13:59
C57	03	10 00.6170S	160 21.6220E	CTD/YO YO	1000	3344	27 Mar 2014 12:24
C57	04	10 00.6169S	160 21.6227E	CTD/YO YO	1000	3344	27 Mar 2014 18:10